Amazon Chime SDK Voice Connector

SIP Trunking Configuration Guide:

3CX with AudioCodes Mediant 1000B SBC

March 2023

Document History

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Table of Contents

1 Audience 6

1.1 Amazon Chime SDK Voice Connector 6

2 SIP Trunking Network Components 7

2.1 Hardware Components 8

2.2 Software Requirements 8

3 Features 8

3.1 Features Supported 8

3.2 Features Not Supported 9

3.3 Features Not Tested 9

3.4 Caveats and Limitations 9

4 Configuration 10

4.1 Configuration Checklist 10

4.2 3CX Configuration 11

4.2.1 3CX Management Console 11

4.2.2 Add SIP Trunk 12

4.2.3 Add Users 18

4.2.4 Outbound Rules 20

4.2.5 Inbound Rules 22

4.3 AudioCodes SBC configuration 23

4.3.1 Network IP Interface configuration 23

4.3.2 Media Realm configuration 23

4.3.3 SRD Configuration 25

4.3.4 SIP Interface configuration 26

4.3.5 Proxy Sets configuration 28

4.3.6 IP Group Table Configuration 31

4.3.7 Coder Groups configuration 35

4.3.8 IP Profile Configuration 36

4.3.9 IP-to-IP Routing 42

4.3.10 TLS Configuration 44

4.3.11 Message Manipulation configuration 46

Table of Figures

Figure 1 Network Topology 7
Figure 2: 3CX Management Console 11
Figure 3: 3CX Management Console (cont.) 12
Figure 4: Add SIP Trunk 12
Figure 5: Add SIP Trunk/VoIP Provider 13
Figure 6: Add SIP Trunk (cont.) 14
Figure 7: Add SIP Trunk (cont.) 14
Figure 8: Add SIP Trunk (cont.) 15
Figure 9: Add SIP Trunk (Outbound Parameters) 16
Figure 10: Add SIP Trunk (Outbound Parameters-cont.) 17
Figure 11: Add SIP Trunk (Outbound Parameters- cont.) 17
Figure 12: Add Users 18
Figure 13: Add Users (cont.) 18
Figure 14: Add Users (cont.) 19
Figure 15: Add Extensions (cont.) 19
Figure 16: Add Users (cont.) 20
Figure 17: Outbound Rules 20
Figure 18: Outbound Rules (cont.) 21
Figure 19: Outbound Rules (cont.) 21
Figure 20: Inbound Rules 22
Figure 21: Inbound Rules (cont.) 22
Figure 22: IP Interfaces 23
Figure 23: Media Realms Table 23
Figure 24: Media Realm for 3CX 24
Figure 25: Media Realm for Amazon Chime SDK Voice Connector 24
Figure 26: Default SRD 25
Figure 27: Default SRD table details 25
Figure 28: SIP Interfaces 26
Figure 29: SIP Interface for 3CX 26
Figure 30: SIP Interface for 3CX Continuation 27
Figure 31: SIP Interface for Amazon Chime SDK Voice Connector 27
Figure 32: SIP Interface for Amazon Chime SDK Voice Connector Continuation 28
Figure 33: Proxy Sets table 28
Figure 34: Proxy Set table for 3CX 29
Figure 35: Proxy Address for 3CX 29
Figure 36: Proxy Set Table for Amazon Chime SDK Voice Connector 30
Figure 37: Proxy Address for Amazon Chime SDK Voice Connector 30

Figure 38: IP Group Table 31
Figure 39: IP Group Table for 3CX 31
Figure 40: IP Group table for 3CX Continuation 32
Figure 41: IP Group Table for 3CX Continuation 32
Figure 42: IP Group Table for 3CX Continuation 33
Figure 43: IP Group Table for Amazon Chime SDK Voice Connector 33
Figure 44: IP Group Table for Amazon Chime SDK Voice Connector Continuation 34
Figure 45: IP Group Table for Amazon Chime SDK Voice Connector Continuation 34
Figure 46: IP Group Table for Amazon Chime SDK Voice Connector Continuation 35
Figure 47: Coder Groups 35
Figure 48: IP Profiles 36
Figure 49: IP Profile for 3CX 36
Figure 50: IP Profile for 3CX Continuation 37
Figure 51: IP Profile for 3CX Continuation 37
Figure 52: IP Profile for 3CX Continuation 38
Figure 53: IP Profile for 3CX Continuation 38
Figure 54: IP Profile for 3CX Continuation 39
Figure 55: IP Profiles for Amazon Chime SDK Voice Connector 39
Figure 56: IP Profiles for Amazon Chime SDK Voice Connector Continuation 40
Figure 57: IP Profile for Amazon Chime SDK Voice Connector Continuation 40
Figure 58: IP Profile for Amazon Chime SDK Voice Connector Continuation 41
Figure 59: IP Profiles for Amazon Chime SDK Voice Connector Continuation 41
Figure 60: IP Profiles for Amazon Chime SDK Voice Connector Continuation 42
Figure 61: IP-to-IP Routing 42
Figure 62: IP-to-IP Routing from 3CX to Amazon Chime SDK Voice Connector 43
Figure 63: IP-to-IP Routing from Amazon Chime SDK Voice Connector to 3CX 43
Figure 64: TLS Contexts 44
Figure 65: TLS Context for Amazon Chime SDK Voice Connector 44
Figure 66: Trusted Root Certificate Import option 45
Figure 67: Media Security 45
Figure 68: SBC Media Security Mode configuration in IP Profile 46
Figure 69: OPTIONS TO header 3CX 47
Figure 70: OPTIONS TO header Amazon Chime SDK Voice Connector 47
Figure 71: FROM header host modification towards 3CX 48
Figure 72: FROM header host modification towards Amazon Chime SDK Voice Connector 48
Figure 73: PAI header host modification towards Amazon Chime SDK Voice Connector 49
Figure 74: BYE response host modification towards Amazon Chime SDK Voice Connector 49
Figure 75: Session Refresher modification towards 3CX 50

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 **3CX** with **AudioCodes Mediant 1000B SBC** to connect to **Amazon Chime SDK Voice Connector** for inbound and/or outbound telephony capabilities.

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1.1 Amazon Chime SDK Voice Connector

Amazon Chime SDK 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 SDK Voice Connector uses the industry-standard Session Initiation Protocol (SIP). Amazon Chime SDK 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 SDK Voice Connector offers cost-effective rates for inbound and outbound calls. Calls into Amazon Chime meetings, as well as calls to other Amazon Chime SDK Voice Connector customers are at no additional cost. With Amazon Chime SDK 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 **3CX** with **AudioCodes Mediant 1000B SBC** with **Amazon Chime SDK Voice Connector.**

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

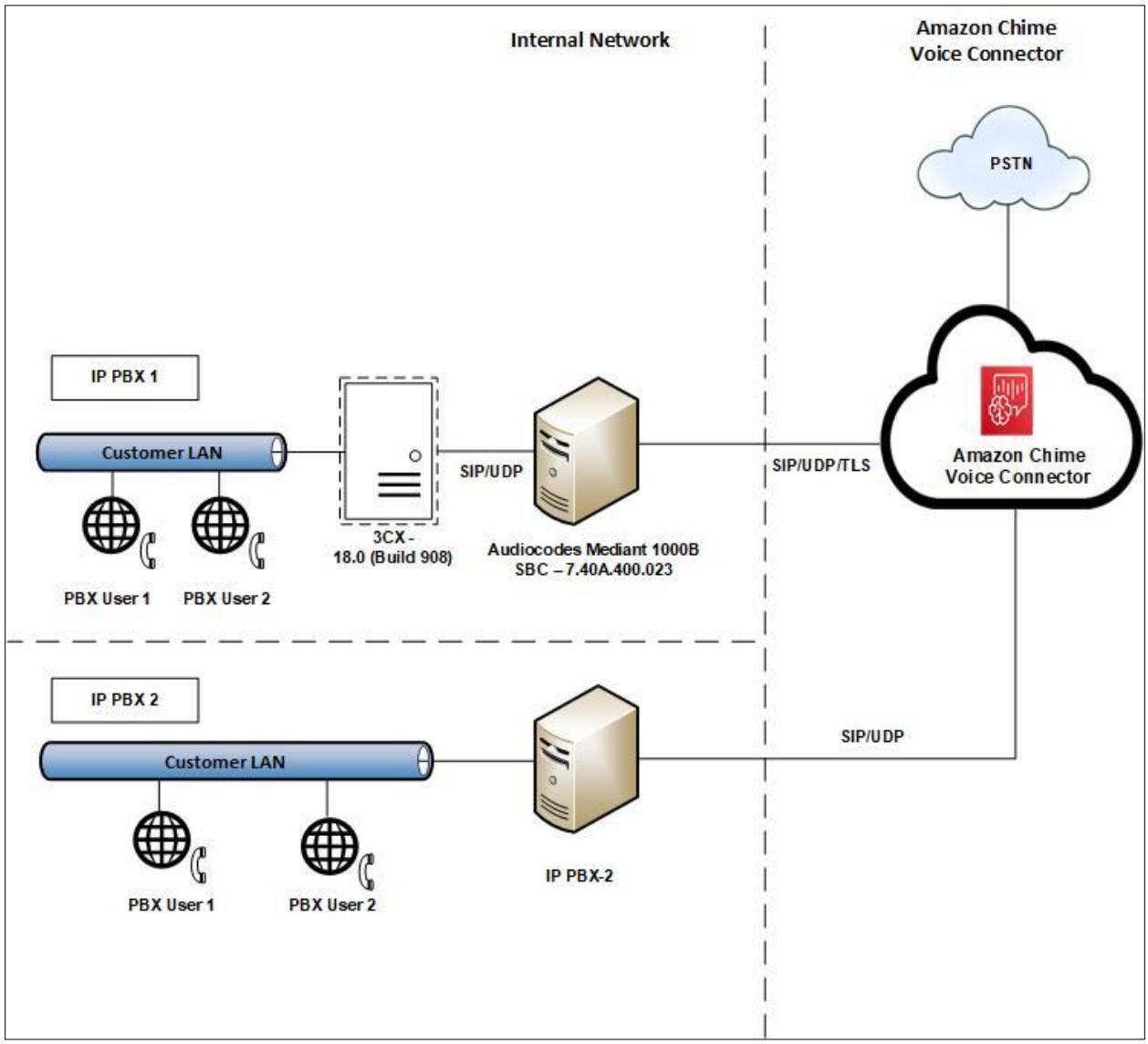

Figure 1 Network Topology

2.1 Hardware Components

- 3CX running on Hyper-V Manager Version: 6.3.9600.16384
- AudioCodes Mediant 1000B SBC

2.2 Software Requirements

- 3CX version 18.0 (Build 908)
- AudioCodes Mediant 1000B SBC version 7.40A.400.023

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
- Call Distribution
- Call Failover

3.2 Features Not Supported

- Amazon Chime SDK Voice Connector responds to OPTIONS and TCP Keep Alive messages received from customer equipment, but does not send OPTIONS or TCP Keep Alive messages to customer equipment.

3.3 Features Not Tested

- None

3.4 Caveats and Limitations

- Amazon Chime SDK 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 must be cleared manually.

- Inbound call INVITE from Amazon Chime SDK Voice Connector with Unsupported cipher is not directly rejected by AudioCodes SBC. Instead, it is sending 180 Ringing first as the call reached the PBX user. When the call is answered, SBC is sending rejection with SIP: 488 Not acceptable to Amazon Chime SDK Voice Connector.

4 Configuration

The specific values listed in this guide are used in the lab configuration described in this document and are for illustrative purposes only. Customer must obtain and use the appropriate values for their deployment. Encryption is always recommended if supported.

4.1 Configuration Checklist

This section presents an overview of the steps that are required to configure **3CX** and **AudioCodes Mediant 1000B SBC** for SIP Trunking with **Amazon Chime SDK Voice Connector.**

Table 1 – PBX Configuration Steps

Steps	Description	Reference
Step 1	3CX Configuration	Section 4.2
Step 2	AudioCodes SBC configuration	Section 4.3

4.2 3CX Configuration

This section with screen shots taken from 3CX used for the interoperability testing gives a general overview of the 3CX configuration.

4.2.1 3CX Management Console

- To access the 3CX PBX, login to 3CX management console by providing the credentials.

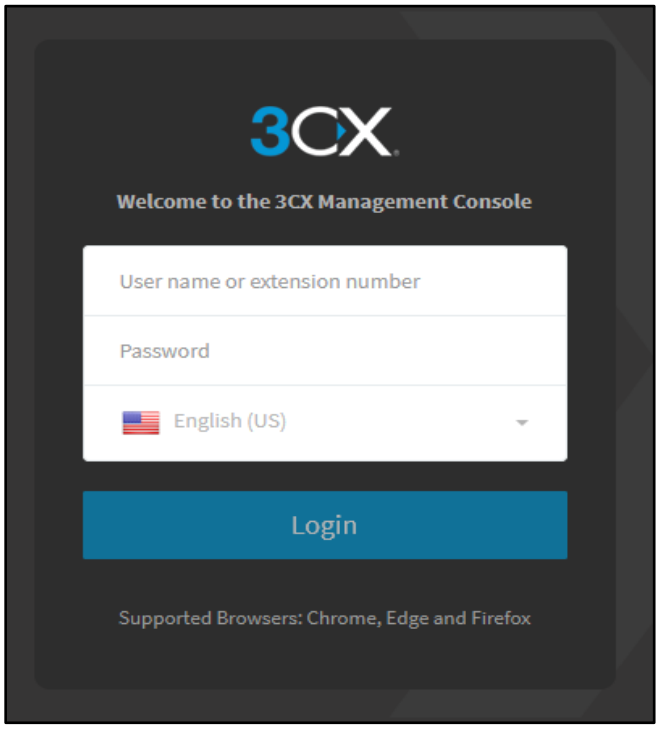

Figure 2: 3CX Management Console

Dashboard will be displayed after successful login. To verify the system version, navigate to **Information** section and find the version against **License**.

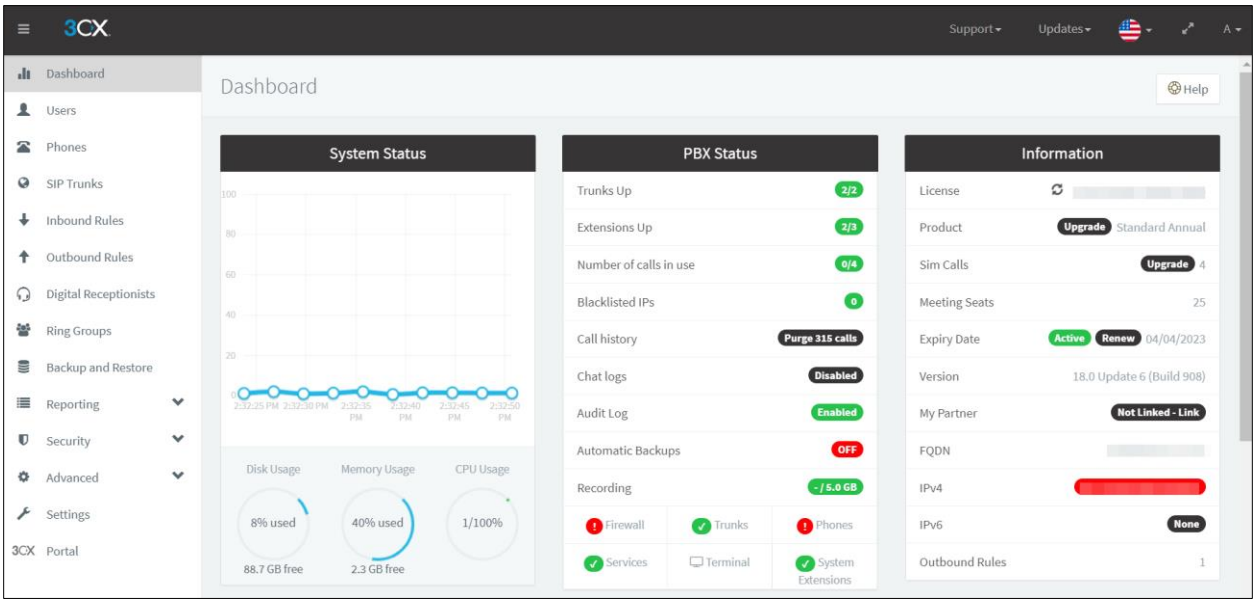

Figure 3: 3CX Management Console (cont.)

4.2.2 Add SIP Trunk

1. Navigate to **SIP Trunks** and click on **Add SIP Trunk.**

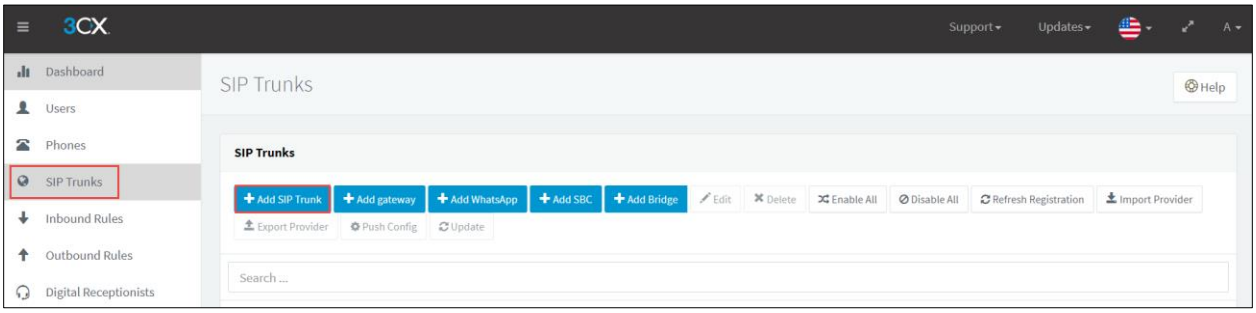

Figure 4: Add SIP Trunk

2. **Select Country** is set to **United States**.
3. **Select Provider in your Country** is set to Amazon Chime SDK Voice Connector.
4. **Main Trunk No** is set to +1919XXXXXXX.
5. Click **OK**.

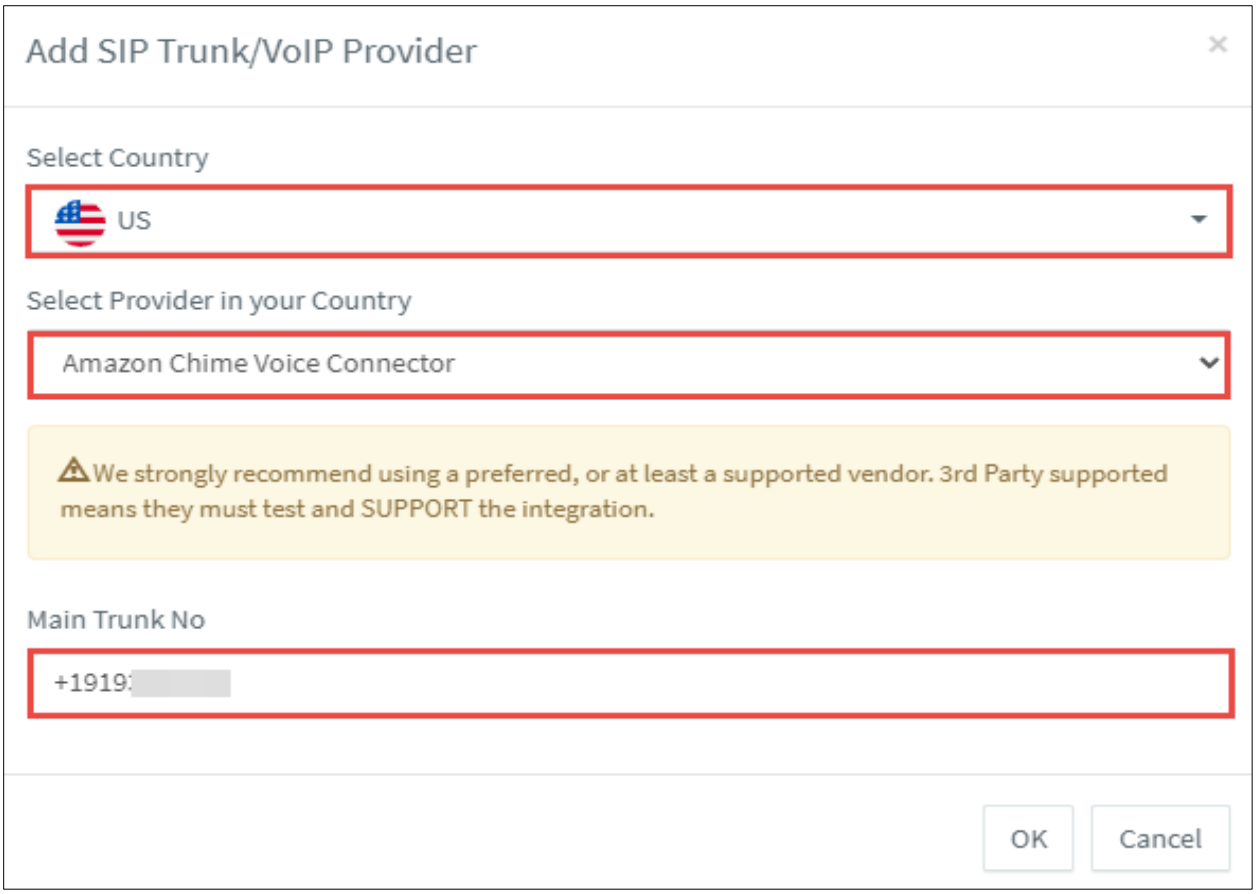

Figure 5: Add SIP Trunk/VoIP Provider

Under **General** tab:

6. **Enter name for Trunk** is displayed as Amazon Chime SDK Voice Connector**.**
7. **Registrar/Server/Gateway Hostname or IP** is set to xx.xx.xx.xx the LAN IP address of AudioCodes Mediant 1000B SBC.
8. **Number of SIM Calls** set to 10.
9. All other fields are left with default settings.

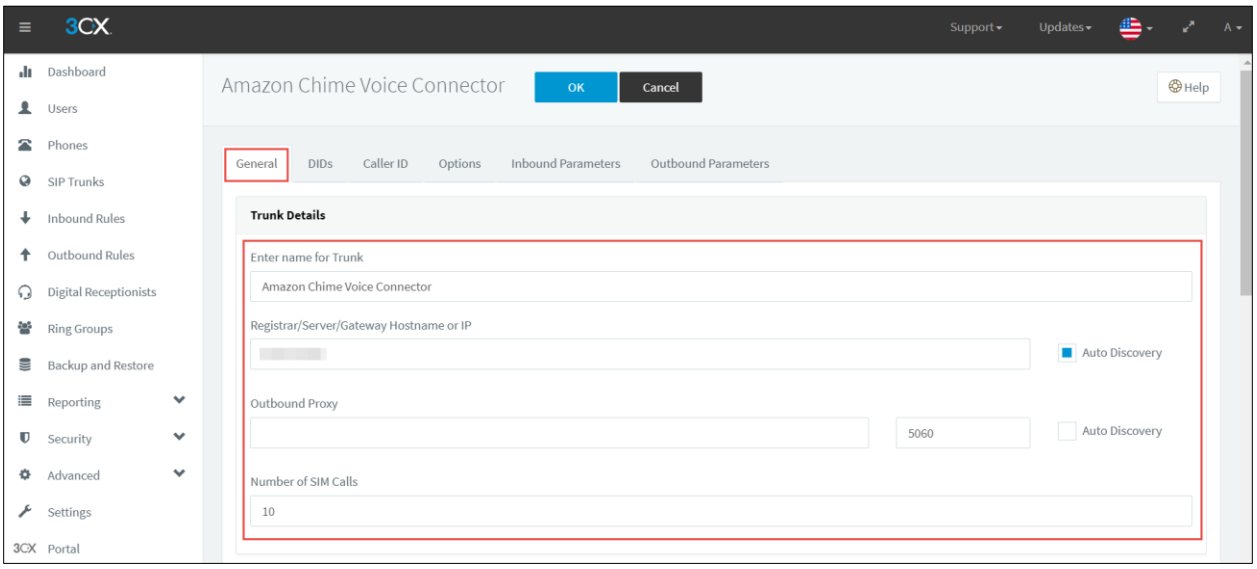

Figure 6: Add SIP Trunk (cont.)

Under **DIDs** tab:

10. Click **Add Single DID** and add all DIDs required.

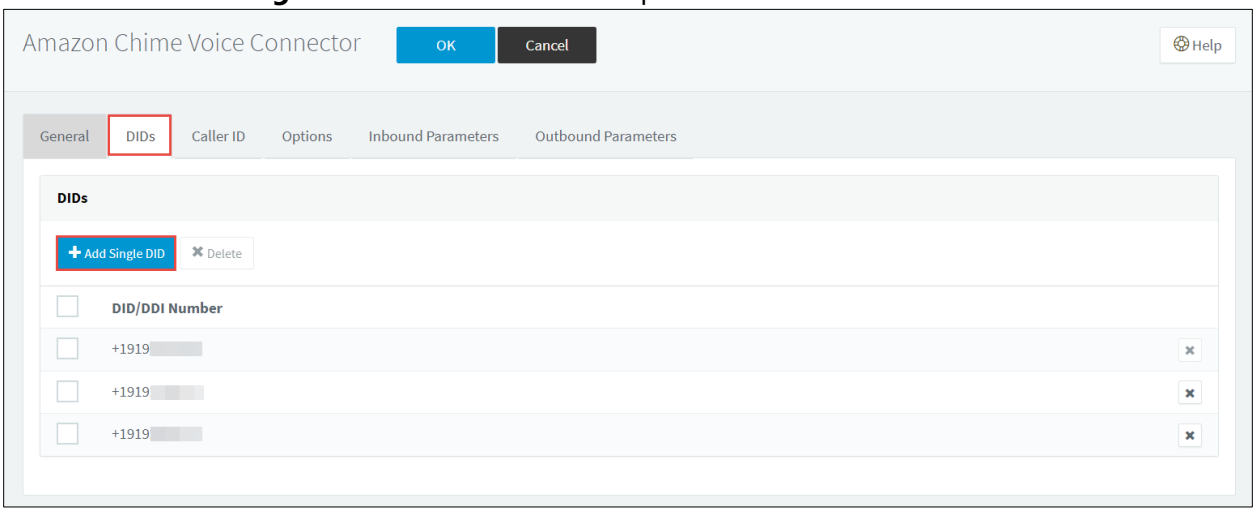

Figure 7: Add SIP Trunk (cont.)

Under **Options** tab:

11. Set the **Transport Protocol** as UDP.
12. Set the **Codec Priority** as G711 U-law.

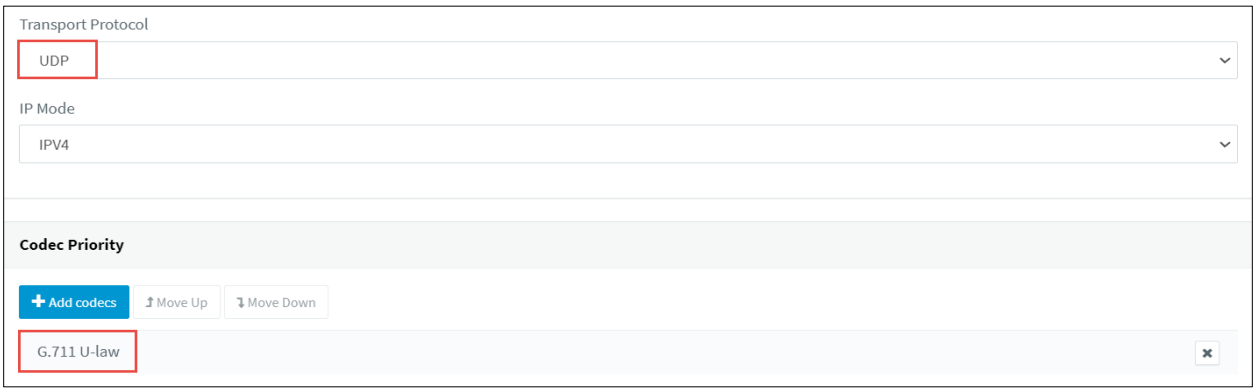

Figure 8: Add SIP Trunk (cont.)

Under **Outbound Parameters** tab:

13. **P-Asserted Identity: Display name** is set to "OutboundCallerId" Original Caller number will be sent.
14. **P-Asserted Identity: User Part** is set to "OutboundCallerId" Original Caller number will be sent.
15. **P-Asserted Identity: Host Part** is set to "GWHostPort" usually, content of Contact field
16. **Remote Party ID- Calling Party for Display Name, User Part and Host Part** is set to "Leave default value".
17. All other fields were left with default settings.

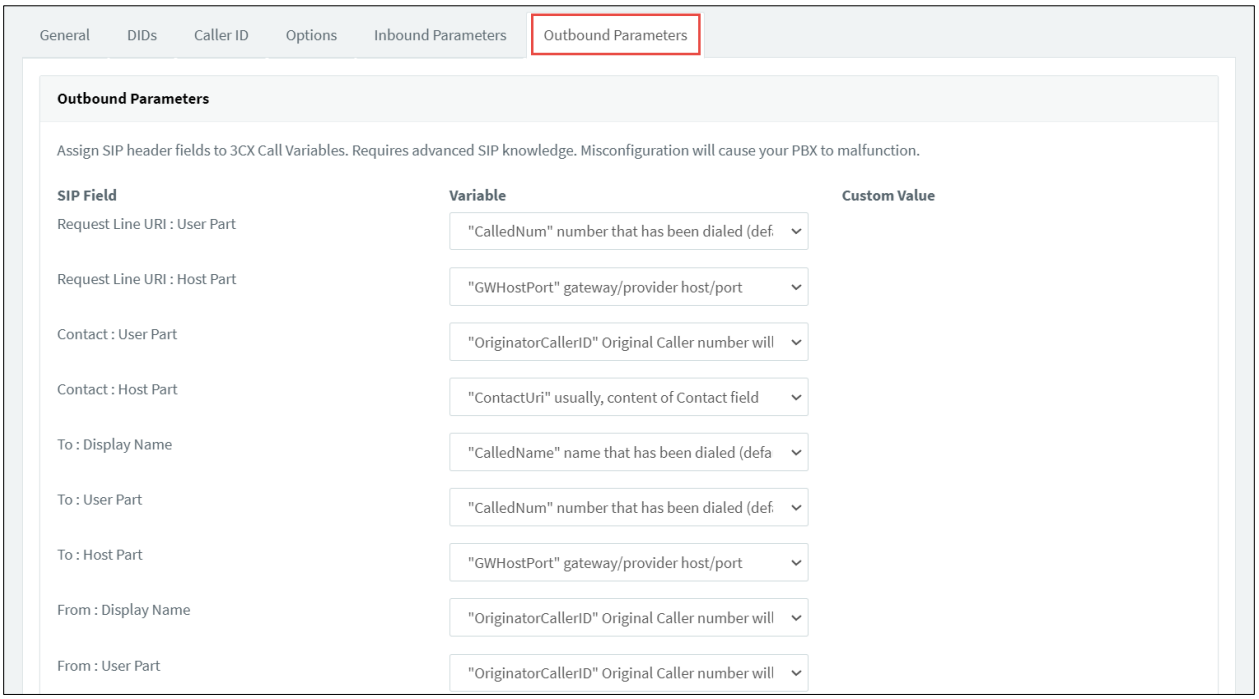

Figure 9: Add SIP Trunk (Outbound Parameters)

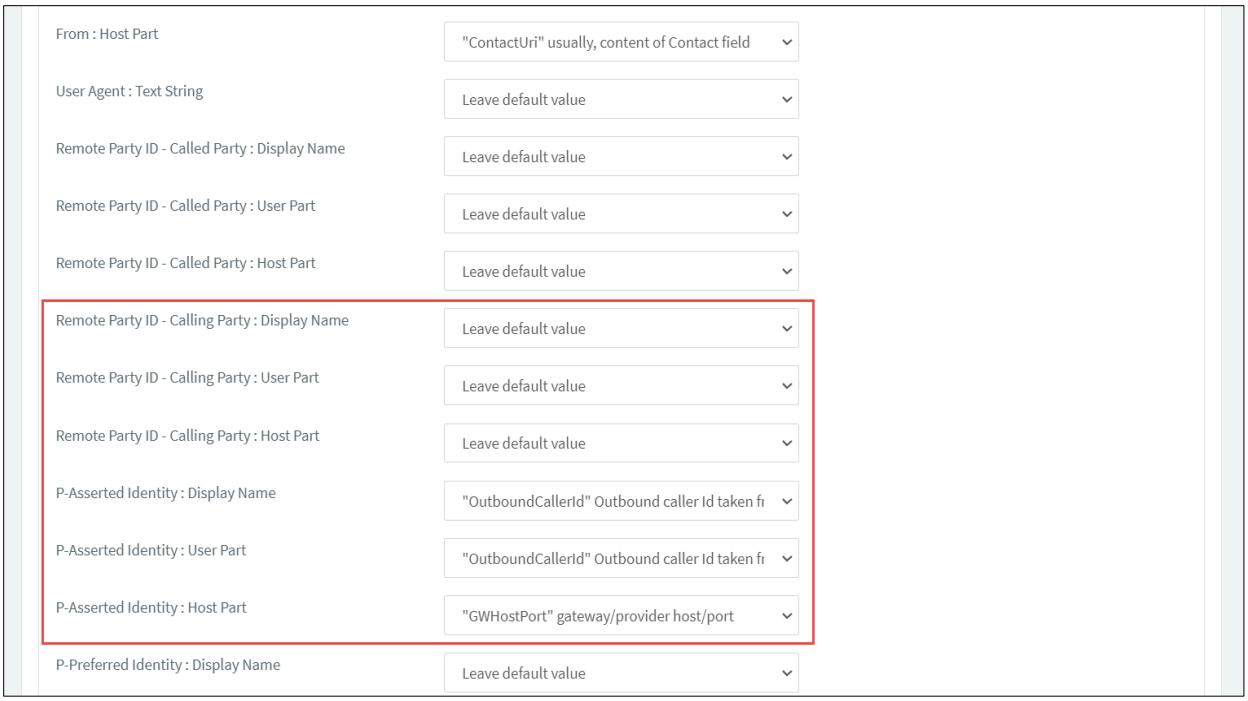

Figure 10: Add SIP Trunk (Outbound Parameters-cont.)

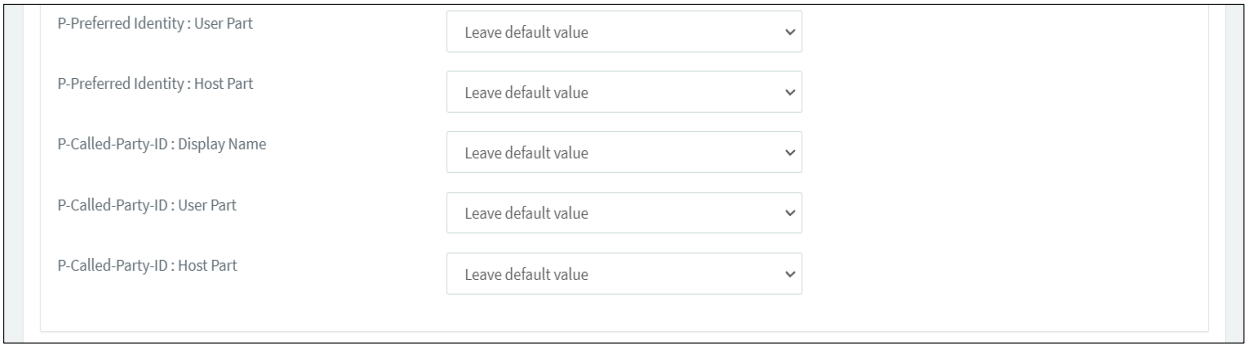

Figure 11: Add SIP Trunk (Outbound Parameters- cont.)

4.2.3 Add Users

1. Navigate to **Users** and click **Add.**

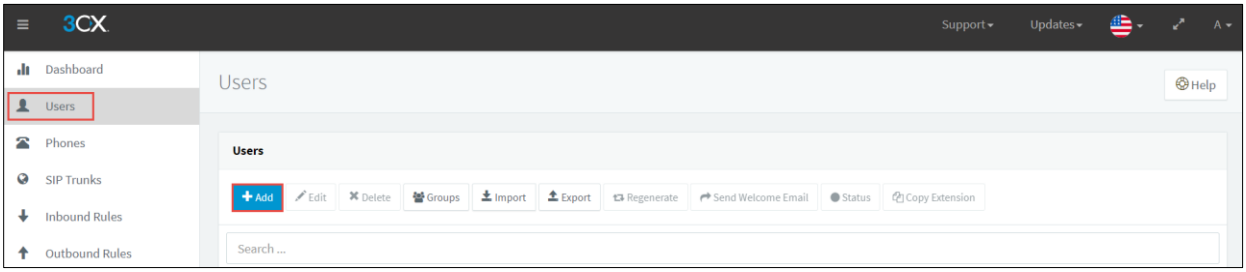

Figure 12: Add Users

2. **User** is set as 4000 for example.
3. **First Name** is set as Amazon and **Last Name** is set as User1.
4. **Outbound Caller ID** is set to +1919XXXXXXX.

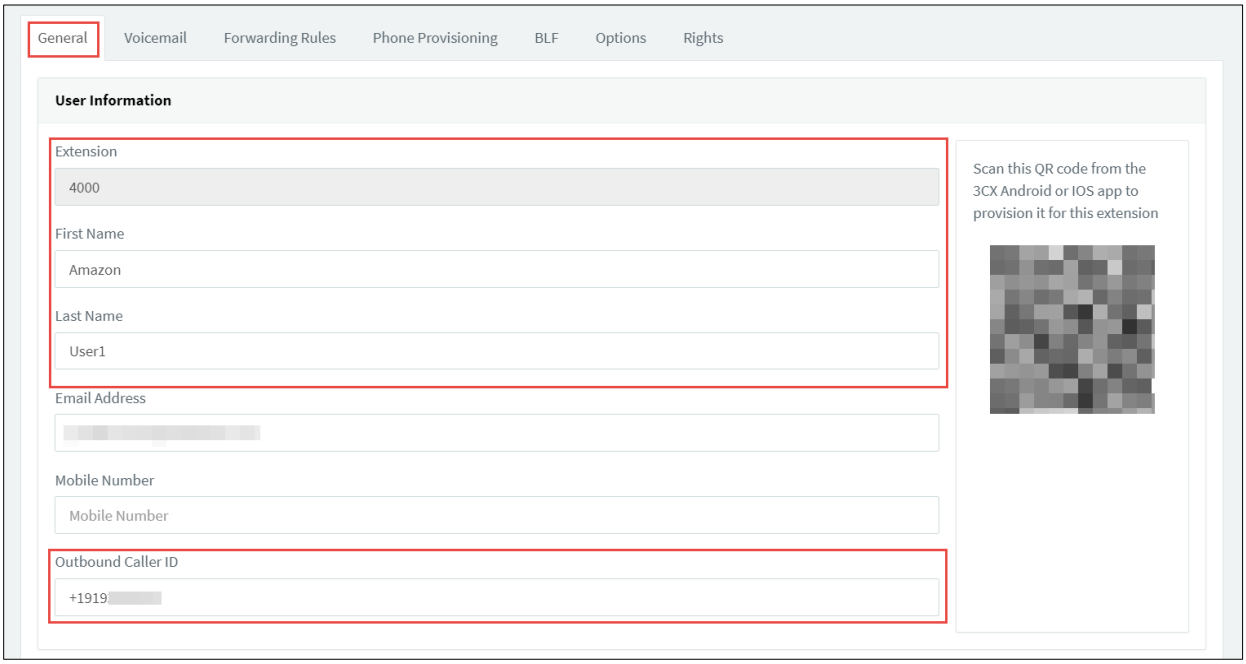

Figure 13: Add Users (cont.)

5. Under **Direct Inbound Dialing (DID)**, click **Add a DID/DDI.**
6. At the new pop-up window, select the desired DID and Click OK.

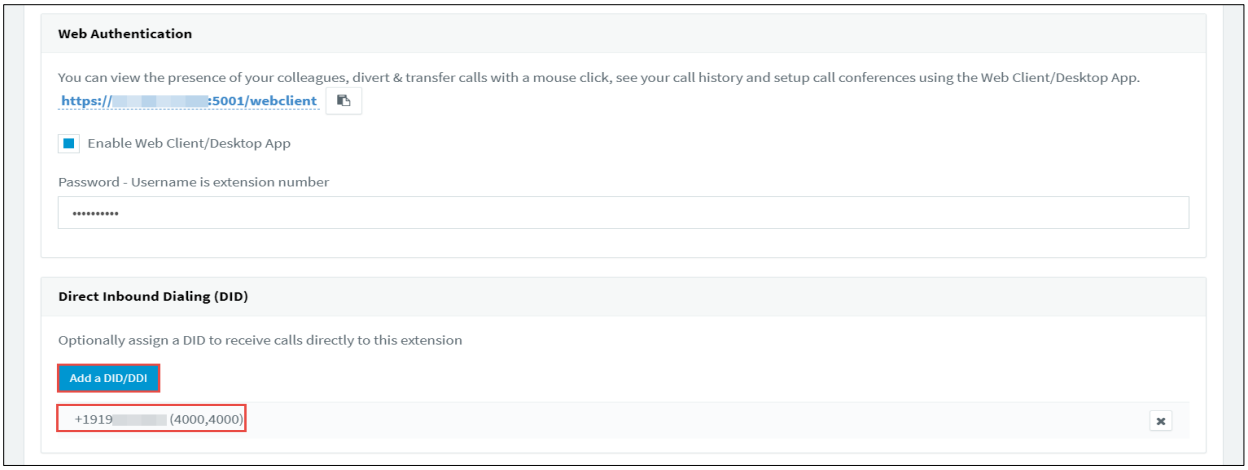

Figure 14: Add Users (cont.)

7. Under **Phone Provisioning** click **Add.**

Figure 15: Add Extensions (cont.)

8. On the **Add Phone** pop-up window, select the phone model and enter the MAC address.
9. Click **OK** in the pop-up window and **OK** in the main window to complete Add Extensions procedure.

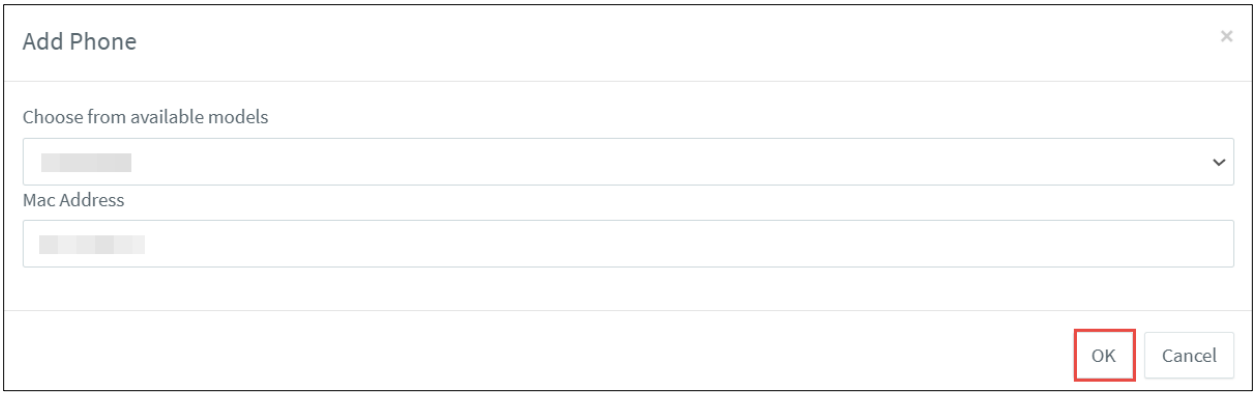

Figure 16: Add Users (cont.)

4.2.4 Outbound Rules

1. Navigate to **Outbound Rules** and click **Add**.

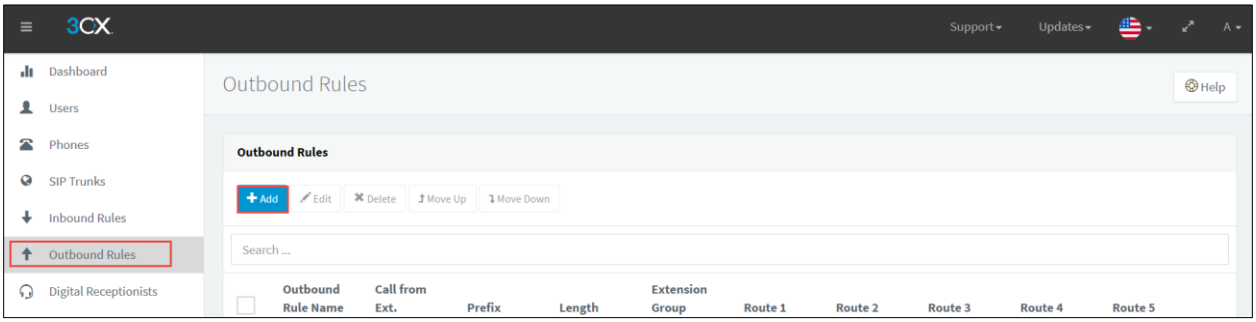

Figure 17: Outbound Rules

2. **Rule Name** is set as AmazonChimeVoiceConnector.
3. **Calls to numbers starting with prefix** is set as 9.

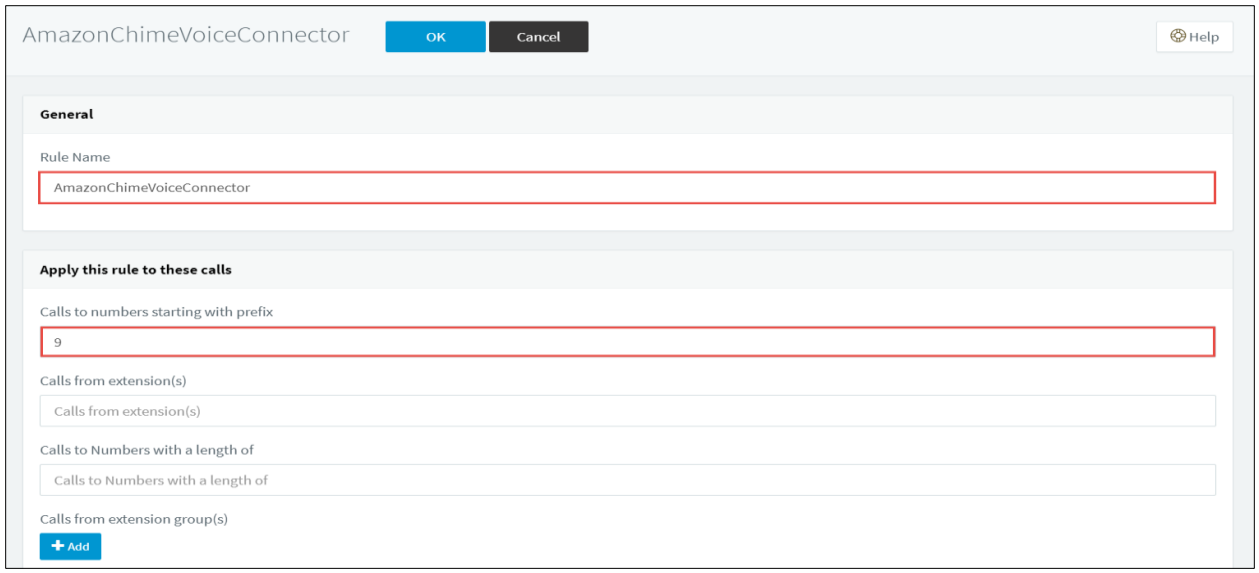

Figure 18: Outbound Rules (cont.)

4. Route 1 is set to Amazon Chime SDK Voice Connector from the drop down.
5. **Strip Digits** is set to 1 and **Prepend** is set to +. This strips 9 and adds + before sending to Amazon Chime SDK Voice Connector.
6. All other fields are left with default settings.

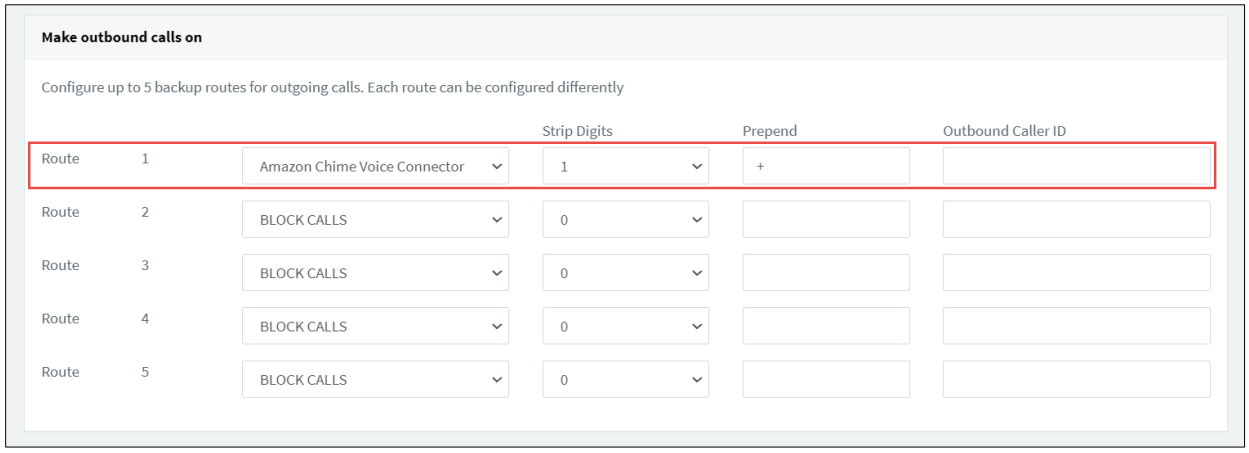

Figure 19: Outbound Rules (cont.)

4.2.5 Inbound Rules

1. Navigate to **Inbound Rules**, click **Add DID Rule**.

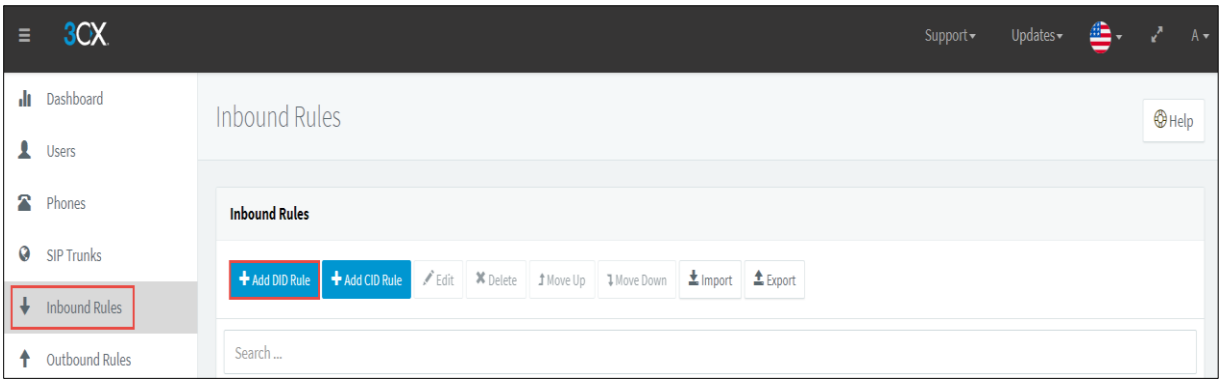

Figure 20: Inbound Rules

2. **Name** is set as Rule for Amazon User1 for example.
3. **DID/DDI** is set to 919XXXXXXX.
4. **Destination for calls during office hours** and **Destination for calls outside office hours** is set as Extension.
5. Click **OK** to complete the configuration.

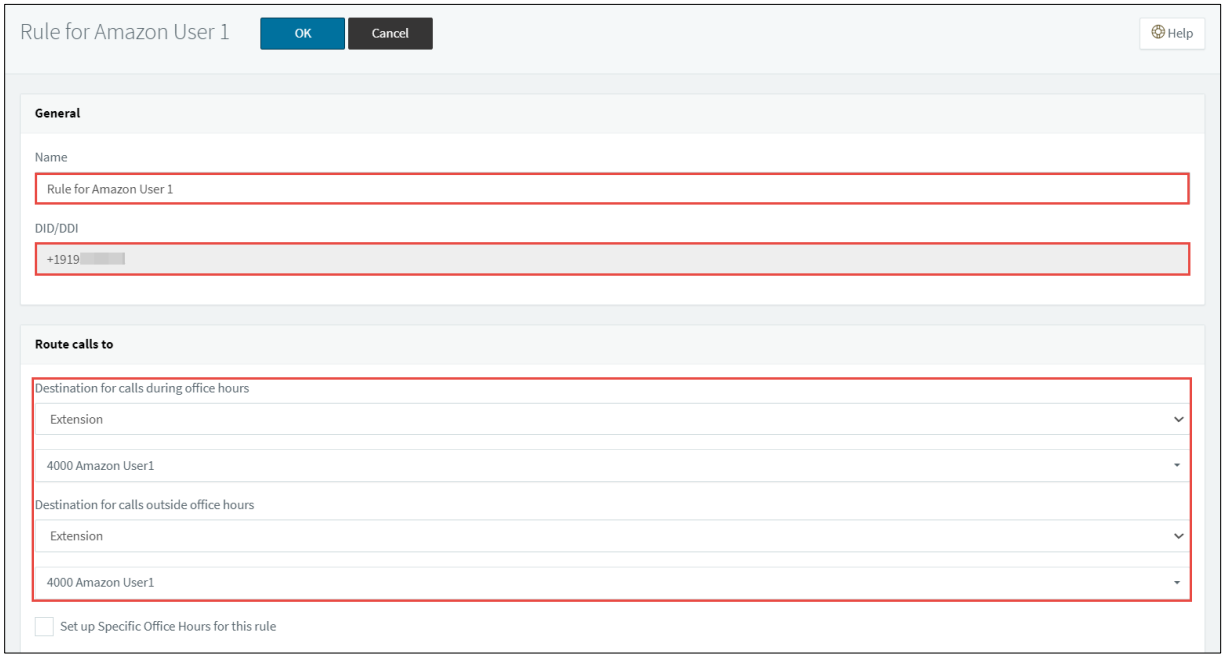

Figure 21: Inbound Rules (cont.)

4.3 AudioCodes SBC configuration

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.

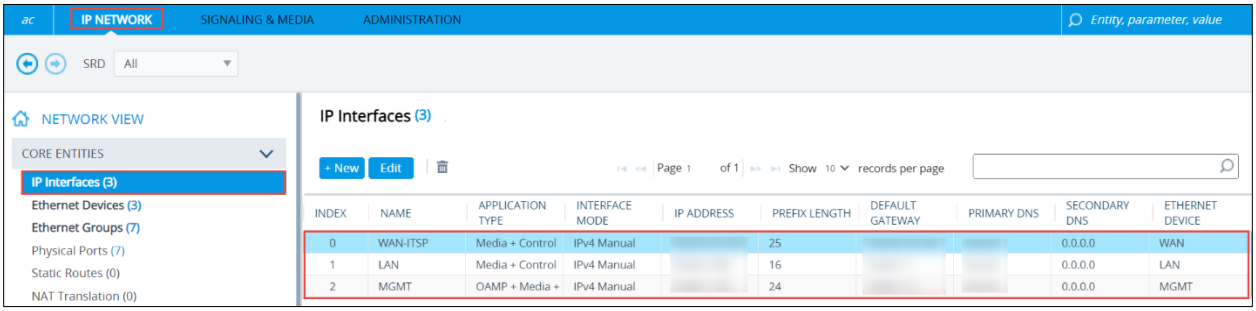

Figure 22: IP Interfaces

4.3.2 Media Realm configuration

Two media realms are created, one is associated to 3CX and another is associated with Amazon Chime SDK Voice Connector. To configure media realm, navigate to **SETUP** and select **SIGNALING & MEDIA**. Expand **CORE ENTITIES** and select **Media Realms**.

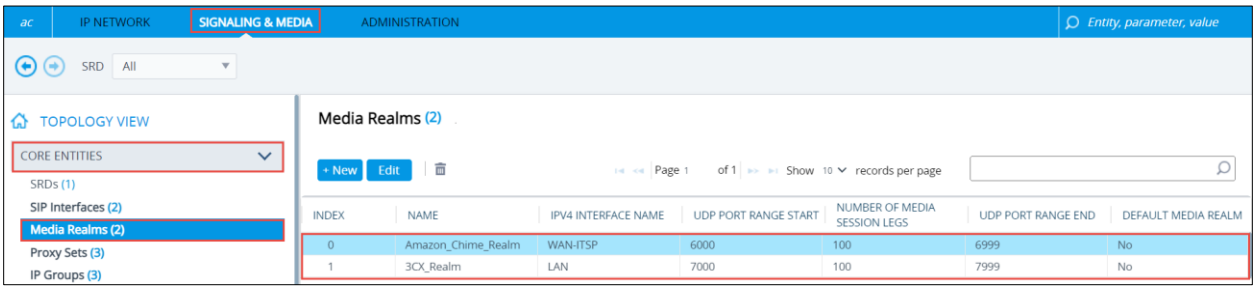

Figure 23: Media Realms Table

Click +**New** button to add new media realms. Enter the **name** of the Media Realm, UDP **Port Range Start** and **Number of Media Session Legs**. Select the appropriate **IPv4 Interface Name** for 3CX.

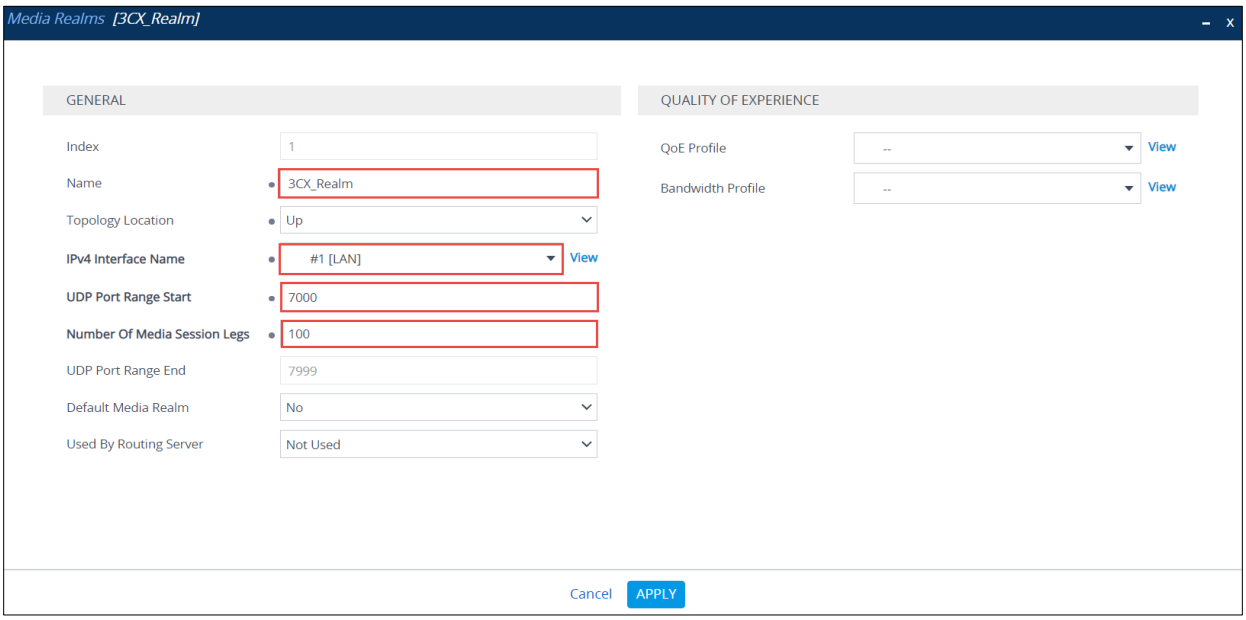

Figure 24: Media Realm for 3CX

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 SDK Voice Connector.

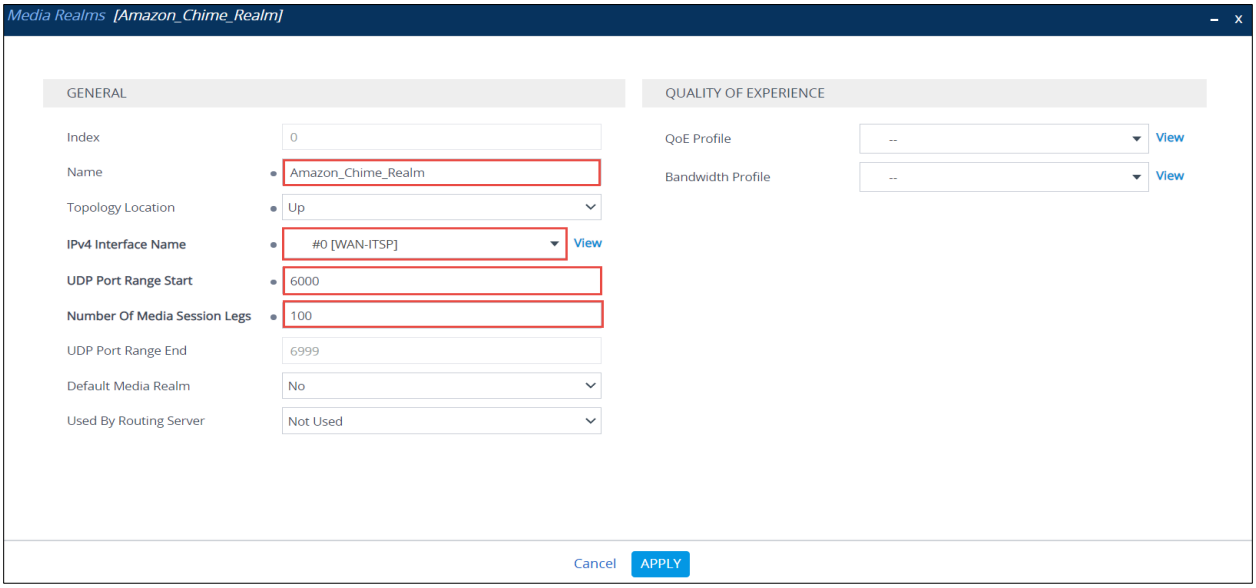

Figure 25: Media Realm for Amazon Chime SDK Voice Connector

4.3.3 SRD Configuration

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

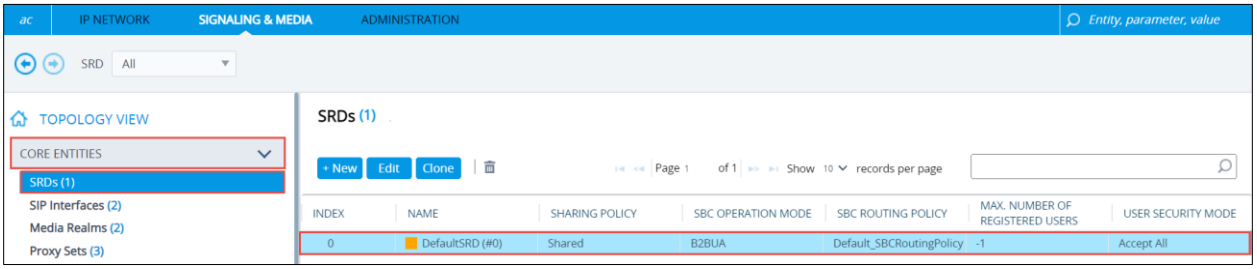

Figure 26: Default SRD

The default SRD configuration is used.

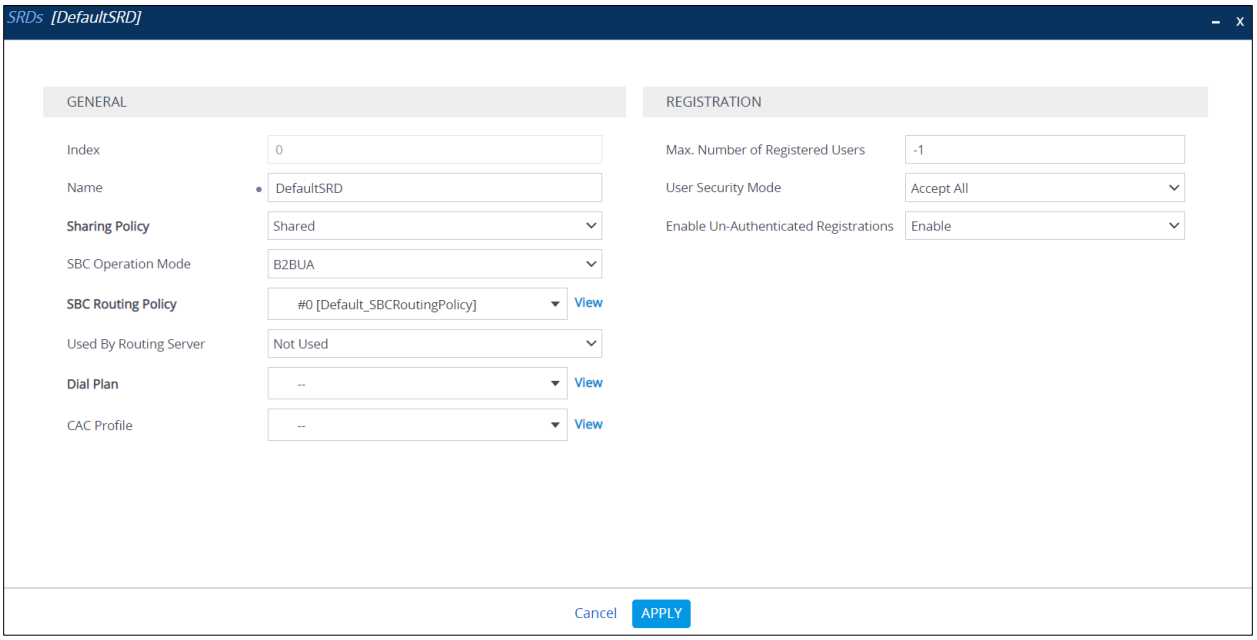

Figure 27: Default SRD table details

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 3CX and the other is for Amazon Chime SDK Voice Connector.

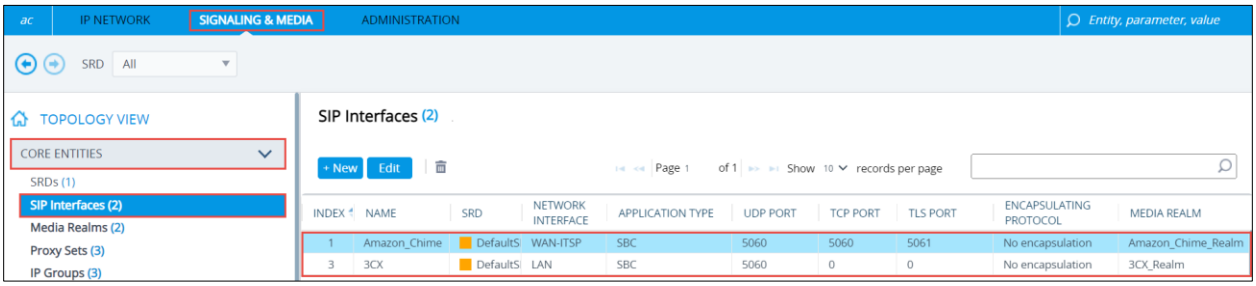

Figure 28: SIP Interfaces

Network Interface, Media Realm, Application Type, SRD and **UDP Port** are associated to 3CX Interface and the remaining parameters are set to default.

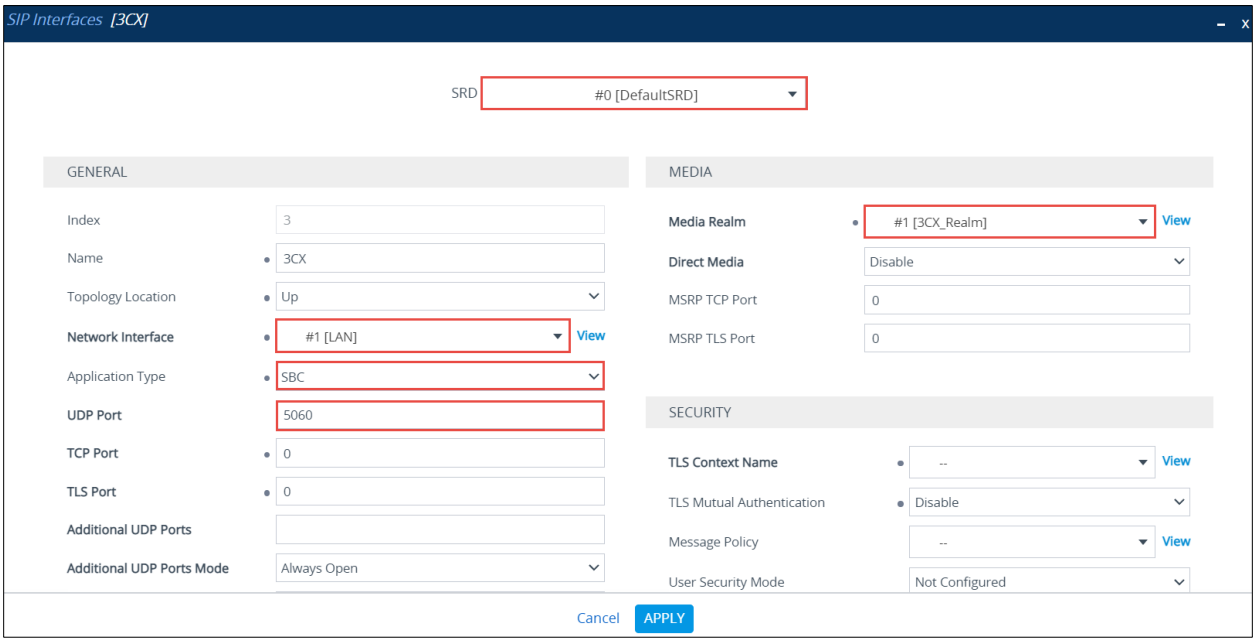

Figure 29: SIP Interface for 3CX

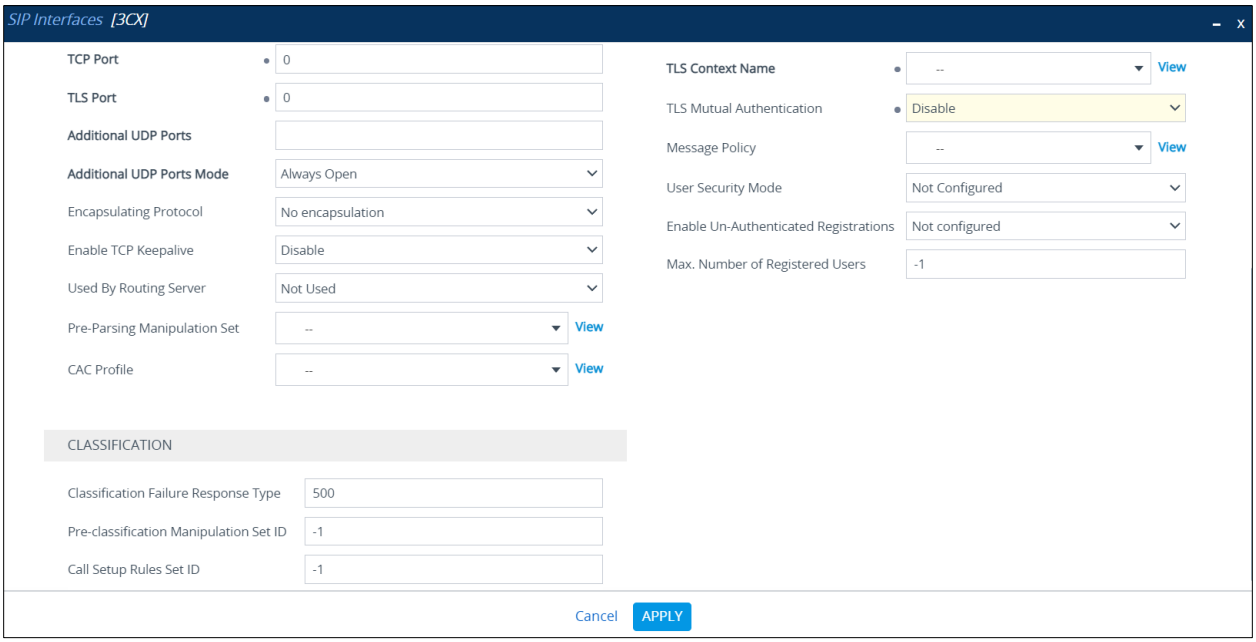

Figure 30: SIP Interface for 3CX Continuation

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

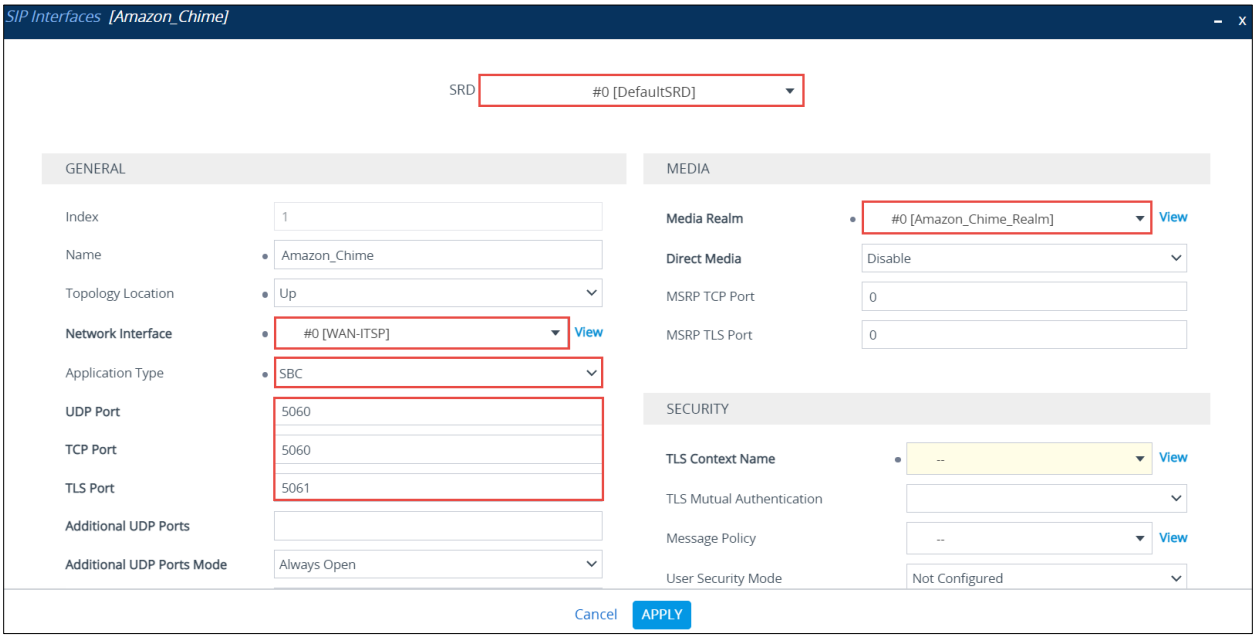

Figure 31: SIP Interface for Amazon Chime SDK Voice Connector

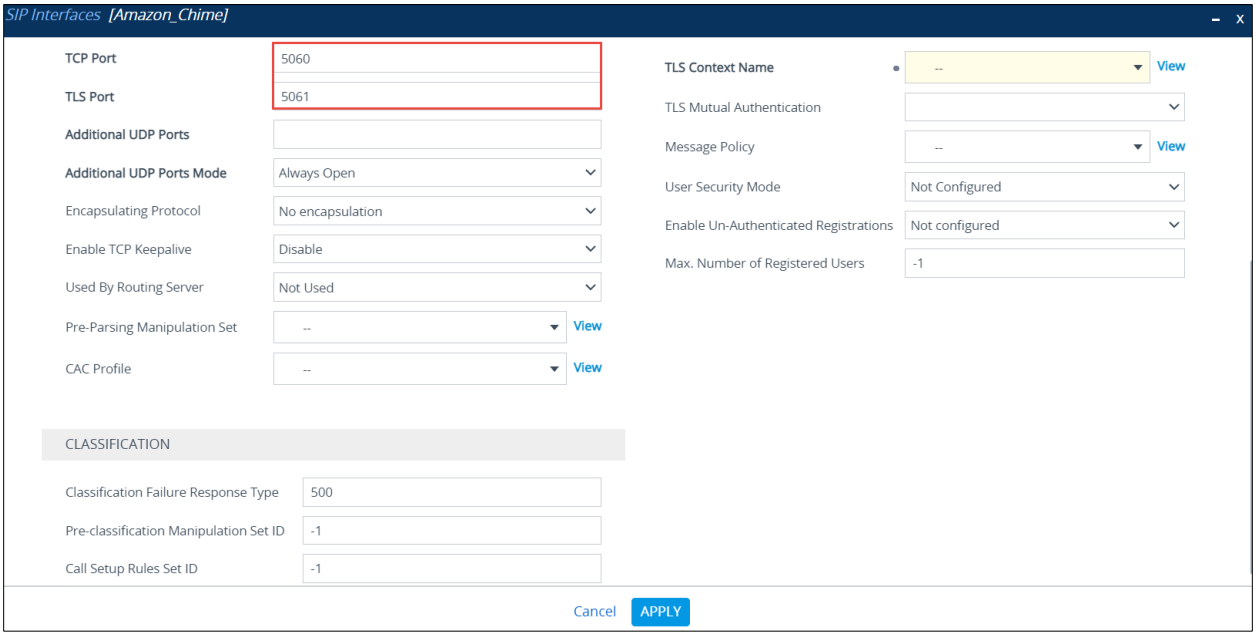

Figure 32: SIP Interface for Amazon Chime SDK Voice Connector Continuation

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 3CX and the other for Amazon Chime SDK Voice Connector.

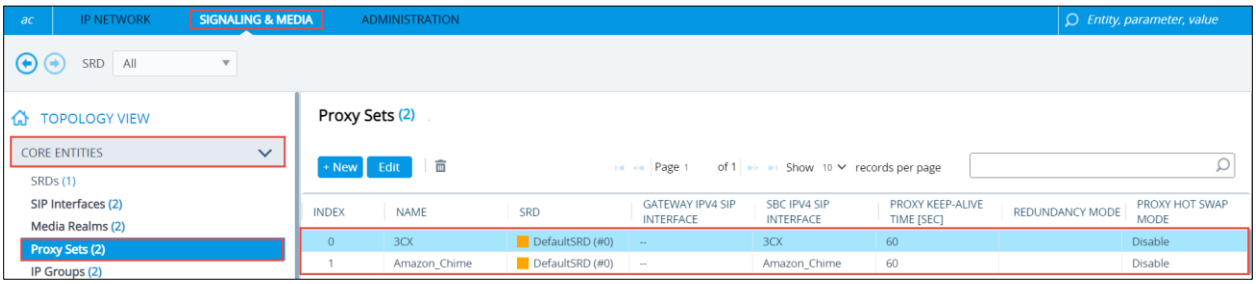

Figure 33: Proxy Sets table

Select **SRD, SBC IPv4 SIP Interface** and enable **Proxy Keep-Alive** for 3CX Proxy Set.

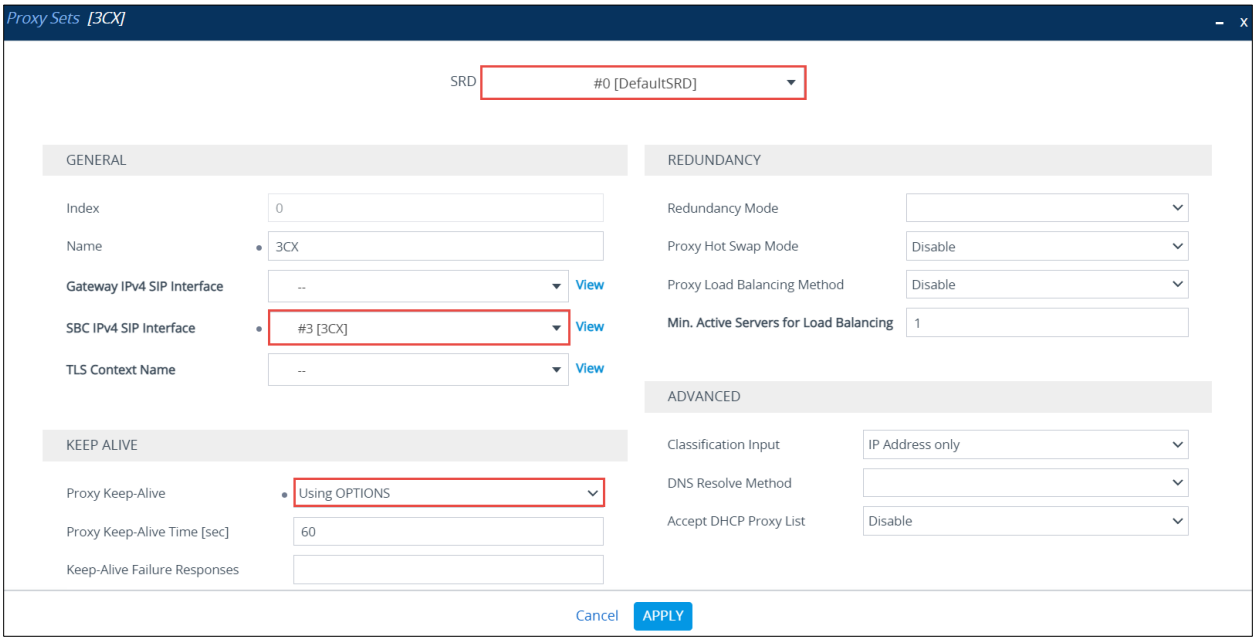

Figure 34: Proxy Set table for 3CX

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

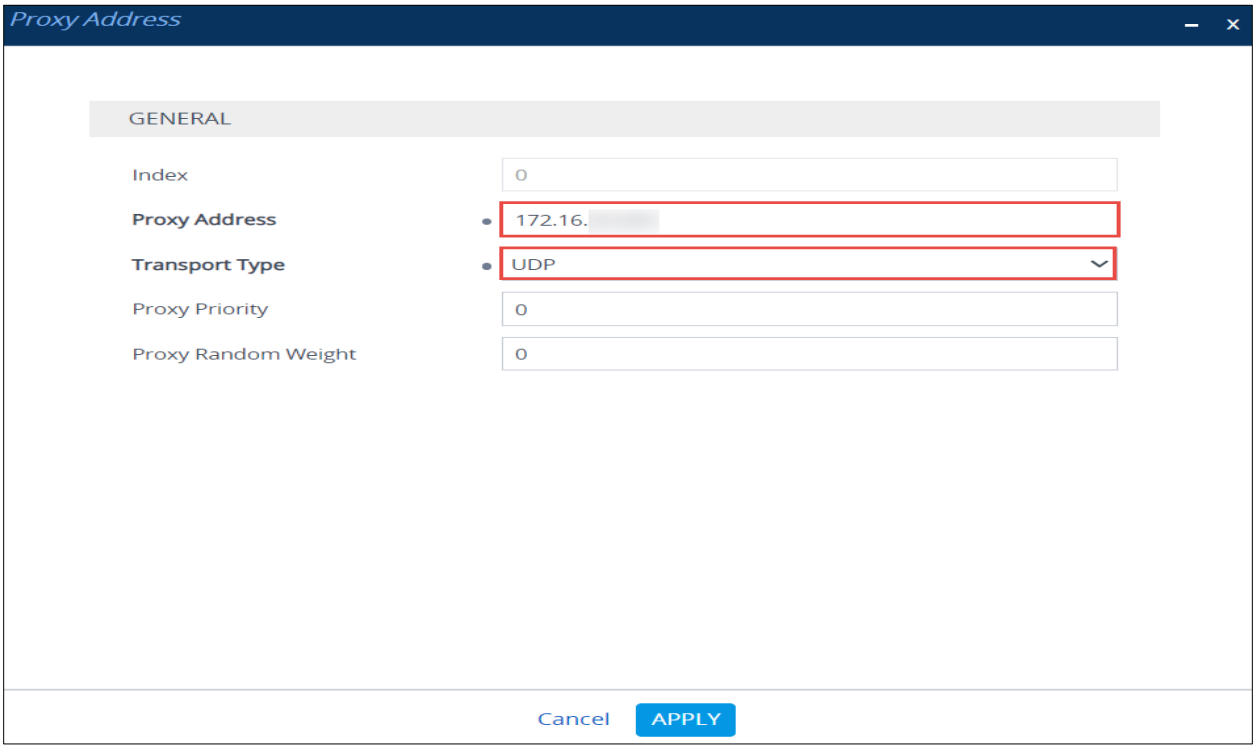

Figure 35: Proxy Address for 3CX

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

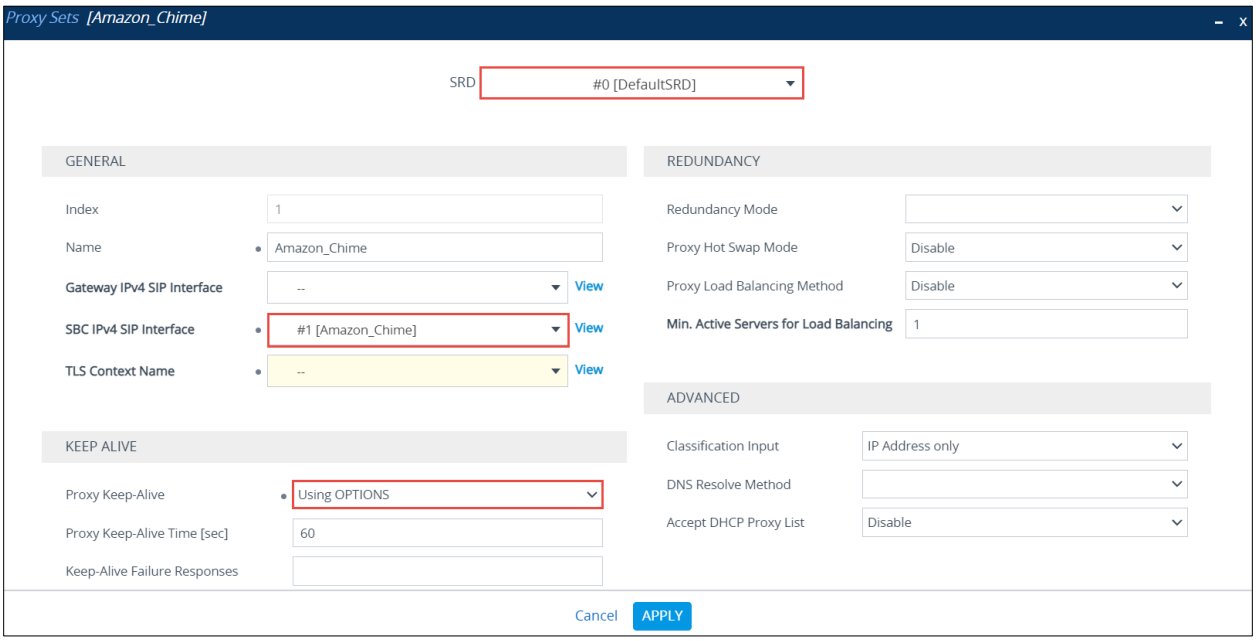

Figure 36: Proxy Set Table for Amazon Chime SDK Voice Connector

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

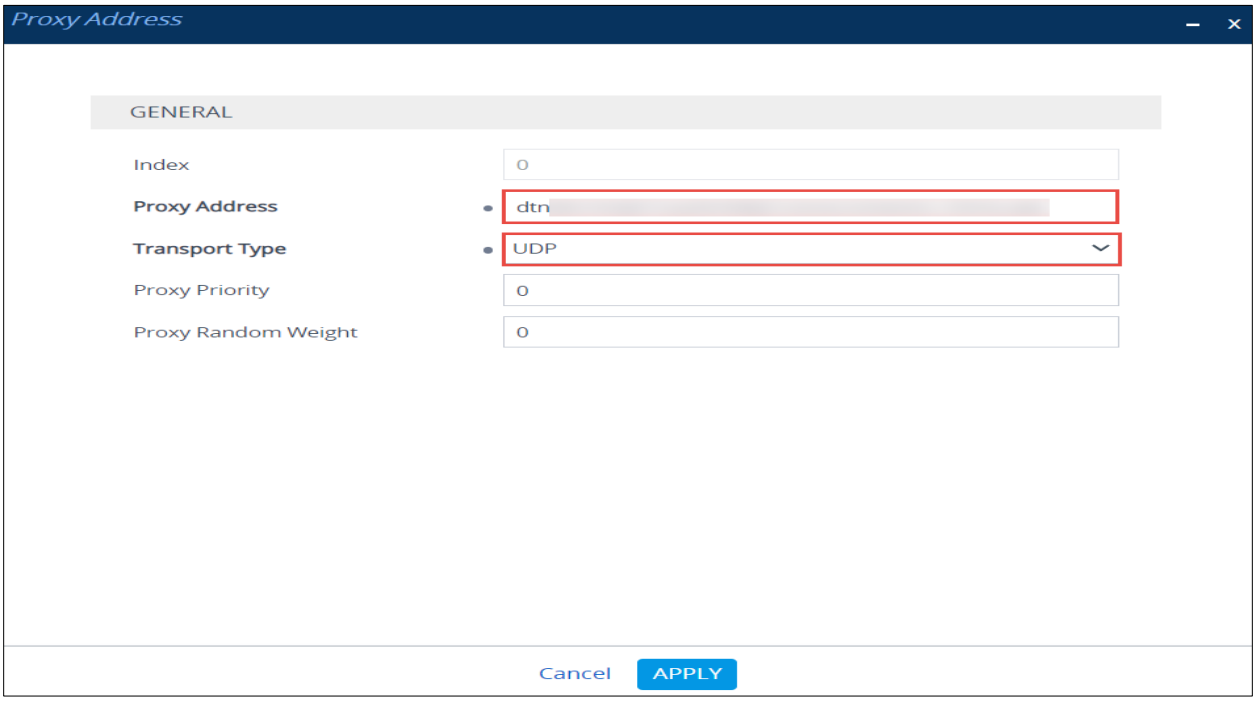

Figure 37: Proxy Address for Amazon Chime SDK Voice Connector

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 3CX and Amazon Chime SDK Voice Connector.

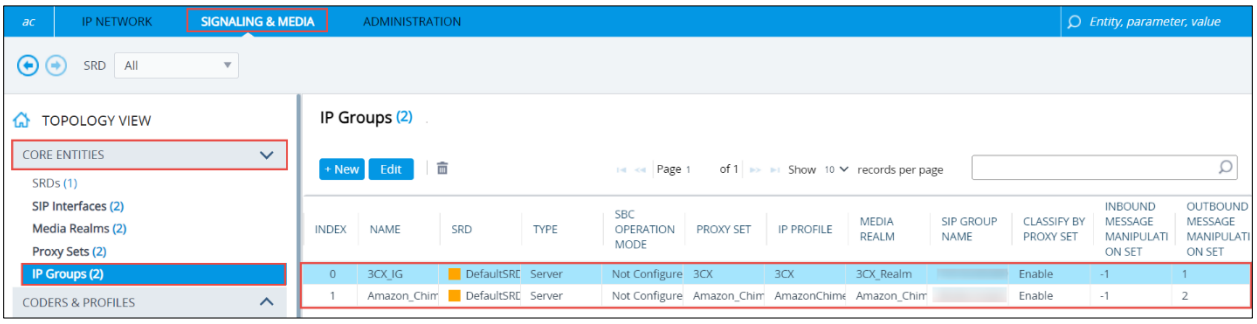

Figure 38: IP Group Table

Enter the name of the IP Groups for 3CX and associate **Proxy Set, IP Profile, Media Realm**, **SRD** and the remaining parameters are set to default.

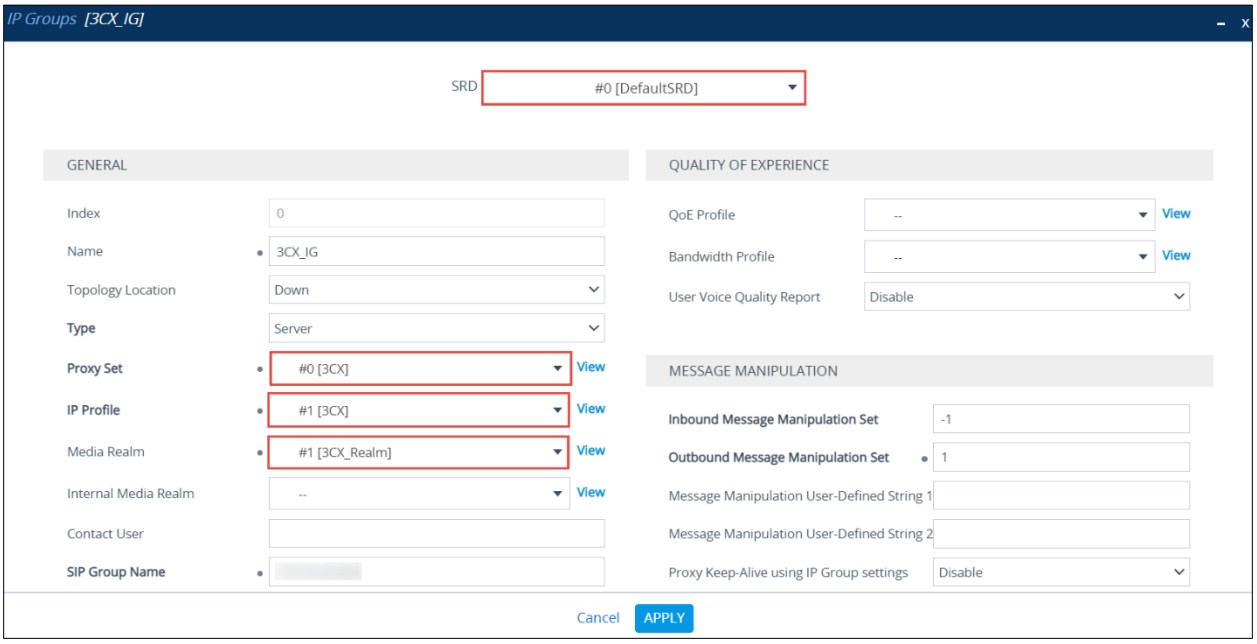

Figure 39: IP Group Table for 3CX

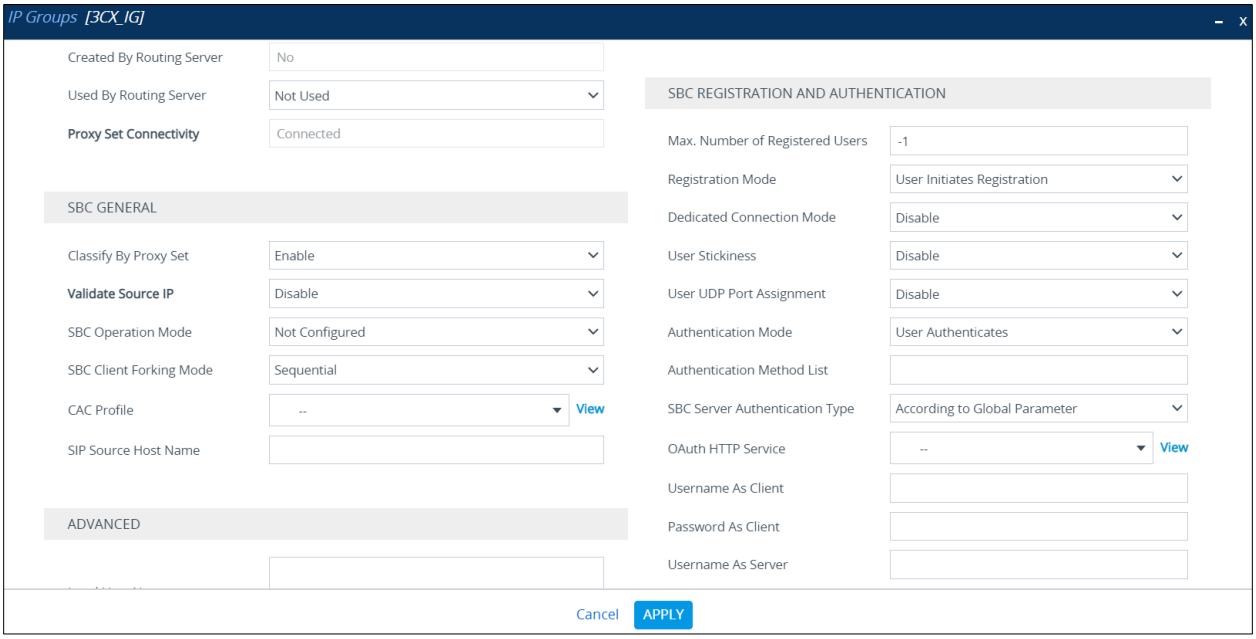

Figure 40: IP Group table for 3CX Continuation

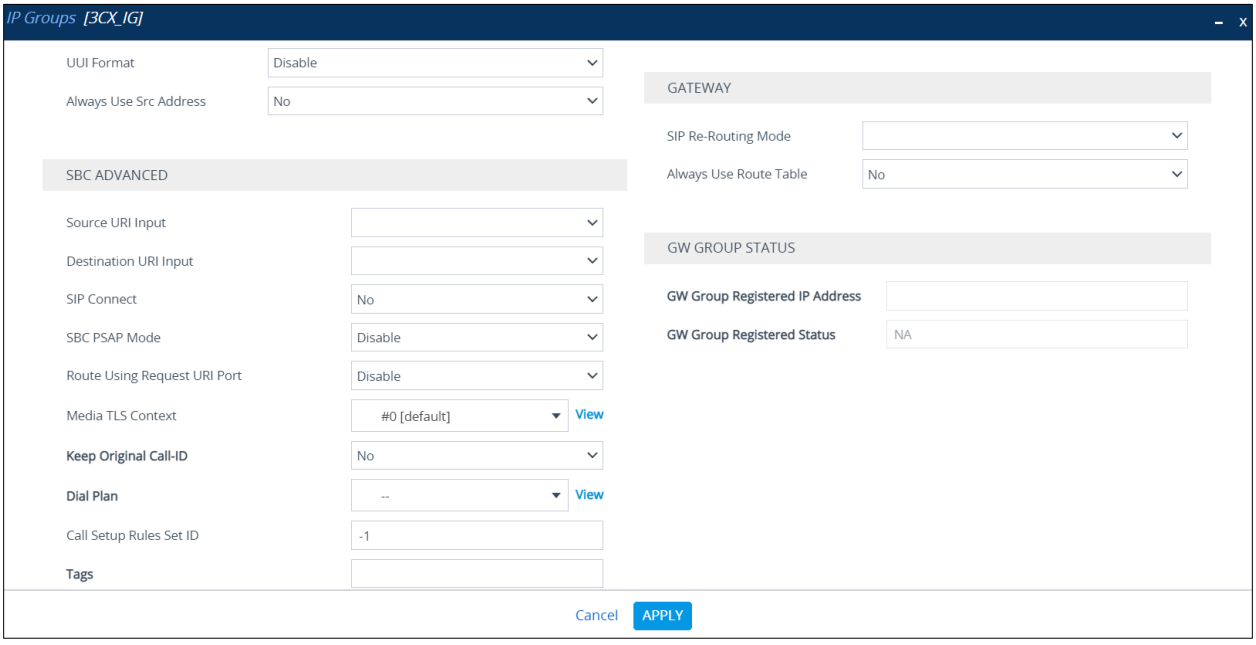

Figure 41: IP Group Table for 3CX Continuation

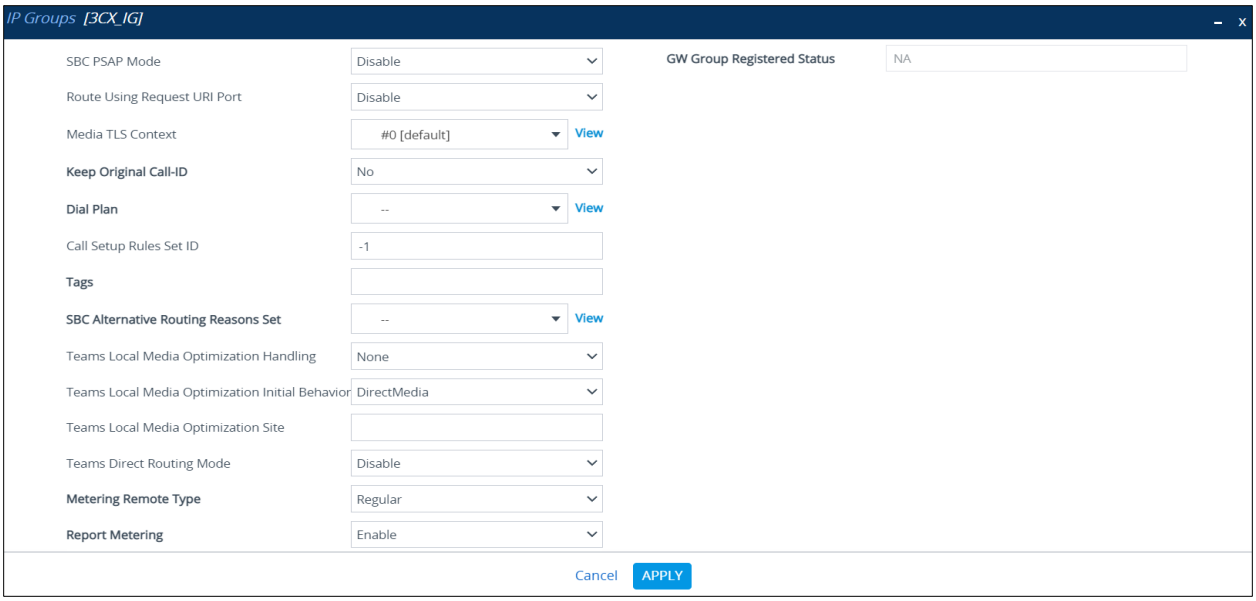

Figure 42: IP Group Table for 3CX Continuation

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

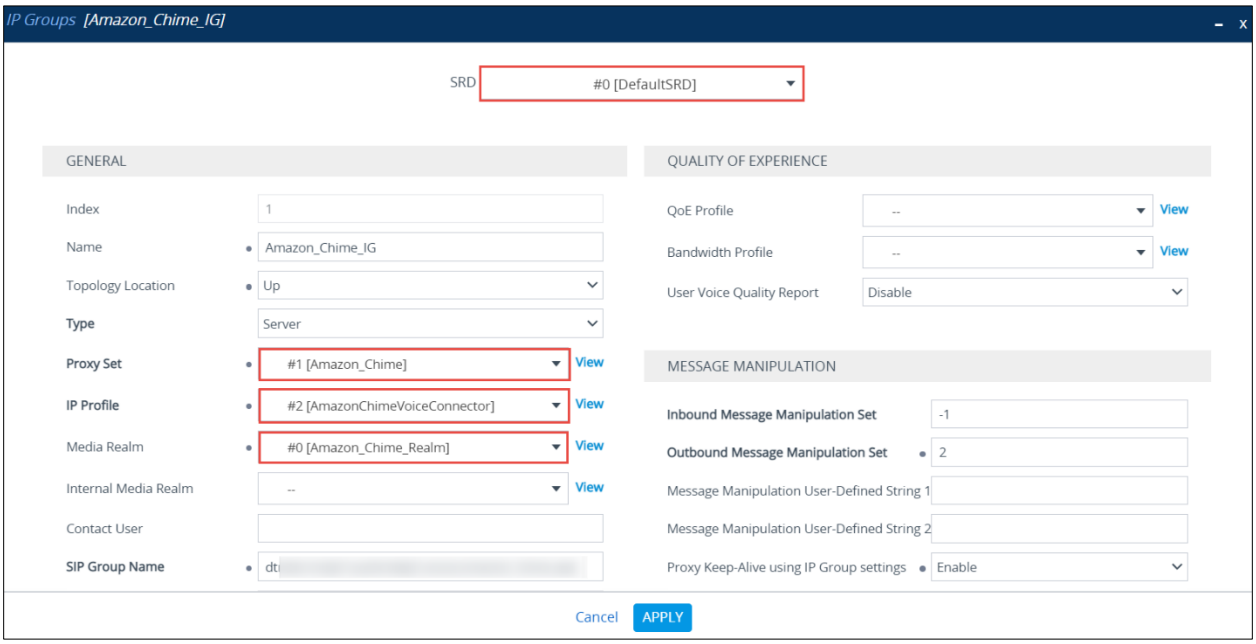

Figure 43: IP Group Table for Amazon Chime SDK Voice Connector

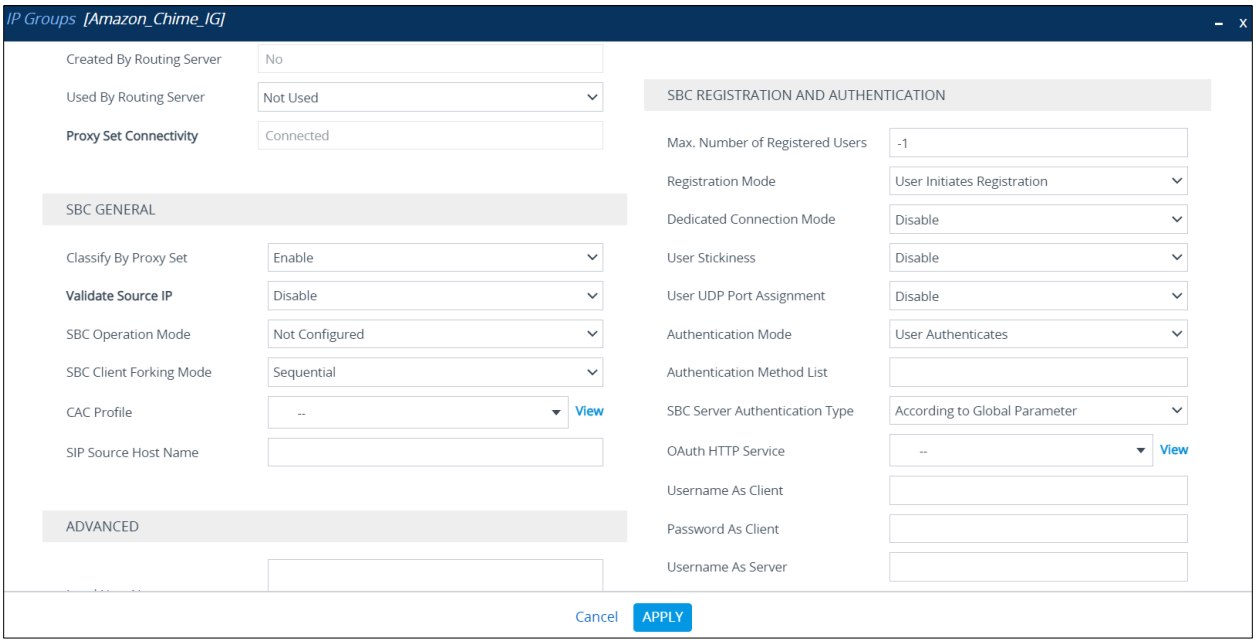

Figure 44: IP Group Table for Amazon Chime SDK Voice Connector Continuation

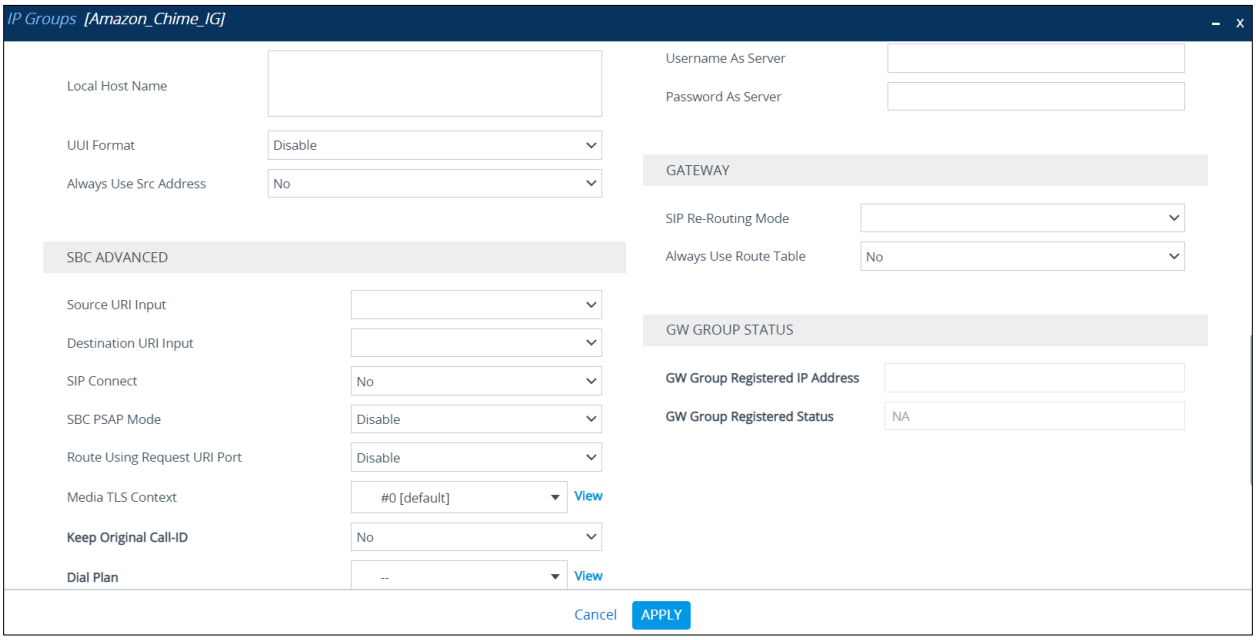

Figure 45: IP Group Table for Amazon Chime SDK Voice Connector Continuation

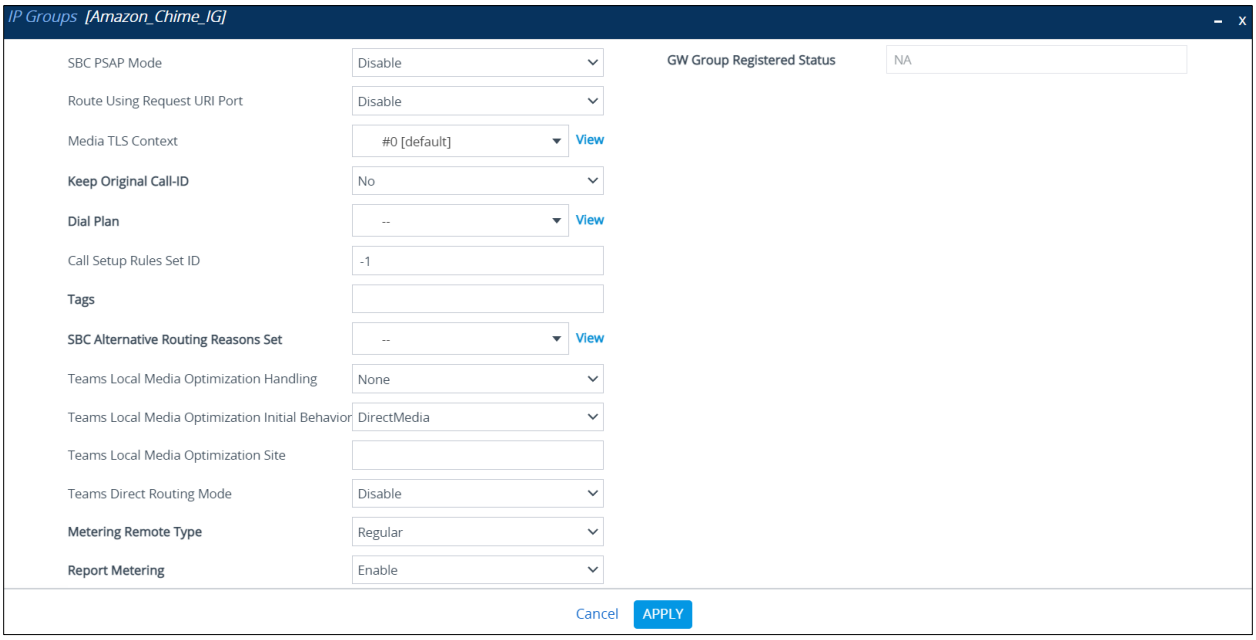

Figure 46: IP Group Table for Amazon Chime SDK Voice Connector Continuation

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.

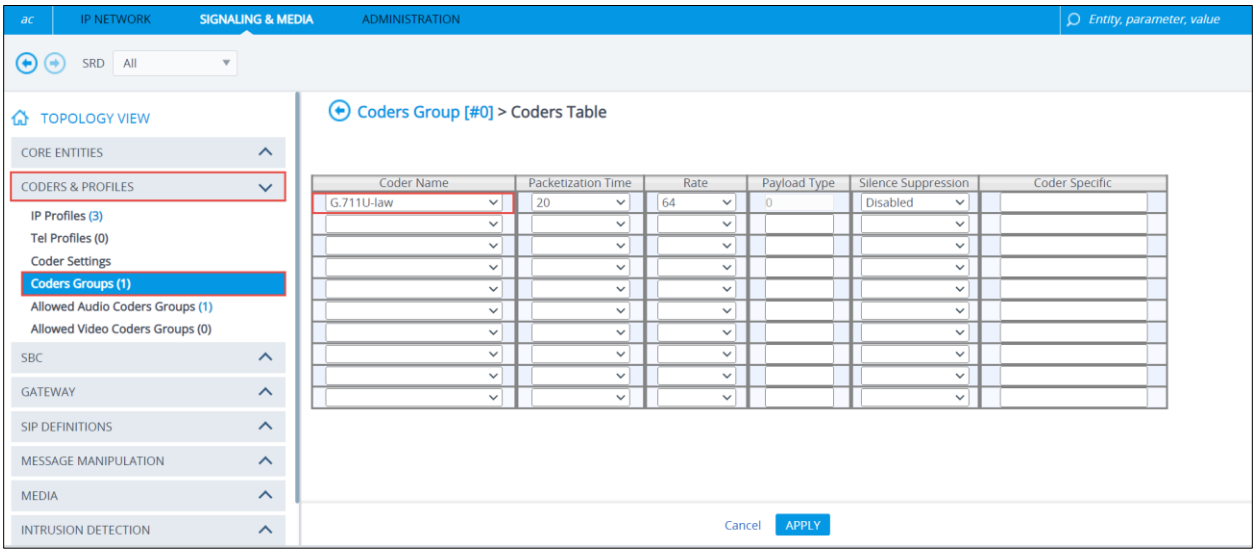

Figure 47: Coder Groups

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 3CX and other for Amazon Chime SDK Voice Connector.

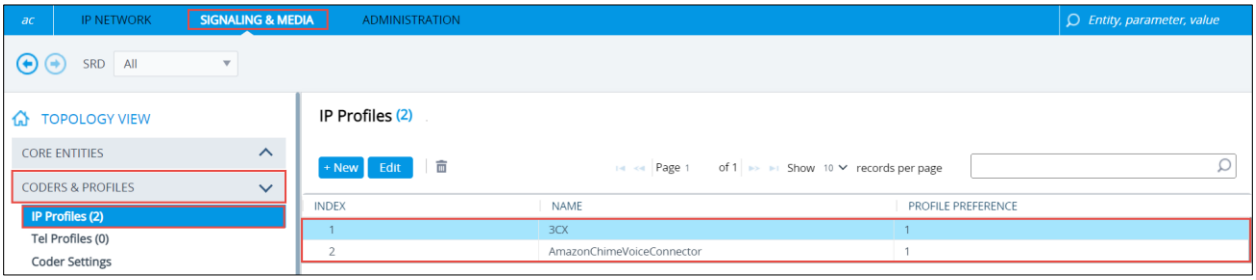

Figure 48: IP Profiles

In the IP Profile for 3CX, select **Session Expire Mode** as *Supported*, **SBC Media Security Mode** as *Not Secured* and **Extension Coder Group** is associated appropriately.

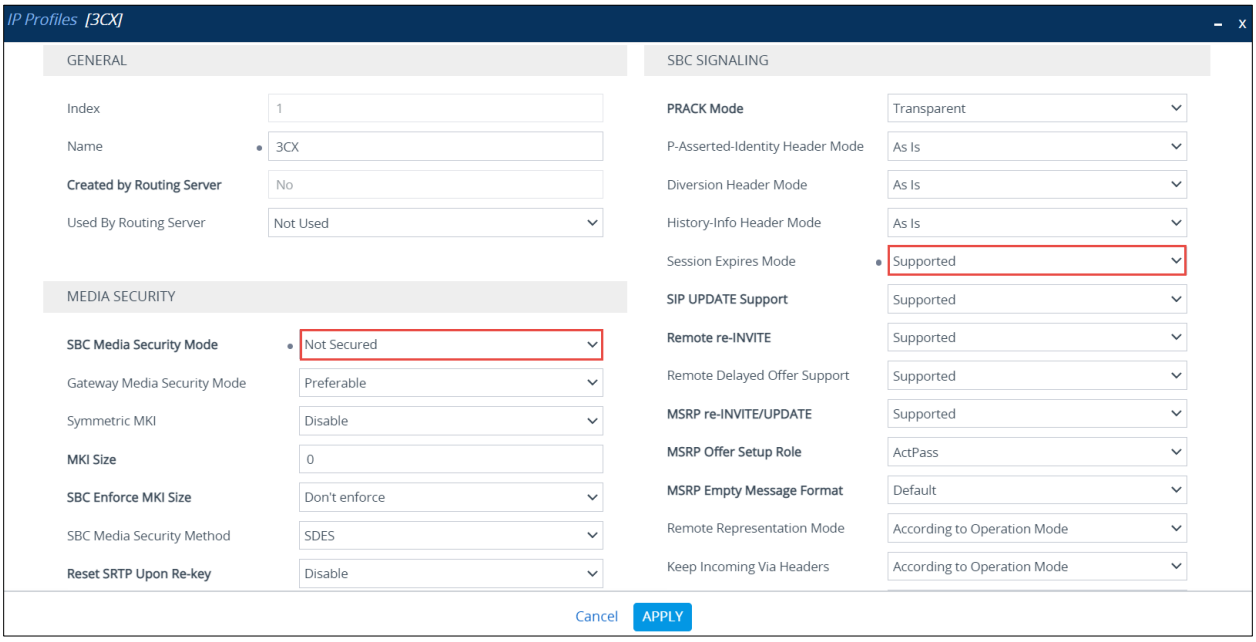

Figure 49: IP Profile for 3CX

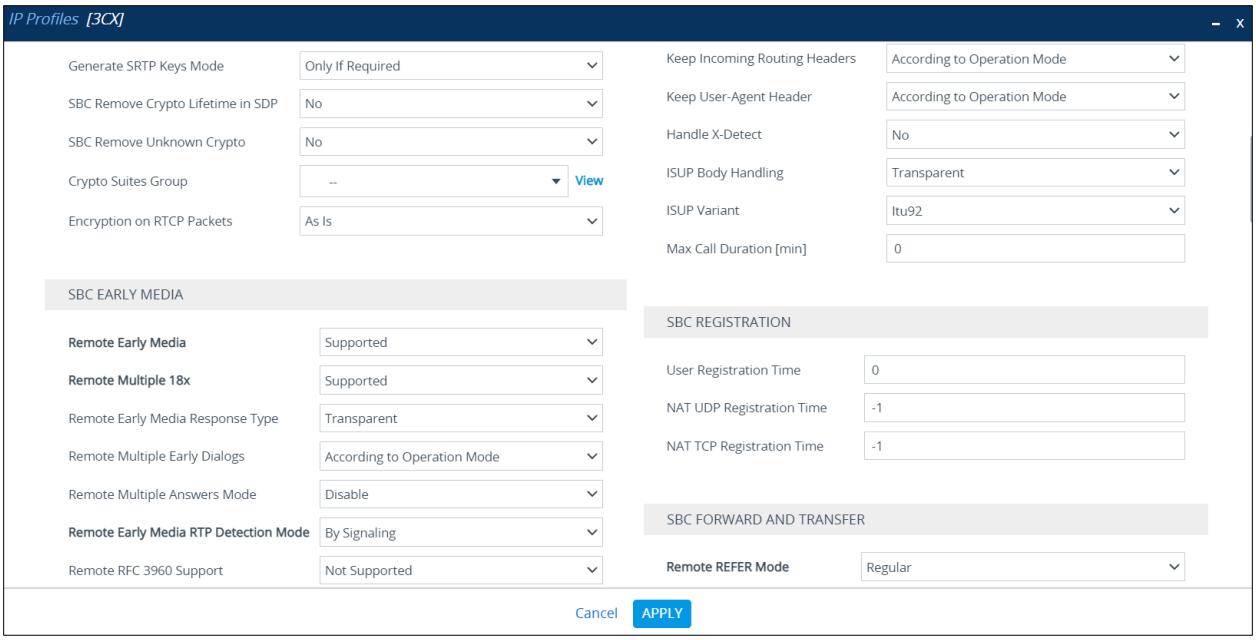

Figure 50: IP Profile for 3CX Continuation

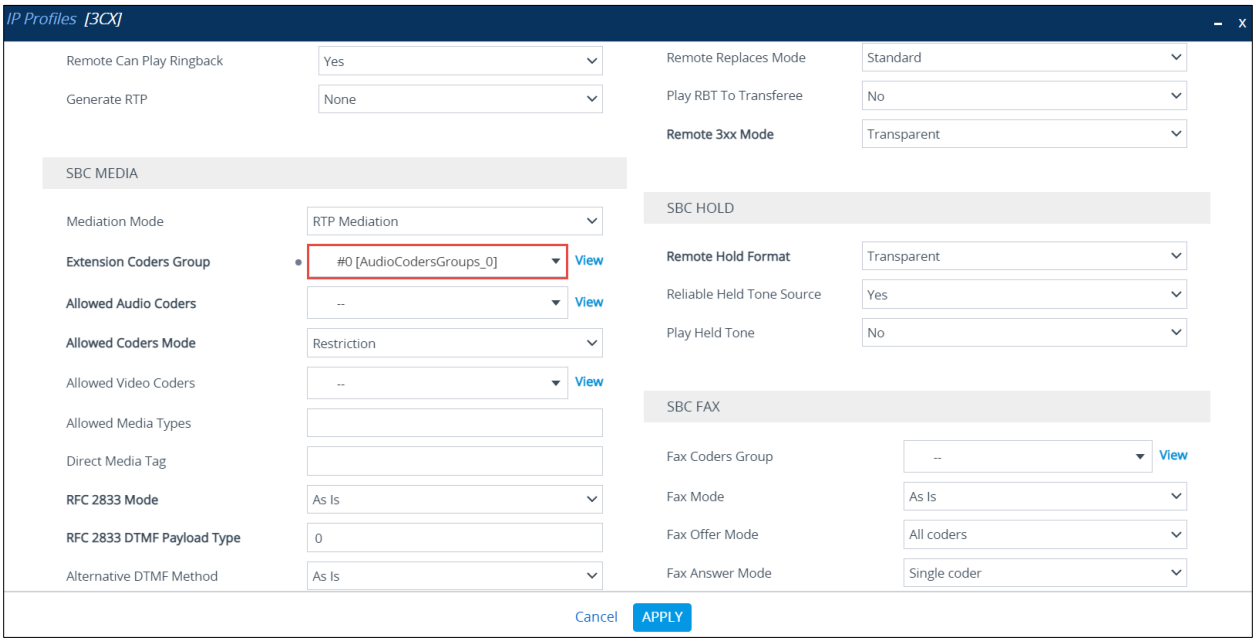

Figure 51: IP Profile for 3CX Continuation

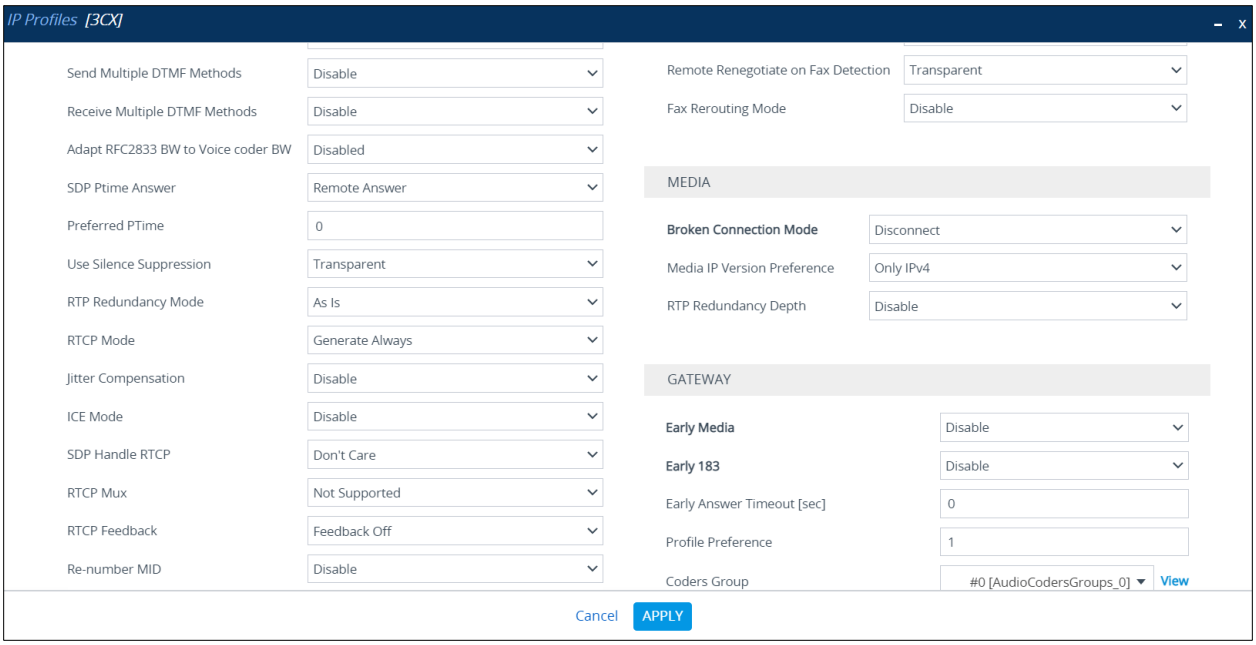

Figure 52: IP Profile for 3CX Continuation

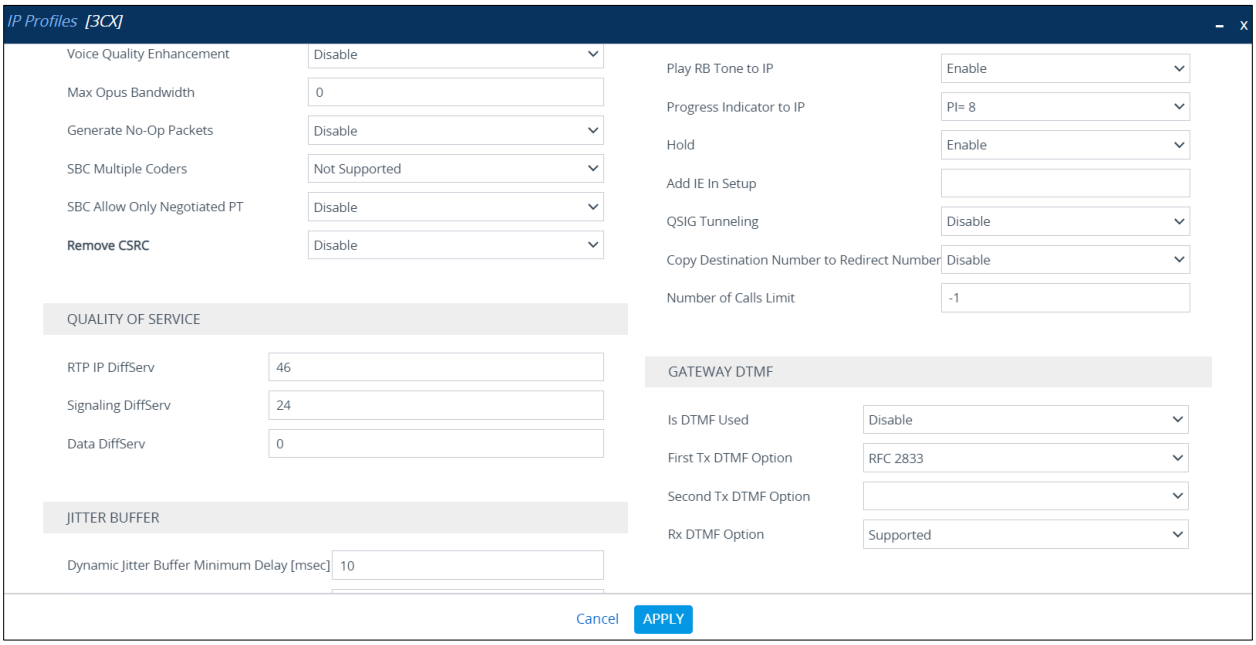

Figure 53: IP Profile for 3CX Continuation

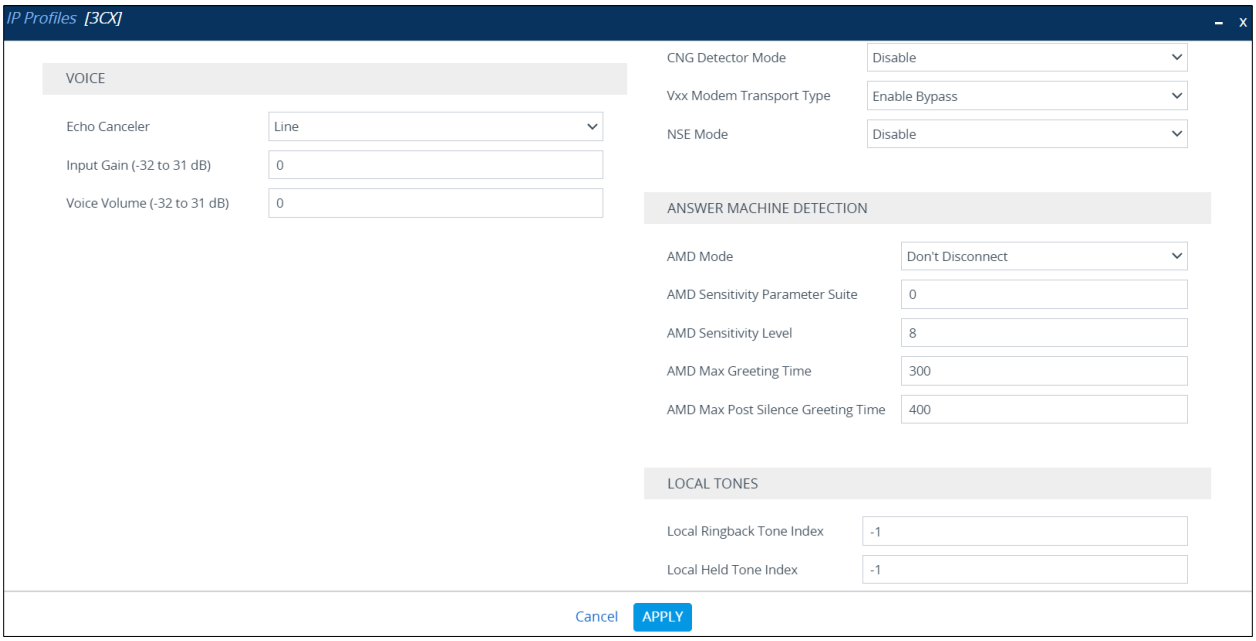

Figure 54: IP Profile for 3CX Continuation

In the IP profile for Amazon Chime SDK Voice Connector **Extension Coder Group** is associated appropriately.

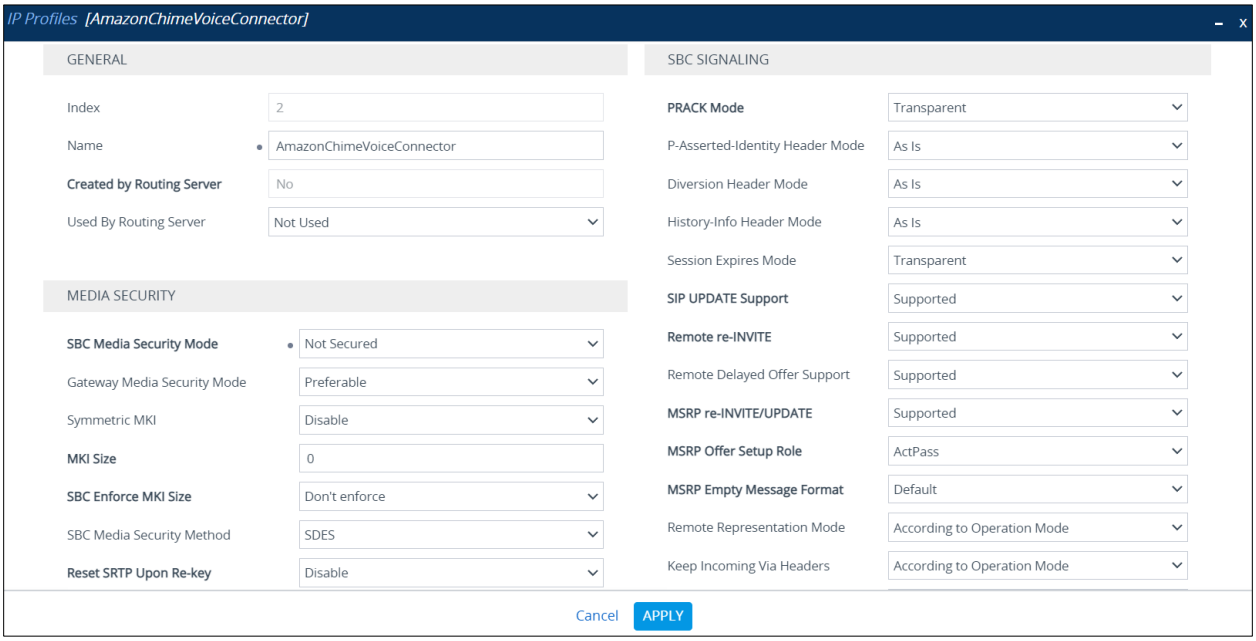

Figure 55: IP Profiles for Amazon Chime SDK Voice Connector

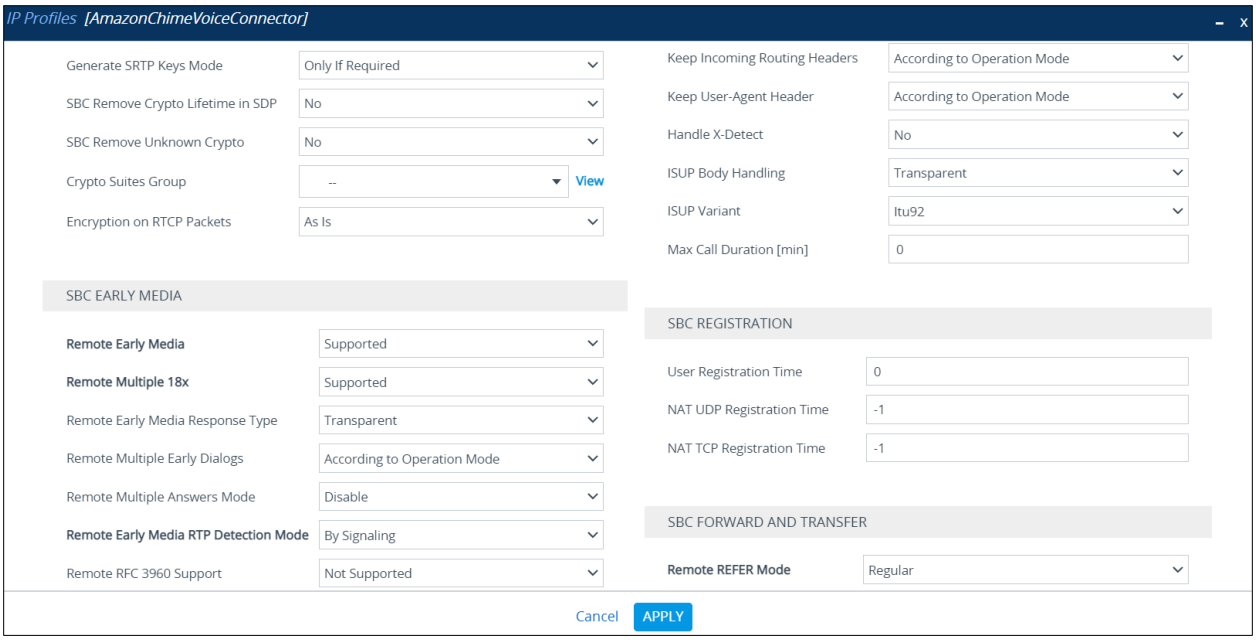

Figure 56: IP Profiles for Amazon Chime SDK Voice Connector Continuation

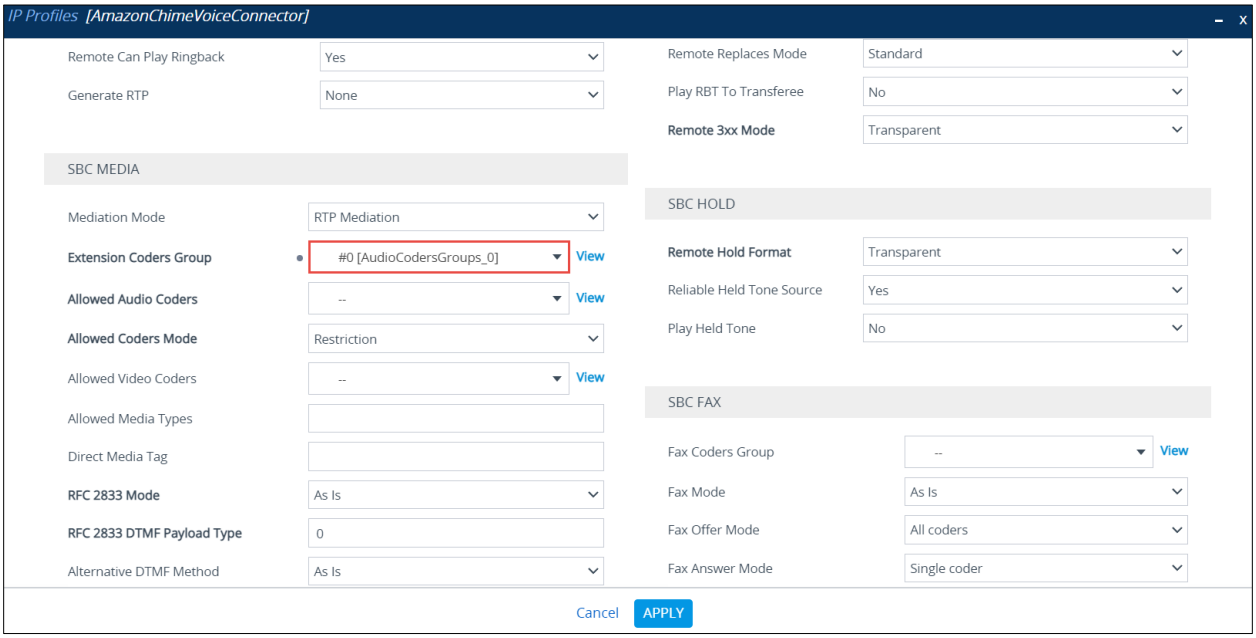

Figure 57: IP Profile for Amazon Chime SDK Voice Connector Continuation

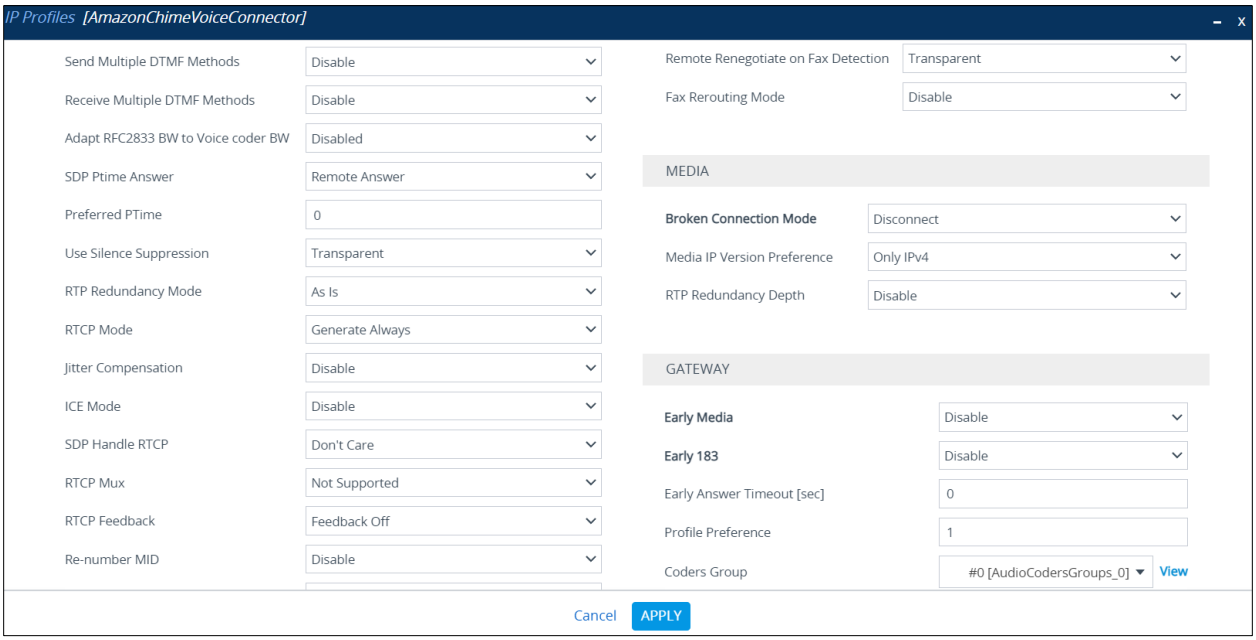

Figure 58: IP Profile for Amazon Chime SDK Voice Connector Continuation

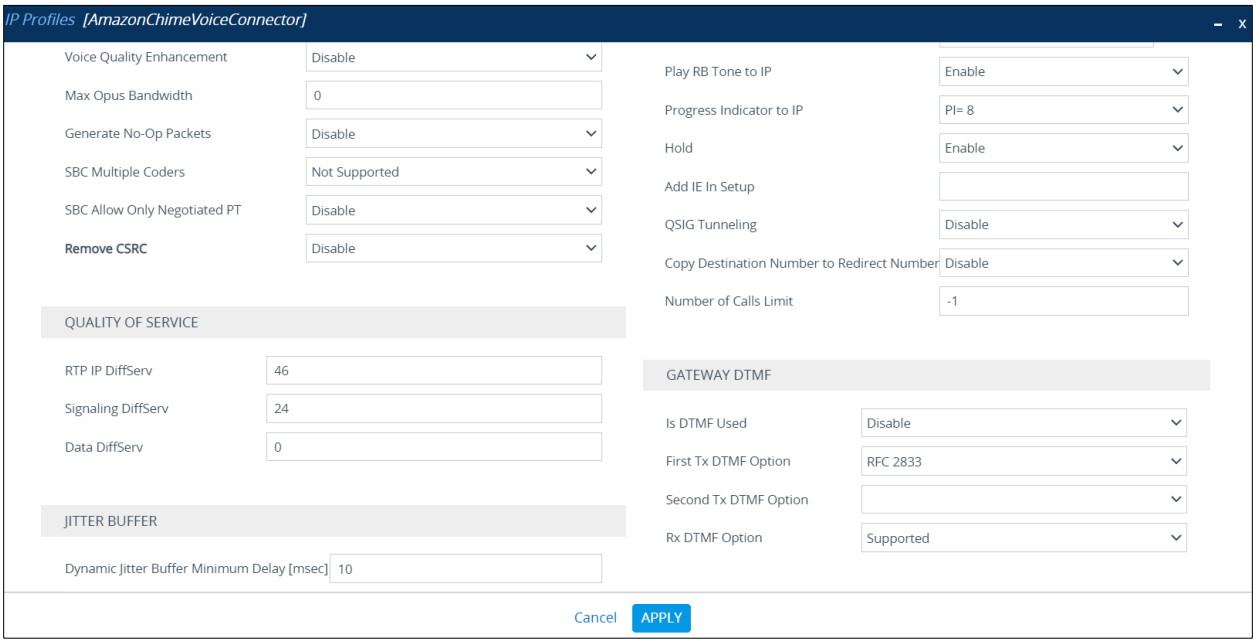

Figure 59: IP Profiles for Amazon Chime SDK Voice Connector Continuation

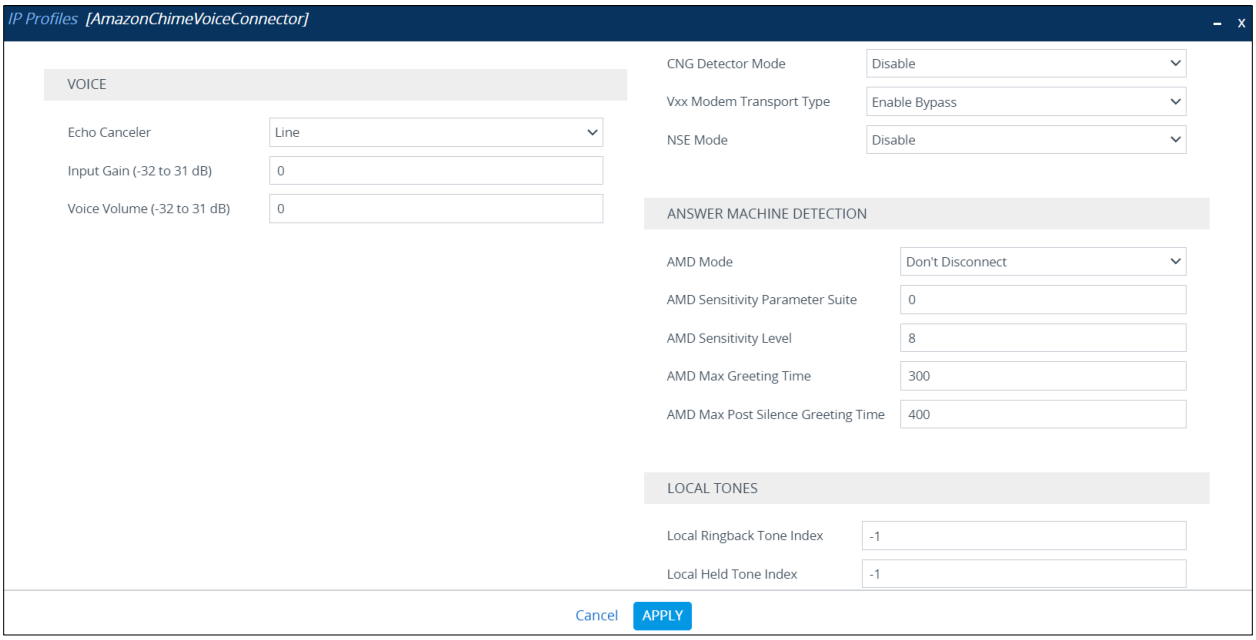

Figure 60: IP Profiles for Amazon Chime SDK Voice Connector Continuation

4.3.9 IP-to-IP Routing

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

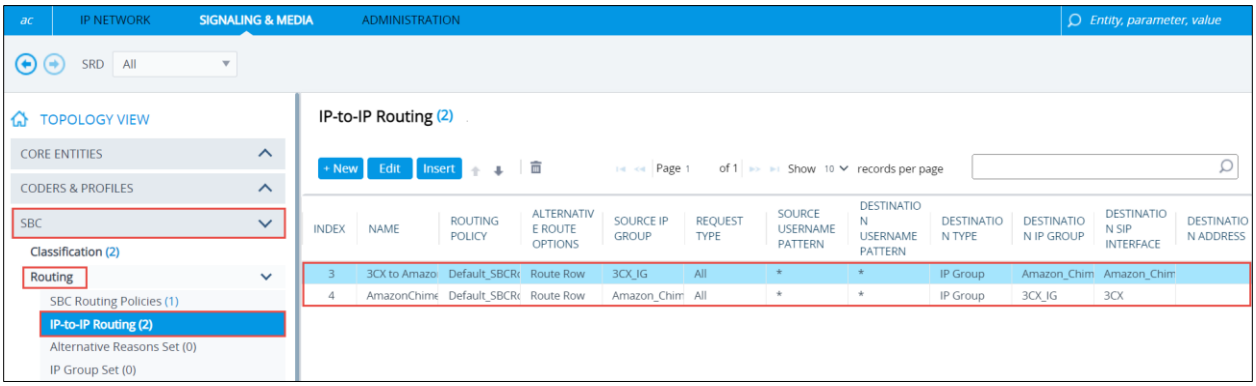

Figure 61: IP-to-IP Routing

IP to IP routing from 3CX to Amazon Chime SDK Voice Connector.

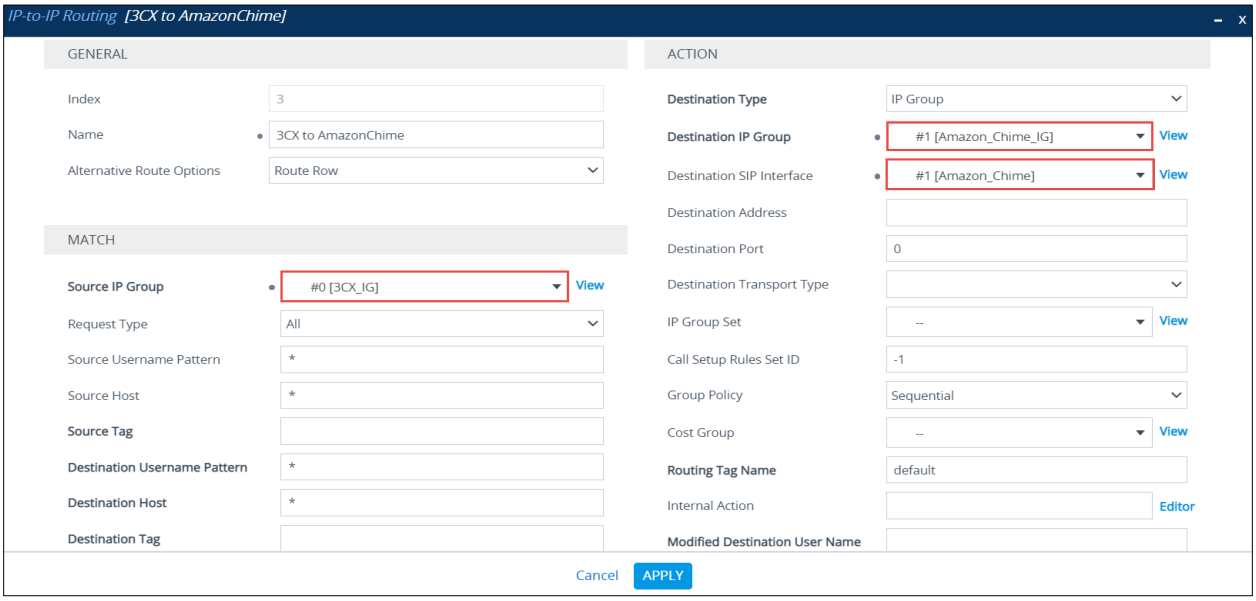

Figure 62: IP-to-IP Routing from 3CX to Amazon Chime SDK Voice Connector

IP to IP routing from Amazon Chime SDK Voice Connector to 3CX.

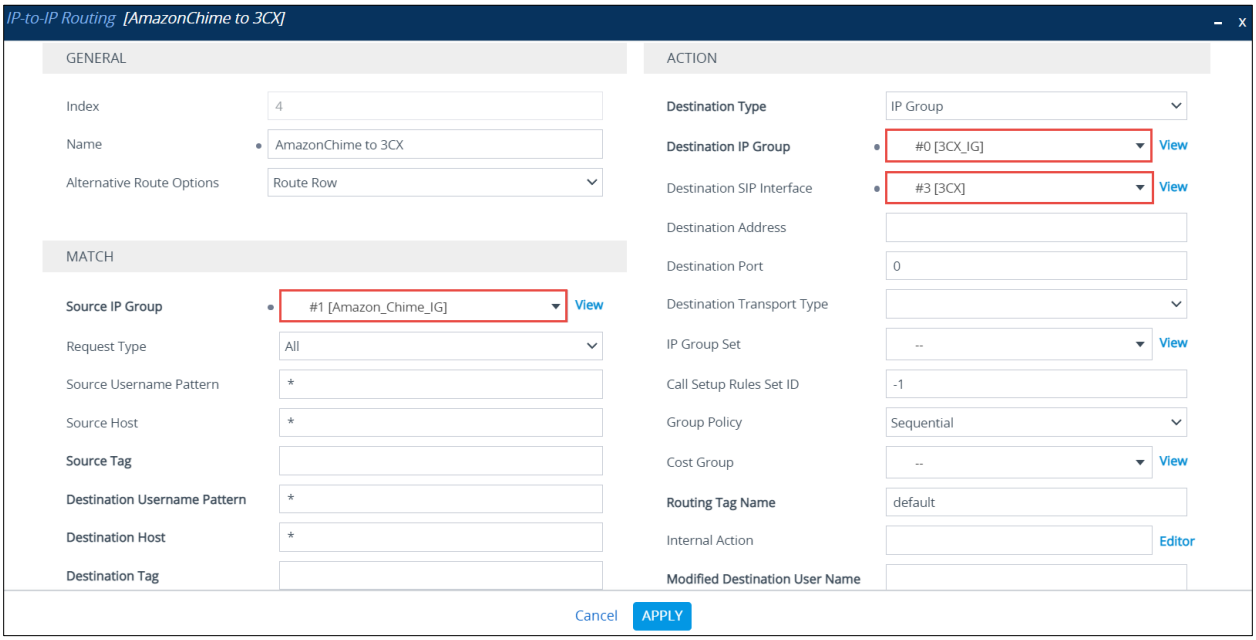

Figure 63: IP-to-IP Routing from Amazon Chime SDK Voice Connector to 3CX

4.3.10 TLS Configuration

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

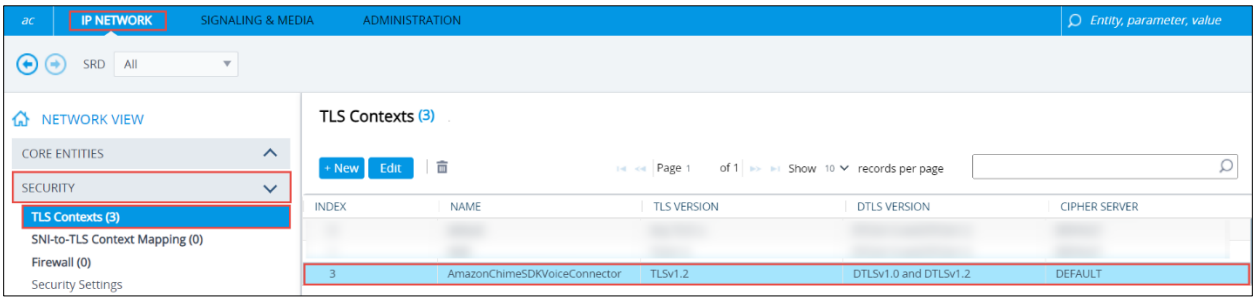

Figure 64: TLS Contexts

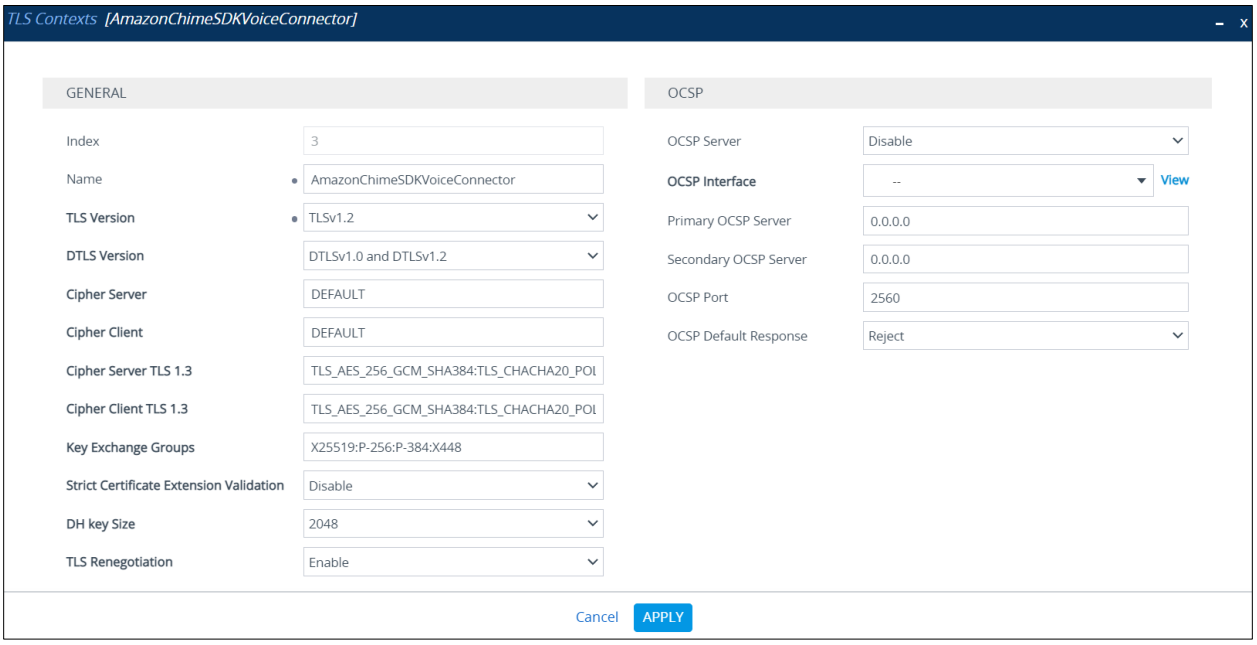

Figure 65: TLS Context for Amazon Chime SDK Voice Connector

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 SDK Voice Connector and click **Trusted Root Certificates** link located in the bottom. Click on **Import** button and select the certificate file.

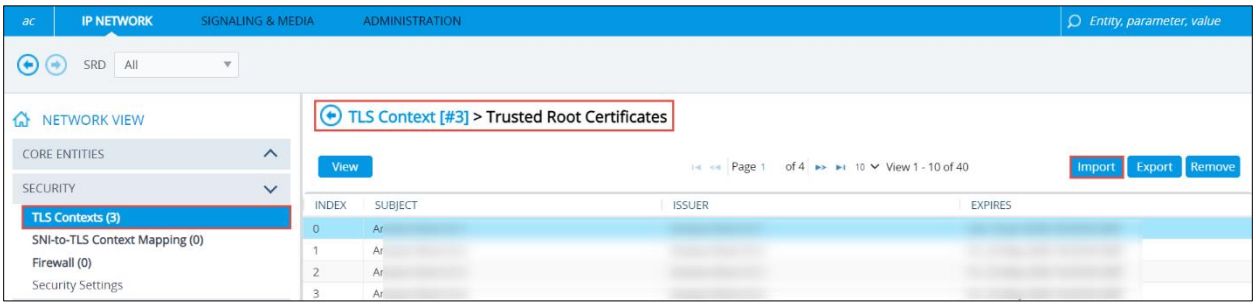

Figure 66: Trusted Root Certificate Import option

Amazon Chime SDK Voice Connector Root Certificate can be downloaded from Amazon Chime SDK Voice Connector account. Generate Self-signed certificate for the created TLS context. 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.

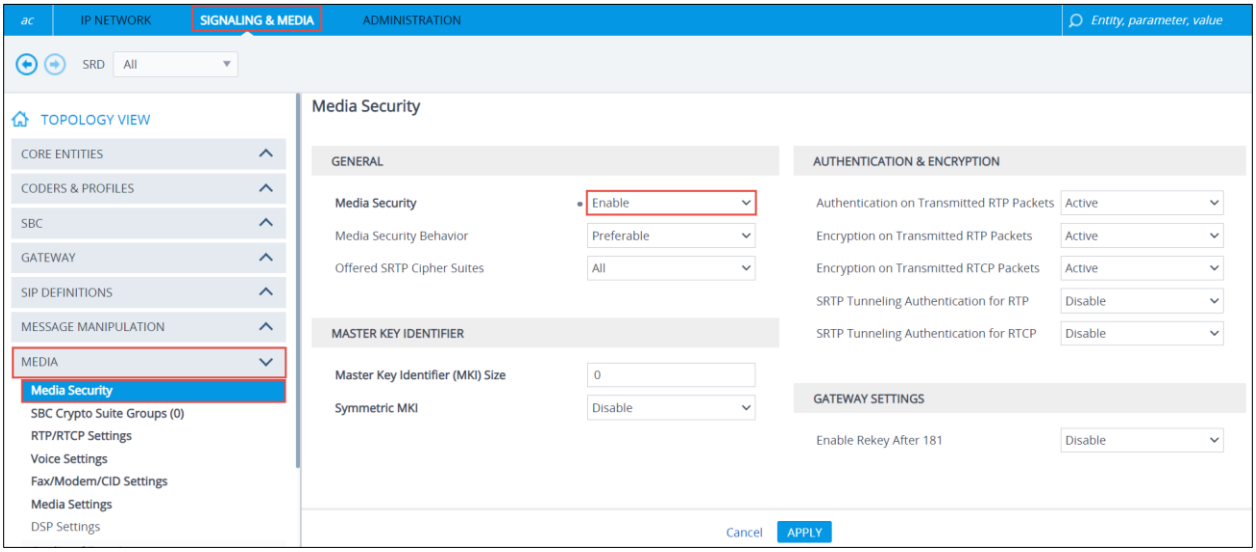

Figure 67: Media Security

In the IP Profile for Amazon Chime SDK Voice Connector **SBC Media Security Mode** must be set to Secured.

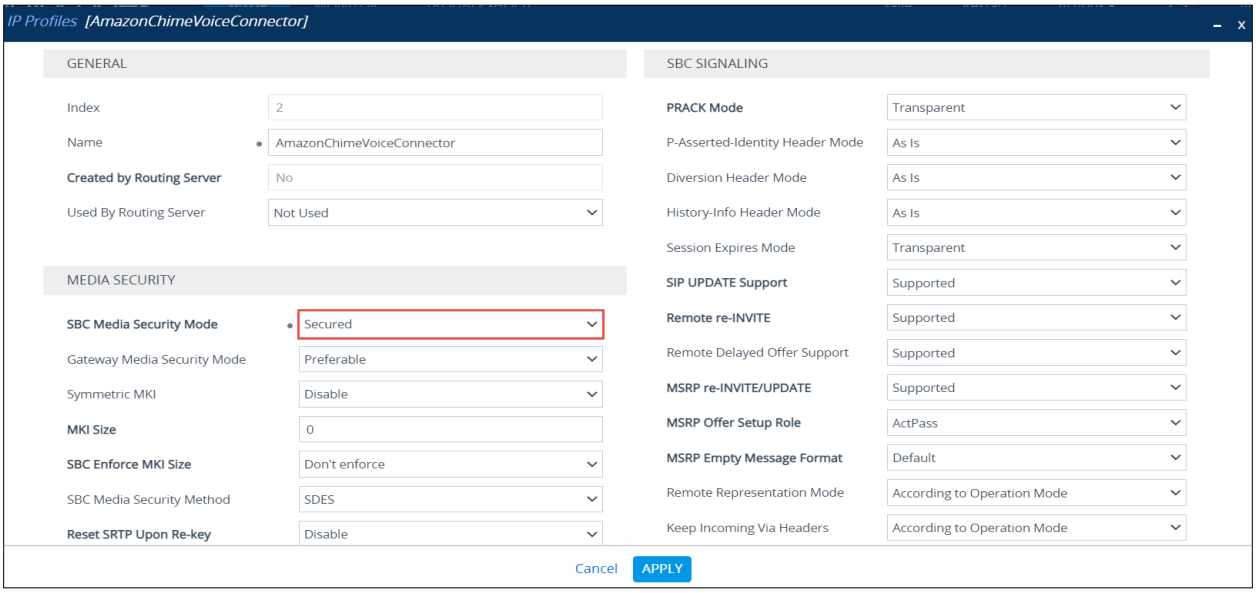

Figure 68: SBC Media Security Mode configuration in IP Profile

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 3CX and Amazon Chime SDK Voice Connector.

Below manipulation is created to modify Host value of "To" header with the Destination IP address in the OPTIONS request that is sent towards 3CX.

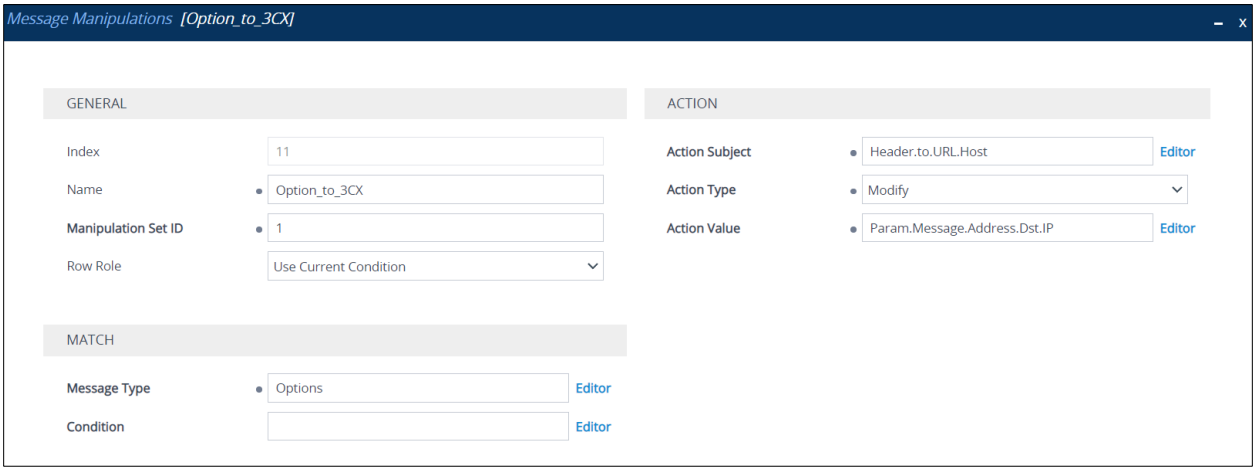

Figure 69: OPTIONS TO header 3CX

Below manipulation is created to modify Host value of "To" header with the Destination IP address in the OPTIONS request that is sent towards the Amazon Chime SDK Voice Connector.

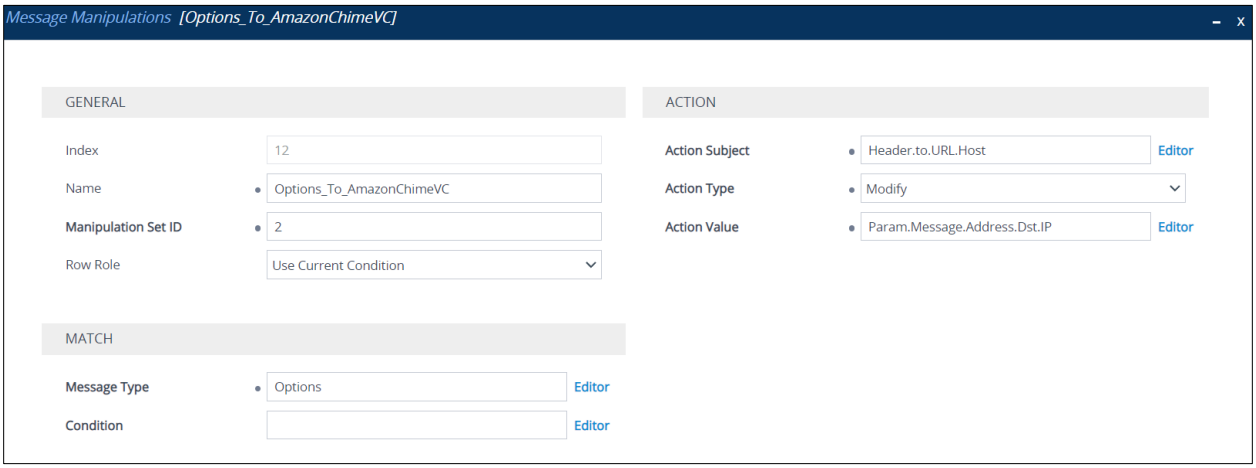

Figure 70: OPTIONS TO header Amazon Chime SDK Voice Connector

Below manipulation is created to modify Host value of "From" header with the LAN IP address, when AudioCodes sends a request towards 3CX.

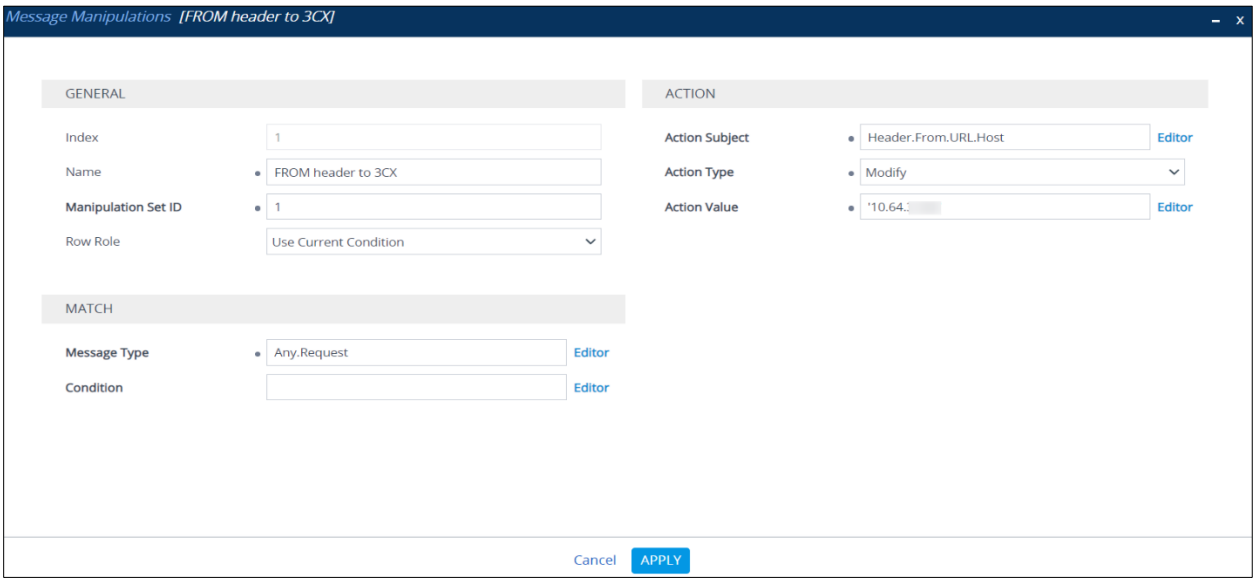

Figure 71: FROM header host modification towards 3CX

Below manipulation is created to modify Host value of "From" header with the WAN IP address, when AudioCodes sends a request towards the Amazon Chime SDK Voice Connector.

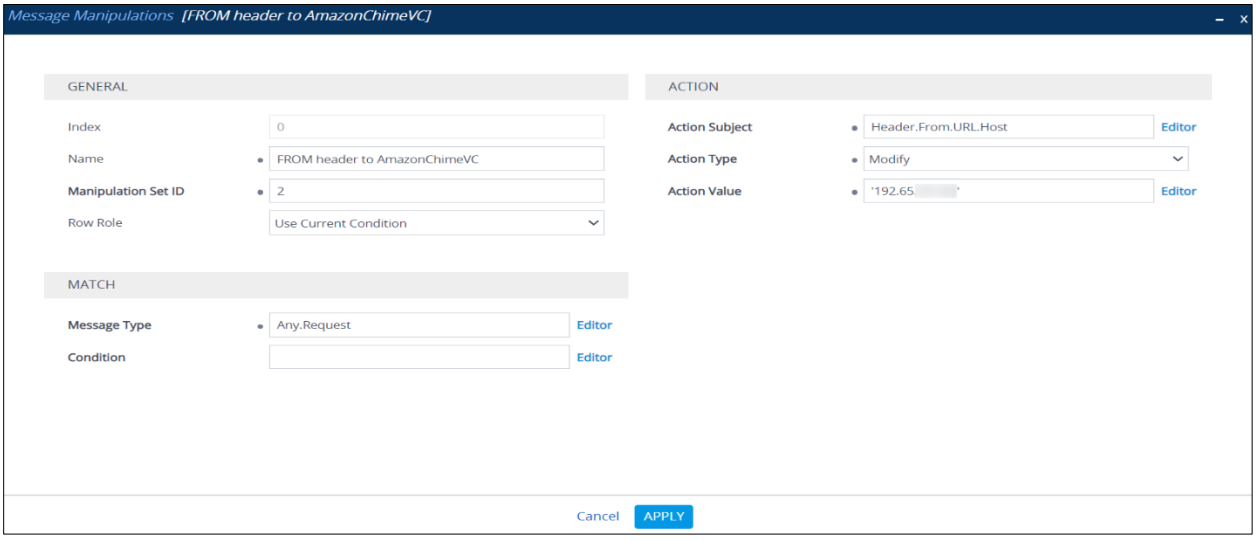

Figure 72: FROM header host modification towards Amazon Chime SDK Voice Connector

Below manipulation is created to modify Host value of "PAI" header with the WAN IP address, when AudioCodes sends INVITE request towards the Amazon Chime SDK Voice Connector.

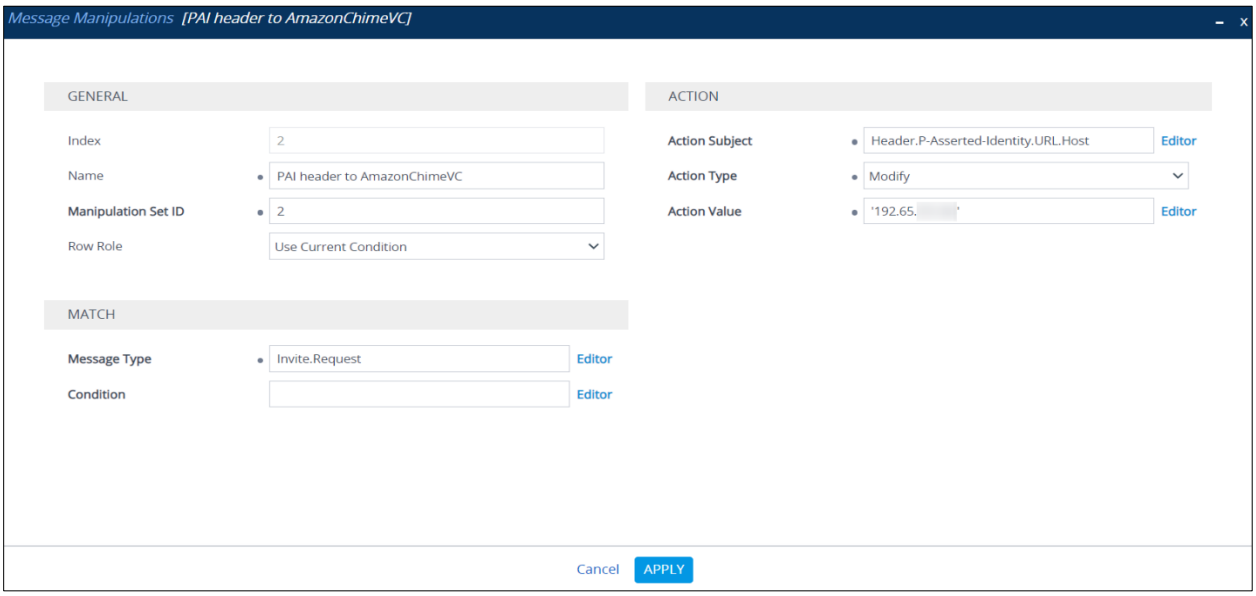

Figure 73: PAI header host modification towards Amazon Chime SDK Voice Connector

Below manipulation is created to modify Host value of "To" header in response to BYE that is sent towards the Amazon Chime SDK Voice Connector.

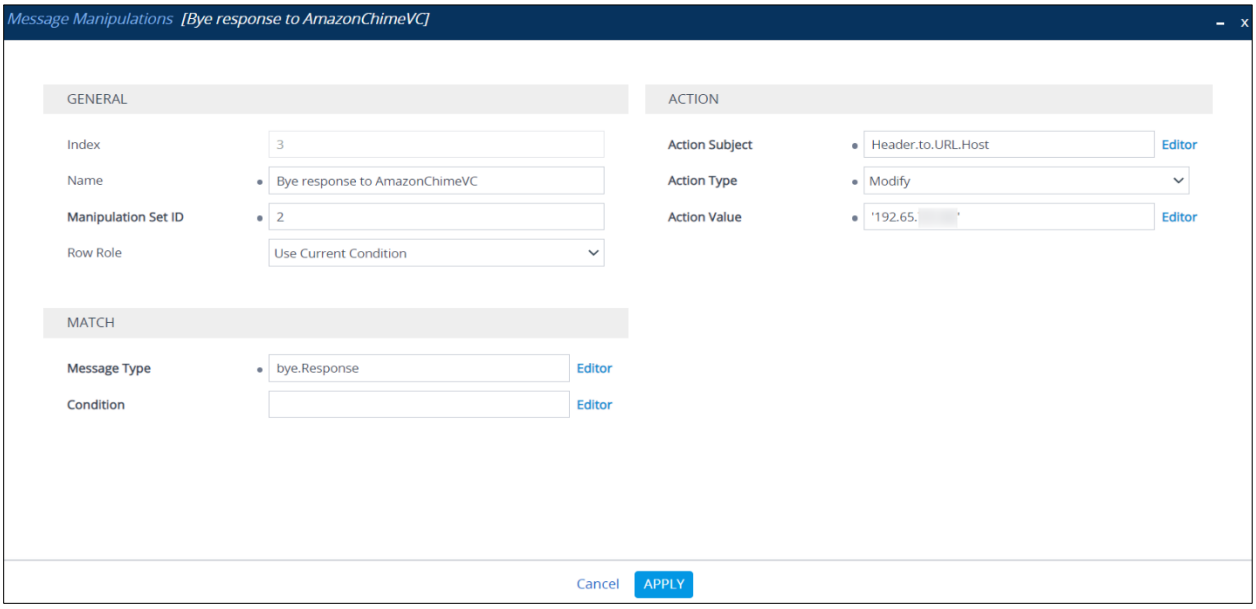

Figure 74: BYE response host modification towards Amazon Chime SDK Voice Connector

Below manipulation is created to modify Session refresher value from UAC to UAS in the INVITE requests that is sent towards 3CX.

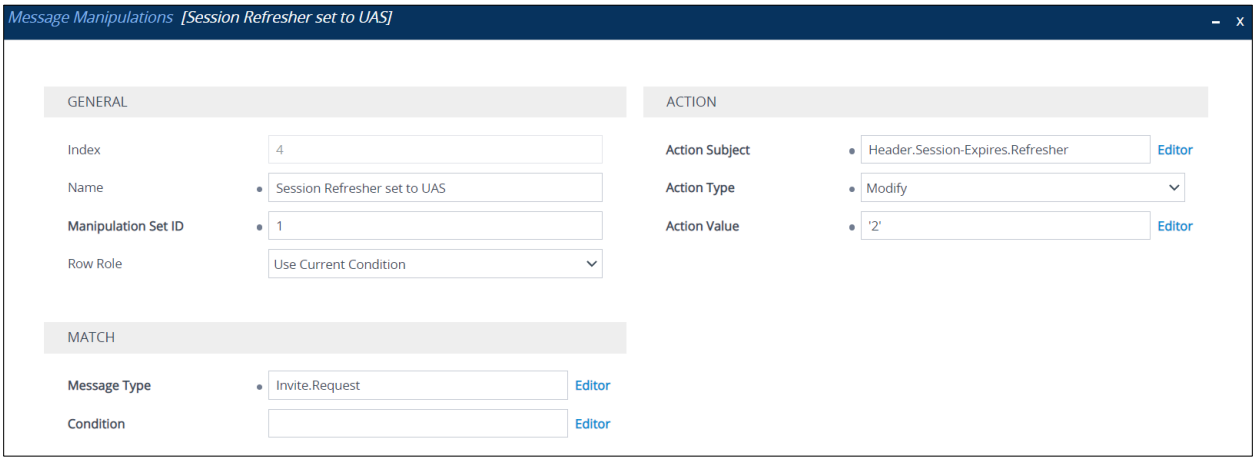

Figure 75: Session Refresher modification towards 3CX