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**SIP Trunking Configuration Guide  
for  
Microsoft Teams Direct Routing  
Using Ribbon SBC 2000**

**Document Version 1.2**

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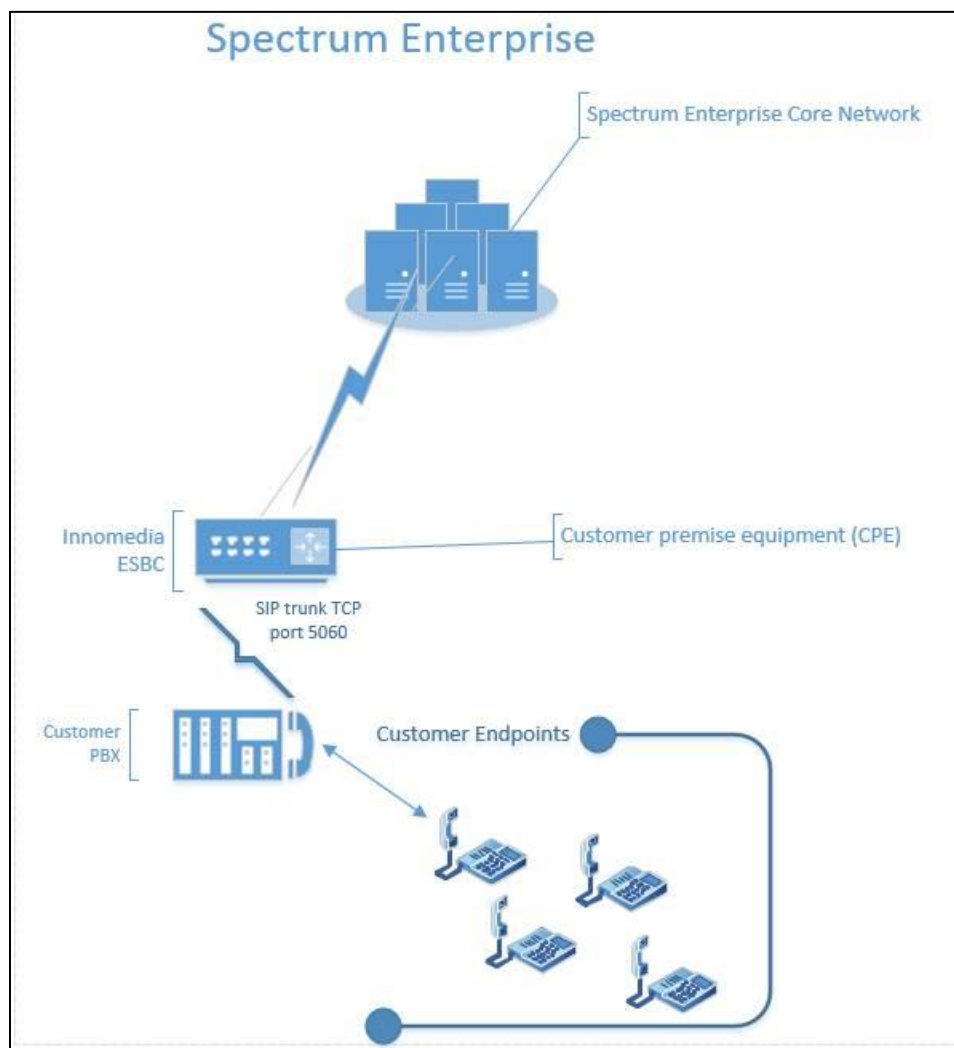
## 1 Audience

This document is intended for the Spectrum Enterprise (“Spectrum”) SIP Trunk customer’s technical staff and Value Added Retailer (VAR) having installation and operational responsibilities.

## 2 Introduction

This Configuration Guide describes configuration steps for Spectrum SIP Trunking to Microsoft Teams via Ribbon SBC.

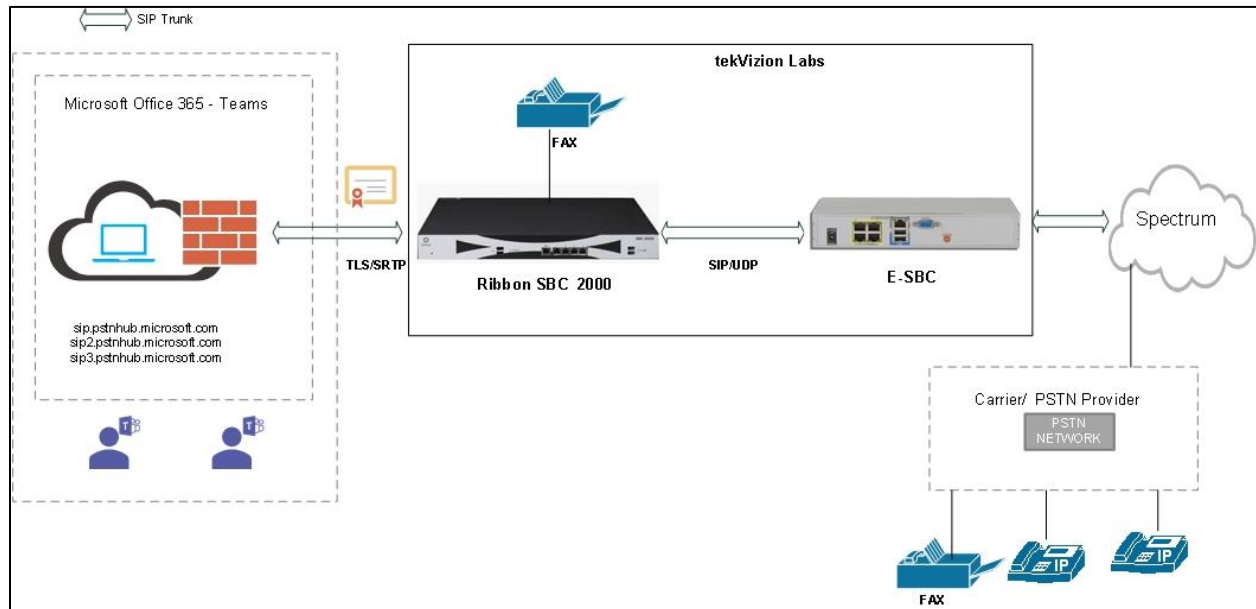
This Guide is written for Ribbon SBCs; however, the general information and configuration steps may be applied to other SBCs certified by Microsoft for Direct Routing. Ribbon-specific elements are called out in the text.



**Figure 1: MSO Network**

### 3 SIP Trunking Network Components

The network for the SIP trunk reference configuration is illustrated below and is representative of the Microsoft Teams Direct Routing to Spectrum using Ribbon SBC 2000.



**Figure 2: SIP Trunk Lab Reference Network**

The lab network consists of the following components:

- Microsoft Office 365 Tenant
- Ribbon SBC 2000
- Ribbon 1k (Version 8.0.3 Build Number 537) is used as SBC for fax test cases due to non-existence of FXS ports in Ribbon 2K (Limitation in hardware). Note: Ribbon 1K and Ribbon 2K belong to same base version.
- The Spectrum E-SBC is the SIP interface to the customer's SIP PBX. The E-SBC acts as a B2BUA and anchors all SIP and RTP packets to the Spectrum SIP Trunks.
- Customer must configure their LAN/VLAN to support Spectrum service.

#### 3.1 Spectrum Enterprise Service Gateway

Spectrum Enterprise Trunking delivers high-quality, secure voice service that can easily scale to shifting business needs. Furthermore, Enterprise Trunking provides the flexibility and productivity features of SIP and PRI voice solutions—backed by competitive service level agreements (SLAs)—over a private, fiber network to ensure quality, reliability and security.

#### 3.2 Hardware Components

- Ribbon SBC 2000
- Spectrum (Innomedia) ESBC (Provided and managed by Spectrum)

### 3.3 Software Requirements

- Ribbon SBC 2000 Version 8.0.3 Build 537
- Microsoft Teams Client Version 1.3.00.13565
- Spectrum (Innomedia) ESBC 9378-4B-2.0.13.0-Build8 – Provided and managed by Spectrum

### 3.4 PBX Configuration

**Table 1 - PBX Configuration**

<b>PBX Parameter</b>	<b>PBX Configuration</b>
SIP Messages	Anchored by Microsoft Phone System
RTP Packets	Tested for both Media flows from Ribbon SBC to Teams Client directly and Media flows via Microsoft Phone System
SIP Registration to ESBC	Non-registering trunk to ESBC
DTMF offer on calls	RFC2833

## 4 Features

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### 4.1 SIP Registration Method

Spectrum supports but does not require SIP REGISTER methods. Spectrum requires the SIP PBX to have a static IP address and provide the address to Spectrum for ESBC provisioning.

### 4.2 Features Supported

- Basic inbound and outbound calls using G.711ulaw
- Hold/Resume
- Call Transfer
- Call Forward No Answer
- Call Forward Always
- Simultaneous Ring
- Three-Way Calling
- Call Waiting
- CLID Restriction
- Early Media
- Session Audit
- DTMF RFC2833
- Fax (G711 and T38)

### 4.3 Features Not Supported

- G729 codec is not supported by Spectrum

### 4.4 Caveats, Limitations and Known Issues

- Spectrum Innomedia SBC accepts both G711 and T38 Fax re-INVITE. Hence fallback from T38 to G711 is not tested
- Ribbon 1k (Version 8.0.3 Build Number 537) is used as SBC for fax test cases due to non-existence of FXS ports in Ribbon 2K (Limitation in hardware). Note: Ribbon 1K and Ribbon 2K belong to same base version
- Ribbon 1K supports only G3 with the speed limitation up to 14,400 b/s

## 5 Configuration

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### 5.1 Configuration Checklist

The specific values listed in the table below and in subsequent sections are used in the lab configuration described in this document, and are for **illustrative purposes only**. The customer must obtain and use the values for your deployment.

**Table 2 – IP Addresses**

Component	Lab Value	Customer Value
<b>E-SBC</b>		
• LAN IP Address	10.64.5.1	
• LAN Subnet Mask	255.255.255.0	
<b>Ribbon SBC 2000</b>		
• WAN IP Address	10.64.5.10	
• Subnet Mask	255.255.0.0	
• WAN IP Address	192.65.X.X	
• Subnet Mask	255.255.255.0	

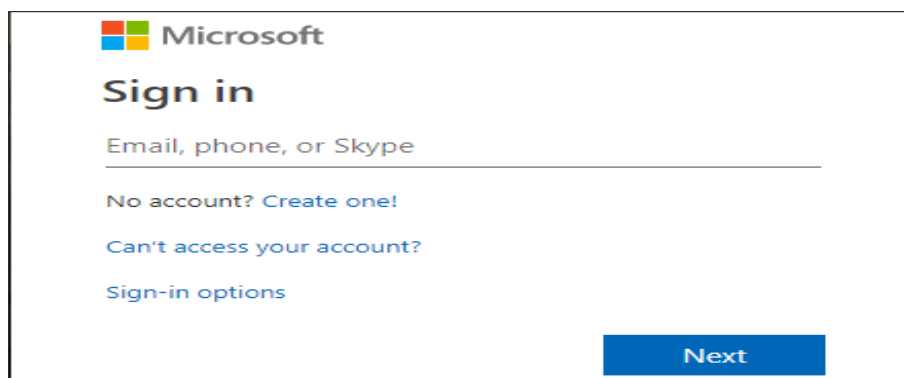
## 5.2 Microsoft Teams Direct Routing Configuration

- These are the main tasks to configure Microsoft Teams Direct Routing

- 5.2.1 Create Users in Office 365
- 5.2.2 Configure Calling policy to Users
- 5.2.3 Configure User parameters
- 5.2.4 Create Online PSTN Gateway
- 5.2.5 Configure Online PSTN usage
- 5.2.6 Configure Online PSTN Voice Route
- 5.2.7 Configure Online Voice Routing Policy

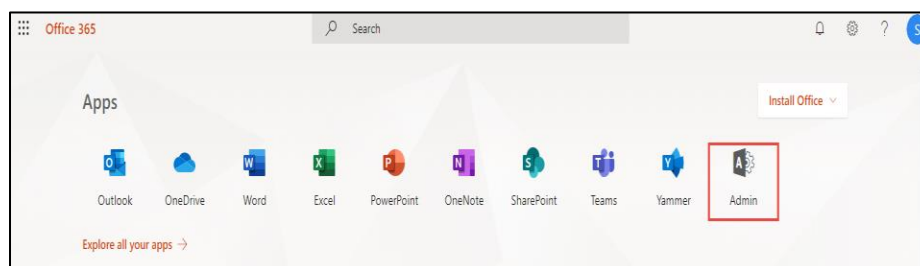
### 5.2.1 Create Users in Office 365

- Login to <http://portal.office.com/> using Office 365 tenant administrator credentials



**Figure 3: Office 365 Portal Login**

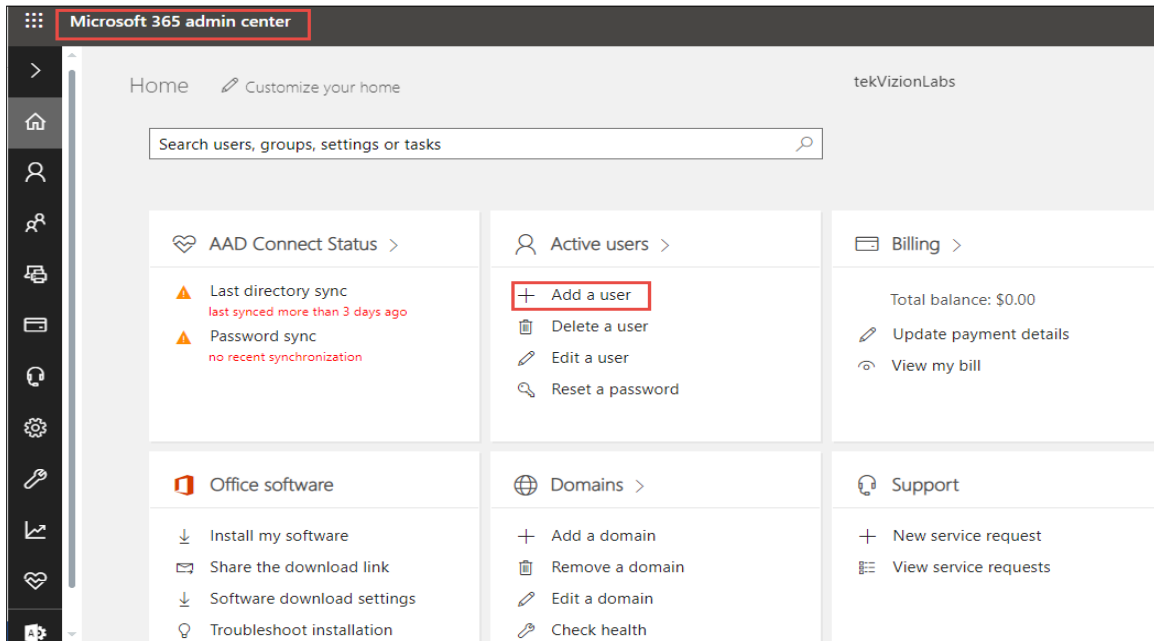
- Select the Office 365 **Admin** Icon to login Office 365 admin center



**Figure 4: Office 365 Portal Login (cont.)**



- Select “Add a user” from the Microsoft 365 admin center



**Figure 5: Teams user creation**

- Enter the user details, password and assign required license to the users

The image shows two screenshots of the 'Add a user' interface. The top screenshot shows the 'Basics' step where user details are entered. The bottom screenshot shows the 'Product licenses' step where a license is selected.

**Basics Step:**

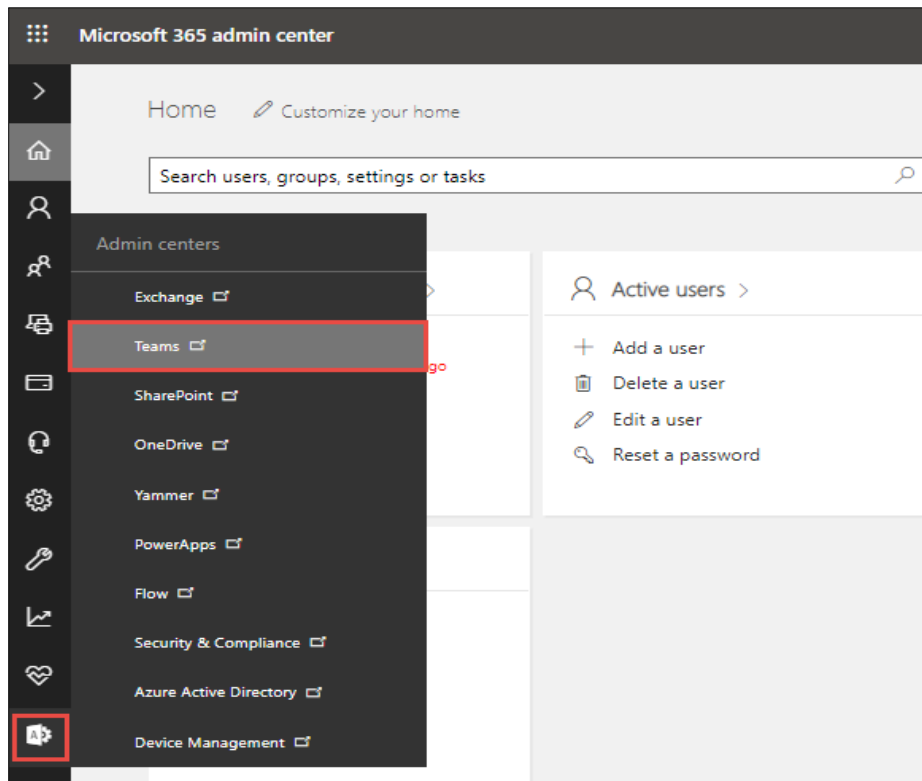
- First name:** teamsvf
- Last name:** user3
- Display name \*:** teamsvfuser3
- Username \*:** teamsvfuser3 @ tekvizionlabs.com
- Password settings:**
  - Auto-generate password
  - Let me create the password
- Password \*:** [Redacted]

**Product Licenses Step:**

- Microsoft Stream Trial (Unlimited licenses available)
- Microsoft Teams Commercial Cloud (Unlimited licenses available)
- Microsoft Teams Exploratory (94 of 100 licenses available)
- Office 365 E5 (0 of 1 licenses available)
- Office 365 E5 without Audio Conferencing (0 of 100 licenses available)
- Create user without product license (not recommended)  
They may have limited or no access to Office 365 until you assign a prod license.

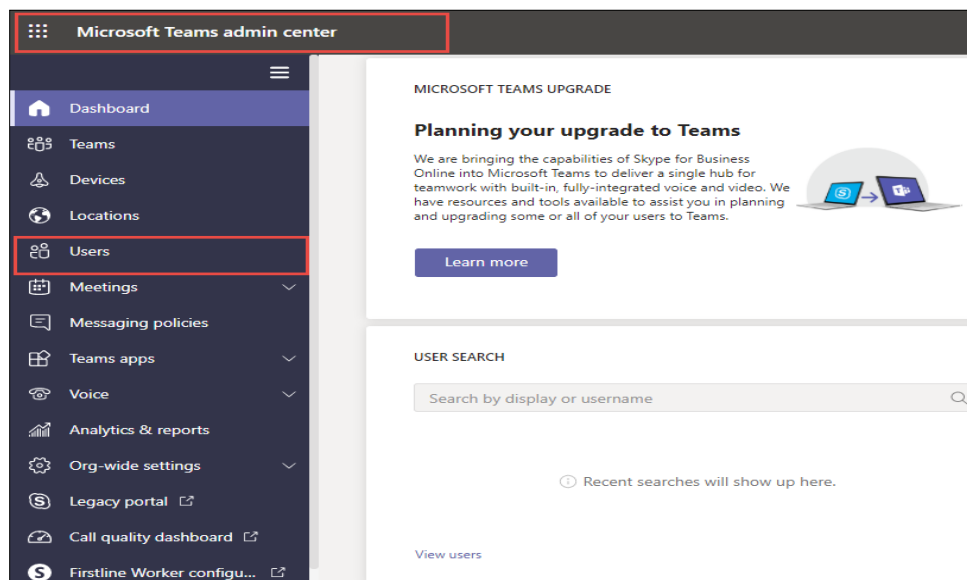
**Figure 6: Teams user creation (cont.)**

- Select the **Admin** icon from the Microsoft 365 admin center home page and navigate to **Microsoft Teams admin center**



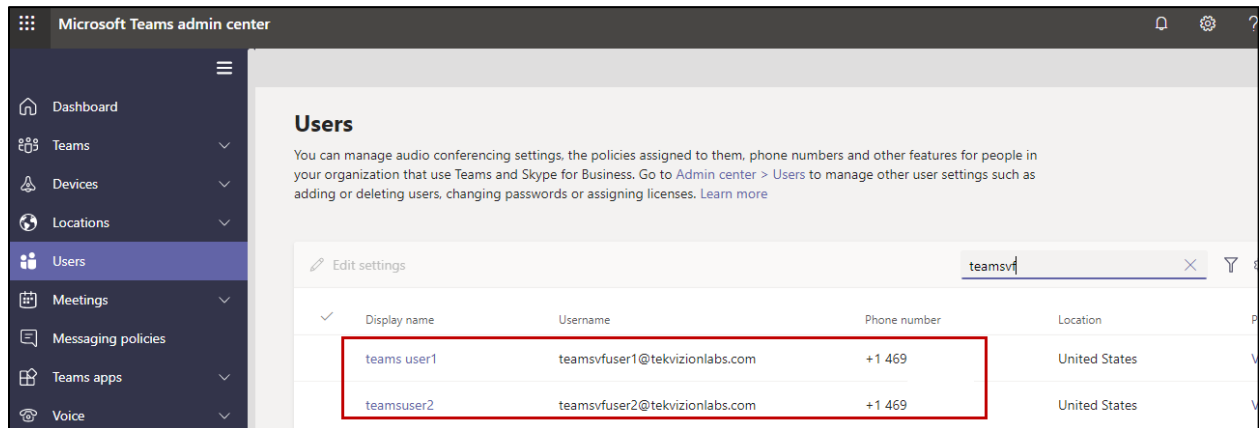
**Figure 7: Teams user creation (cont.)**

- Select **Users** from the Microsoft Teams admin center to view the list of available users



**Figure 8: Teams user creation (cont.)**

- Search for the created user and click on the user display name to view user properties



**Figure 9: Teams user creation (cont.)**

- Under user properties, navigate to **Account** and set the teams upgrade mode to **Teams Only**

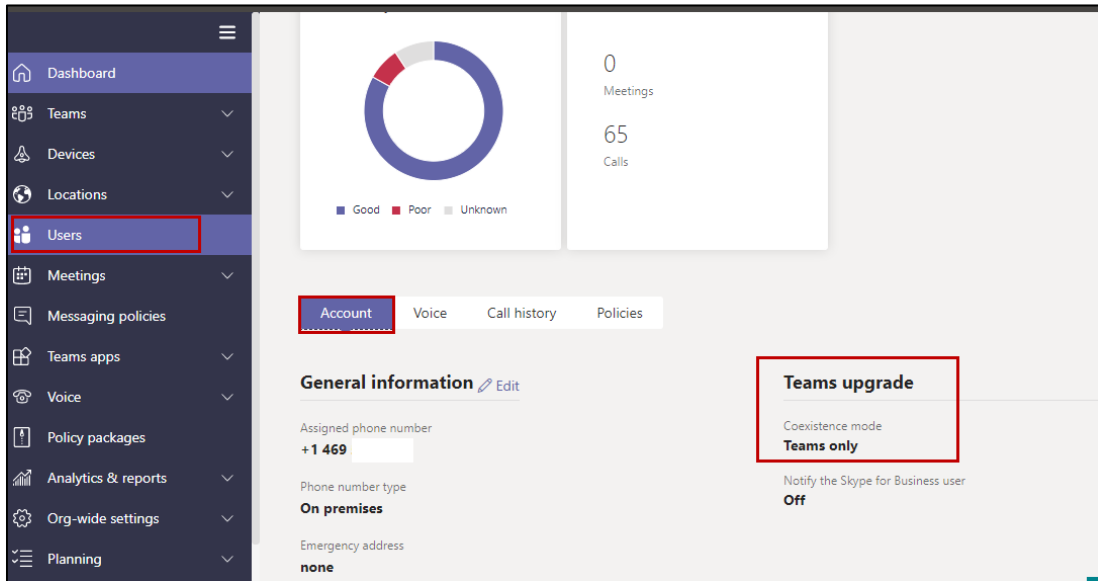


Figure 10: Teams user creation (cont.)

- Under user properties, navigate to **Policies** and set the Calling Policy as shown below. Here in the below example custom policy “**Call waiting**” is assigned to user.

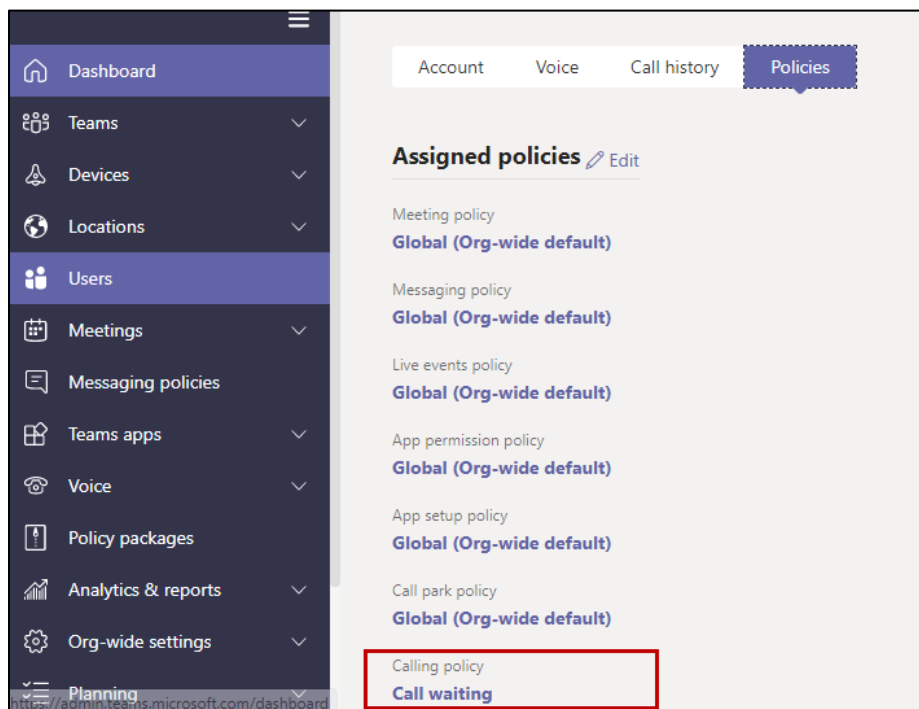


Figure 11: Teams user creation (cont.)

## 5.2.2 Configure Calling policy to Users

- To configure a custom policy, navigate to **Microsoft Teams admin center > Voice > Calling policies > Add**

**Microsoft Teams admin center**

Calling policies

Calling policies are used to control what calling features are available to people in Teams. You can use the Global (Org-wide default) policy and customize it or create one or more custom calling policies for people that have phone numbers in your organization. [Learn more](#)

**Calling policies summary**

3	3
Default policies	Custom policies

**User statistics**

8	141
Custom policies	Default policies

**Actions:** + Add, Edit, Duplicate, Delete, Reset Global policy, Manage users, 6 Items, Search

Name	Custom policy
Global (Org-wide default)	No
Busy on Busy Enabled	Yes

Figure 12: Teams user creation (cont.)



## 5.2.4 Create Online PSTN Gateway

- Using administrator account connect to the remote PowerShell of office 365 tenant

```
New-CsOnlinePSTNGateway -Fqdn <SBC FQDN> -SipSignallingPort <SBC SIP Port>
-ForwardCallHistory $true -ForwardPai $true -MaxConcurrentSessions <Max Concurrent
Sessions the SBC can handle> -Enabled $true
```

- After creating Online PSTN Gateway use “Get-CsOnlinePstnGateway” command to view the online PSTN gateway created. Gateway Identity must be a valid FQDN for the office 365 tenant to reach SBC
- An example is shown below for Media Bypass Enabled. Media Bypass parameter needs to be set to False to disable Media Bypass using the below command

```
Set-CsOnlinePSTNGateway -Fqdn <SBC FQDN> -Identity -MediaBypass $False
```

```
PS C:\WINDOWS\system32> Get-CsOnlinePSTNGateway -Identity "sbc11.tekvizionlabs.com"

Identity                : sbc11.tekvizionlabs.com
InboundTeamsNumberTrans : {}
InboundPstnNumberTrans  : {}
OutboundTeamsNumberTra  : {}
OutboundPstnNumberTra   : {}
Fqdn                    : sbc11.tekvizionlabs.com
SipSignallingPort       : 5061
FailoverTimeSeconds     : 10
ForwardCallHistory      : True
ForwardPai               : True
SendSipOptions          : True
MaxConcurrentSessions   : 100
Enabled                  : True
MediaBypass              : True
GatewaySiteId           :
GatewaySiteLbrEnabled   : False
GatewayLbrEnabledUserO  : False
FailoverResponseCodes   : 408,503,504
GenerateRingingWhileLo  : True
PidfLoSupported         : False
MediaRelayRoutingLocat :
ProxySbc                 :
BypassMode               : None
```

Figure 15: Microsoft Teams – Online PSTN Gateway reference



### 5.2.5 Configure Online PSTN usage

- Use the below command to add a new PSTN usage

```
Set-CsOnlinePstnUsage -identity Global -Usage @{Add="<usage name>"}
```

- After creating Online PSTN usage use the command “(Get-CsOnlinePstnUsage).usage” to view the online pstn usage created. Example is shown below

```
PS C:\WINDOWS\system32> (Get-CsOnlinePstnUsage).usage
US and Canada
Test
CCE
Non E.164
ThinkTel
sbc3
sbc4
Newsbc2
sbc5
sbc2
emergencyusage
SBC6
emergencyusagesbc6
sbc7
sbc8
sbc9
emergencyusagesbc2
sbc10
emergencyusagesbc3
emergencysbc2
<sbc11>
sbc11
sbc12
sbc13
```

Figure 16: Microsoft Teams – Online PSTN usage reference

### 5.2.6 Configure Online Voice Route

- Use the below command to add a new online Voice Route and associate the online pstn usage with online PSTN gateway created earlier

```
New-CsOnlineVoiceRoute -Identity "<Route name>" -NumberPattern ".*"
-OnlinePstnGatewayList "<SBC FQDN>" -Priority 1 -OnlinePstnUsages "<PSTN usage name>"
```

- After creating online voice route use “Get-CsOnlineVoiceRoute” command to view the online voice route created. Here we can see the association of PSTN usage with the PSTN gateway. Example is shown below

```
PS C:\WINDOWS\system32> Get-CsOnlineVoiceRoute -Identity sbc11

Identity           : sbc11
Priority            : 2
Description         :
NumberPattern      : .*
OnlinePstnUsages   : {sbc11}
OnlinePstnGatewayList : {sbc11.tekvizionlabs.com}
Name                : sbc11
```

Figure 17: Microsoft Teams – Online PSTN Voice Route reference

## 5.2.7 Configure Online Voice Routing Policy

- Create a new online Voice Routing Policy using the below command

```
New-CsOnlineVoiceRoutingPolicy "<policy name>" -OnlinePstnUsages "<pstn usage name>"
```

- After creating online Voice Routing Policy use "Get-CsOnlineVoiceRoutingPolicy" command to view the online Voice Routing Policy created. Example is shown below

```
PS C:\WINDOWS\system32> Get-CsOnlineVoiceRoutingPolicy -Identity sbc11

Identity       : Tag:sbc11
OnlinePstnUsages : {sbc11}
Description    :
RouteType     : BYOT
```

**Figure 18: Microsoft Teams – Online PSTN Voice Routing Policy reference**

- Associate Teams user with online voice routing policy using the below command.
- Note: Online Voice Routing is created using above steps

```
Grant-CsOnlineVoiceRoutingPolicy -Identity "<User name>" -PolicyName "<policy name>"
```

```
PS C:\WINDOWS\system32> Grant-CsOnlineVoiceRoutingPolicy -Identity teamsvfuser1 -PolicyName sbc11
```

**Figure 19: Voice Route Policy Creation**

## 5.3 Ribbon SBC Configuration

- Below are the main tasks to configure Ribbon SBC 2000 Version 8.0.3 Build 537 for Microsoft Teams Direct Routing and towards Spectrum

- 5.3.1 Login to Ribbon SBC 2000
- 5.3.2 Create Logical Interfaces
- 5.3.3 Configure System Information
- 5.3.4 Configure SRTP for Teams
- 5.3.5 Create TLS Profile and Generate CSR
- 5.3.6 Create SIP Profile
- 5.3.7 Configure FXS Port
- 5.3.8 Create FXS Profile
- 5.3.9 Create Media Profiles
- 5.3.10 Create Media List
- 5.3.11 Create SIP Server Tables
- 5.3.12 Create Signaling Groups
- 5.3.13 Create Call Routing Table
- 5.3.14 Create Transformation Table
- 5.3.15 Message Manipulations

### 5.3.1 Login to Ribbon SBC 2000

- Log into Ribbon SBC 2000 web interface through its Management IP Address
- Enter the Username and Password, Click Login

← → ↻ ⚠ Not secure | 10.64.5.10/cgi/login/login.php

ribbon

## Welcome to Ribbon SBC 2000

Users (authorized or unauthorized) have no explicit or implicit expectation of privacy. Any or all uses of this system and all files on this system may be intercepted, monitored, recorded, copied, audited, inspected, and disclosed to authorized site, customer administrative, and law enforcement personnel, as well as authorized officials of government agencies, both domestic and foreign. By using this system, the user consents to such interception, monitoring, recording, copying, auditing, inspection, and disclosure at the discretion of authorized personnel.

Unauthorized or improper use of this system may result in administrative disciplinary action and civil and criminal penalties. By continuing to use this system you indicate your awareness of and consent to these terms and conditions of use. CANCEL YOUR LOGIN IMMEDIATELY if you do not agree to the conditions stated in this warning.

User Name

Password

Copyright © 2010-2020 Ribbon Communications Operating Company, Inc. All Rights Reserved

Figure 20: Ribbon SBC Login

### 5.3.2 Create Logical Interfaces

- To configure Logical Interfaces navigate to **Settings > Node Interfaces > Logical Interfaces**. Create Logical Interfaces for Spectrum and Teams as shown below

Interface Name: Ethernet 1 IP  
 I/F Index: 47  
 Alias:   
 Description: **To Spectrum**  
 Admin State: Enabled

**Networking**

MAC Address: 00:80:b2:f0:27:61  
 IP Addressing Mode: IPv4

**IPv4 Information**

ACL In: None  
 ACL Out: None  
 ACL Forward: None  
 IP Assign Method: Static  
 Primary Address: **10.64.5.10** x.x.x.x  
 Primary Netmask: **255.255.0.0** x.x.x.x  
 Configure Secondary Interface: Disabled

**Figure 21: Ribbon SBC – Logical Interface towards Spectrum**

Interface Name: Ethernet 3 IP  
 I/F Index: 51  
 Alias:   
 Description: **To Teams**  
 Admin State: Enabled

**Networking**

MAC Address: 00:80:b2:f0:27:61  
 IP Addressing Mode: IPv4

**IPv4 Information**

ACL In: None  
 ACL Out: None  
 ACL Forward: None  
 IP Assign Method: Static  
 Primary Address: **192.65.** x.x.x.x  
 Primary Netmask: **255.255.** x.x.x.x  
 Configure Secondary Interface: Disabled

Figure 22: Ribbon SBC- Logical Interface towards Teams

### 5.3.3 Configure System Information

- Navigate to **Settings > System > Node-Level Settings** to configure DNS Server IP, Host Name and Domain Name as shown below

<p><b>Host Information</b></p> <p>Host Name <input type="text" value="bbc11"/> *</p> <p>Domain Name <input type="text" value="tekvizionlabs.com"/></p> <hr/> <p><b>System Information</b></p> <p>System Description <input type="text"/></p> <p>System Location <input type="text"/></p> <p>System Contact <input type="text"/></p>	<p><b>Domain Name Service</b></p> <p>Use Primary DNS <input type="text" value="Yes"/> ▼</p> <p>Primary Server IP <input type="text" value="8.8.8.8"/> * XXXXX or XXXXX.X</p> <p>Use Secondary DNS <input type="text" value="No"/> ▼</p> <p>Enable DNS Service <input type="text" value="Yes"/> ▼</p>
<p><b>Time Management</b></p> <p>Time Zone <input type="text" value="(GMT-6:00) Central (US/Canada)"/> ▼</p> <hr/> <p><b>Network Time Protocol</b></p> <p>Use NTP <input type="text" value="Yes"/> ▼</p> <p>NTP Server <input type="text" value="10.10.10.5"/> * IPv4/6 Address or FQDN</p> <p>NTP Server Authentication <input type="text" value="Disabled"/> ▼</p> <hr/> <p><b>NTP Server 2</b></p> <p>Use NTP Server 2 <input type="text" value="No"/> ▼</p>	<p><b>DHCP Server</b></p> <p>Enable DHCP Server <input type="text" value="No"/> ▼</p>
<p><b>System LEDs</b></p> <p>Power LED Green</p> <p>Alarm LED Blinking Red</p> <p>Ready LED Green</p> <p>Locator LED <input type="text" value="On Green"/> ▼</p>	

Figure 23: Ribbon SBC- System Information

### 5.3.4 Configure SRTP for Teams

- To configure SRTP towards Teams navigate to **Settings > Media > SDES-SRTP Profiles**. Create new SRTP profile for Teams as shown below

The screenshot shows the SRTP Config interface with the following settings:

- Description: SRTP\_Profile\_for\_MSTeams
- Operation Option: Required
- Crypto Suite: AES\_CM\_128\_HMAC\_SHA1\_80
- Master Key section:
  - Master Key Lifetime: Set
  - Lifetime Value: 2<sup>31</sup>
  - Derivation Rate: 0
  - Key Identifier Length: 1

**Figure 24: Ribbon SBC- SRTP Profile for Teams**

### 5.3.5 Create TLS Profile and Generate CSR

- Microsoft Teams Direct Routing allows only TLS connections from SBCs for SIP traffic with a certificate signed by one of the trusted Certification Authorities. Currently, supported Certification Authorities are:
  - AffirmTrust
  - AddTrust External CA Root
  - Baltimore CyberTrust Root
  - Buypass
  - Cybertrust
  - Class 3 Public Primary Certification Authority
  - Comodo Secure Root CA
  - Deutsche Telekom
  - DigiCert Global Root CA
  - DigiCert High Assurance EV Root CA
  - Entrust
  - GlobalSign
  - Go Daddy
  - GeoTrust
  - Verisign, Inc.
  - Starfield
  - Symantec Enterprise Mobile Root for Microsoft
  - SwissSign
  - Thawte Timestamping CA
  - Trustwave
  - TeliaSonera
  - T-Systems International GmbH (Deutsche Telekom)
  - QuoVadis

- To configure TLS profile navigate to **Settings > Security > TLS Profiles**. Create TLS profile for Teams as shown below

**Figure 25: Ribbon SBC - TLS Profile for Teams**

- Navigate to **Settings > Security > SBC Certificates > Generate SBC Edge CSR** to generate CSR as shown below.
- Note: Root Certificates used by Microsoft Direct Routing has to be uploaded to SBC trusted Root Certificates

**Figure 26: Ribbon SBC- Generate CSR for Teams**

- Copy and paste the generated CSR below and get it signed from CA trusted by direct routing

**Result**

```

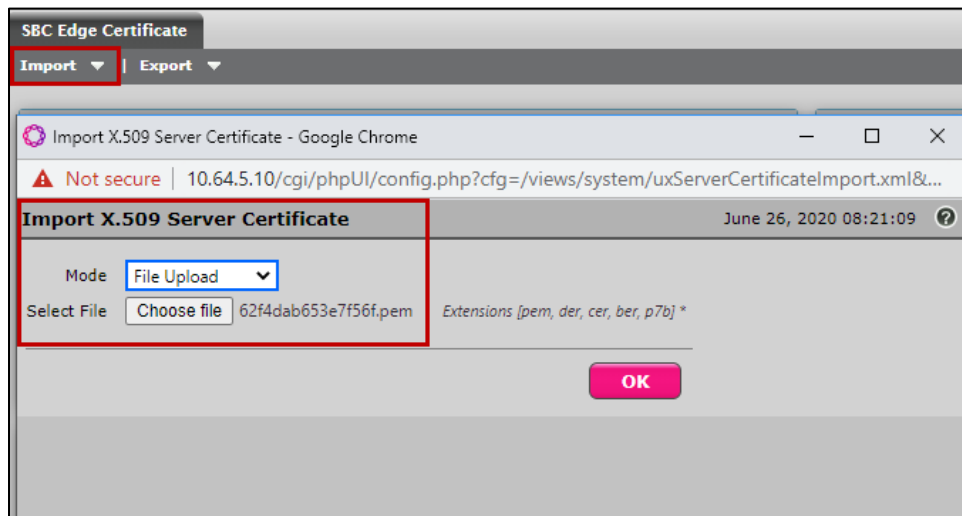
-----BEGIN CERTIFICATE REQUEST-----
MIICuzCCAaMCAQAwLjFfMBOGA1UEAxMwZm50ZWt2aXppb25sYWZlMmNvbTEl
MAkGA1UEBHMCMVVMwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQCSilaP
fZiA8FIG11FIViVUxXSpJR6woE1DfUSsrpF3kdi8W+be4QeXWlqpbqXSToOtk0B
EmEf1DztxqwHQyUNCtnj1ErigMtFTz9LP1w21kj5Sxfs2wQpAPhuFNw7Q9JsY3J
CduMiXgxQQLUilX3ouMHhd+tpZLJ3ZEU6tO+2dETz1mwL0Qt9BZfw5cSFydkU/N
IM5FaUJ2sTawnQfNYmbRLUcq8xUqwldeVZGCT6T3EnZbm+JwEYJywY56kj10E9m
cfVmlkxH1dtG4+NQzD8a+RRoo3N2ztL3E/ppv+mtCZFRafcmWrVnbDEuPhFkSNM2
fsxPuNsszxC75hiBAGMBAAGgSDBGBgkqhkiG9w0BCQ4xOTA3MAkGA1UdEwQCMAAw
CwYDVR0PBAQDAgWgMB0GA1UdJQQWMBQGCCsGAQUFBwMBBggrBgEFBQcDAjANBgkq
hkiG9w0BAQsFAAOCAQEAJw6ieEPvh2UO09FgUVv9Tt9VRVzE2WPFrGeLhQtF3kX
EBcQ0pCGlod91hul9iaVMAwo7ILE4diWSVWGGugliLMBXzoSs+WGGsn92fVa/w4
7EmNu2zfaEyCHNZOb2yja6AbH1Vf9K19RVMePlhNbFKIVlkhF/oxTnsn8p9YX6Po
AnVGyeKMPcD8hoGldUgvVlySjBbOyeeQGH2AxT/1fQ28qjr3eE5176L6WkoSVkK6
eHMIrlngNDQoyhIPVQPC7MuUEfsfEJ7iVRhpMWGaVieWyR0Kis5Zggcw59r67RAy
yYxV6WNpLkpDXKHcQJWhiYVfQc0w70Te/Q5rpgqjLA==
-----END CERTIFICATE REQUEST-----

```

Copy CSR

**Figure 27: Ribbon SBC- CSR**

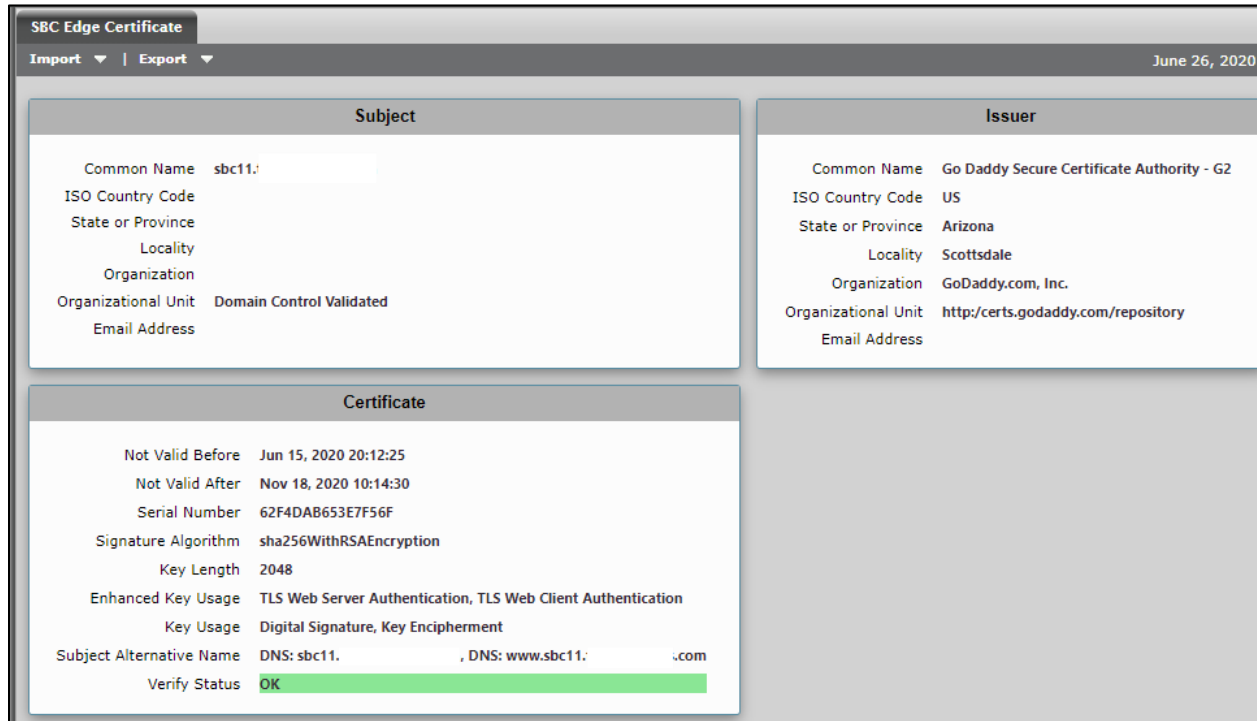
- Navigate to **Settings > Security > SBC Certificates > SBC Edge Certificate** and upload the signed CA as shown below



**Figure 28: Ribbon SBC – Import SBC Edge Certificate**

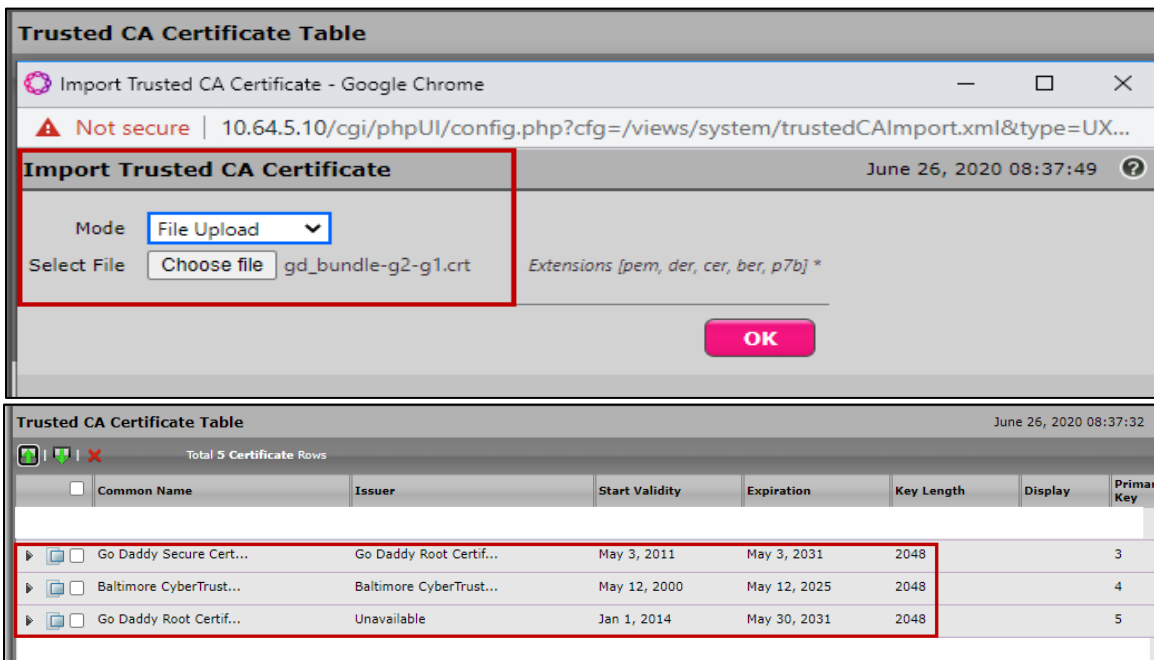


- SBC Edge Certificate is uploaded as shown below



**Figure 29: Ribbon SBC – SBC Edge Certificate**

- Navigate to **Settings > Security > SBC Certificates > Trusted CA Certificates** and import the Root and Intermediate Certificates for Teams as shown below



**Figure 30: Ribbon SBC – Root Certificates for Teams**

### 5.3.6 Create SIP Profile

- To configure SIP profile navigate to **Settings > SIP > SIP Profiles**. Create SIP profiles for Spectrum and Teams as shown below

The screenshot shows the configuration interface for a SIP profile named 'Spectrum\_Profile'. The interface is organized into several panels:

- Session Timer:**
  - Session Timer: Enable
  - Minimum Acceptable Timer: 600 \* secs [90..7200]
  - Offered Session Timer: 3600 \* secs [90..7200]
  - Terminate On Refresh Failure: False
- MIME Payloads:**
  - ELIN Identifier: LOC
  - PIDF-LO Passthrough: Enable
  - Unknown Subtype Passthrough: Disable
- Header Customization (highlighted with a red box):**
  - FQDN in From Header: Static
  - Static Host FQDN/IP[:port]: 10.64.5.10
  - FQDN in Contact Header: Static
  - Send Assert Header: Always
  - SBC Edge Diagnostics Header: Disable
  - Trusted Interface: Enable
  - UA Header: Ribbon SBC Edge
  - Calling Info Source: "From" Header Only
  - Diversion Header Selection: Last
  - Record Route Header: RFC 3261 Standard
- Options Tags:**
  - 100rel: Supported
  - Path: Not Present
  - Timer: Supported
  - Update: Supported
- Timers:**
  - Transport Timeout Timer: 5000 ms [5000..32000]
  - Maximum Retransmissions: RFC Standard
  - Redundancy Retry Timer: 180000 ms [5000..180000]
  - RFC Timers:**
    - Timer T1: 500 ms [100..10000]
    - Timer T2: 4000 ms [1000..80000](>= T1)
    - Timer T4: 5000 ms [1000..100000]
    - Timer D: 32000 ms [5000..640000]
    - Timer B: 32000 ms
    - Timer F: 32000 ms
    - Timer H: 32000 ms (64\*TimerT1)
    - Timer J: 4000 ms [4000..640000]
- SDP Customization:**
  - Send Number of Audio Channels: False
  - Connection Info in Media Section: True
  - Origin Field Username: SBC (default: SBC)
  - Session Name: VoipCall (default: VoipCall)
  - Digit Transmission Preference: RFC 2833/Voice
  - SDP Handling Preference: Legacy Audio/Fax

**Figure 31: Ribbon SBC – SIP Profile for Spectrum**

Teams\_Profile
3

<div style="border-bottom: 1px solid gray; padding: 5px;"> <p style="text-align: center; margin: 0;"><b>Session Timer</b></p> <p>Session Timer: <input type="text" value="Enable"/> <span style="font-size: small;">▼</span></p> <p>Minimum Acceptable Timer: <input type="text" value="600"/> * secs [90..7200]</p> <p>Offered Session Timer: <input type="text" value="3600"/> * secs [90..7200]</p> <p>Terminate On Refresh Failure: <input type="text" value="False"/> <span style="font-size: small;">▼</span></p> </div> <div style="padding: 5px;"> <p style="text-align: center; margin: 0;"><b>Header Customization</b></p> <p>FQDN in From Header: <input type="text" value="SBC Edge FQD"/> <span style="font-size: small;">▼</span></p> <p>FQDN in Contact Header: <input type="text" value="SBC FQDN"/> <span style="font-size: small;">▼</span></p> <p>Send Assert Header: <input type="text" value="Trusted Only"/> <span style="font-size: small;">▼</span></p> <p>SBC Edge Diagnostics Header: <input type="text" value="Enable"/> <span style="font-size: small;">▼</span></p> <p>Trusted Interface: <input type="text" value="Enable"/> <span style="font-size: small;">▼</span></p> <p>UA Header: <input type="text" value="Ribbon SBC Edge"/></p> <p>Calling Info Source: <input type="text" value="'From' Header Only"/> <span style="font-size: small;">▼</span></p> <p>Diversion Header Selection: <input type="text" value="Last"/> <span style="font-size: small;">▼</span></p> <p>Record Route Header: <input type="text" value="RFC 3261 Standard"/> <span style="font-size: small;">▼</span></p> </div>	<div style="border-bottom: 1px solid gray; padding: 5px;"> <p style="text-align: center; margin: 0;"><b>MIME Payloads</b></p> <p>ELIN Identifier: <input type="text" value="LOC"/> <span style="font-size: small;">▼</span></p> <p>PIDF-LO Passthrough: <input type="text" value="Enable"/> <span style="font-size: small;">▼</span></p> <p>Unknown Subtype Passthrough: <input type="text" value="Disable"/> <span style="font-size: small;">▼</span></p> </div> <div style="padding: 5px;"> <p style="text-align: center; margin: 0;"><b>Options Tags</b></p> <p>100rel: <input type="text" value="Supported"/> <span style="font-size: small;">▼</span></p> <p>Path: <input type="text" value="Not Present"/> <span style="font-size: small;">▼</span></p> <p>Timer: <input type="text" value="Supported"/> <span style="font-size: small;">▼</span></p> <p>Update: <input type="text" value="Supported"/> <span style="font-size: small;">▼</span></p> </div>
<div style="border-bottom: 1px solid gray; padding: 5px;"> <p style="text-align: center; margin: 0;"><b>Timers</b></p> <p>Transport Timeout Timer: <input type="text" value="5000"/> ms [5000..32000]</p> <p>Maximum Retransmissions: <input type="text" value="RFC Standard"/> <span style="font-size: small;">▼</span></p> <p>Redundancy Retry Timer: <input type="text" value="180000"/> ms [5000..180000]</p> <hr style="border: 0; border-top: 1px solid gray; margin: 5px 0;"/> <p style="text-align: center; font-size: small; margin: 0;"><b>RFC Timers</b></p> <p>Timer T1: <input type="text" value="500"/> ms [100..10000]</p> <p>Timer T2: <input type="text" value="4000"/> ms [1000..80000](&gt;= T1)</p> <p>Timer T4: <input type="text" value="5000"/> ms [1000..100000]</p> <p>Timer D: <input type="text" value="32000"/> ms [5000..640000]</p> <p>Timer B: 32000 ms</p> <p>Timer F: 32000 ms</p> <p>Timer H: 32000 ms (64*TimerT1)</p> <p>Timer J: <input type="text" value="4000"/> ms [4000..640000]</p> </div>	<div style="padding: 5px;"> <p style="text-align: center; margin: 0;"><b>SDP Customization</b></p> <p>Send Number of Audio Channels: <input type="text" value="False"/> <span style="font-size: small;">▼</span></p> <p>Connection Info in Media Section: <input type="text" value="True"/> <span style="font-size: small;">▼</span></p> <p>Origin Field Username: <input type="text" value="SBC"/> <span style="font-size: small;">default: SBC</span></p> <p>Session Name: <input type="text" value="VoipCall"/> <span style="font-size: small;">default: VoipCall</span></p> <p>Digit Transmission Preference: <input type="text" value="RFC 2833/Voice"/> <span style="font-size: small;">▼</span></p> <p>SDP Handling Preference: <input type="text" value="Legacy Audio/Fax"/> <span style="font-size: small;">▼</span></p> </div>

Figure 32: Ribbon SBC – SIP Profile for Teams

### 5.3.7 Configure FXS Port

- To configure FXS port navigate to **Settings > SIP > Node Interfaces > Ports > FXS Port**

**Port Table View**

Set DS1 Port Type | Set FXS Local Loop Type | Total 8 Port Rows

Port ID	Port Type	Description	Admin State	Service Status	Display
Port 1:1	FXS	Analog phone 1	Enabled	Up	Call Counters Channel

**Identification/Status**

Port Alias: 46957  
 Description: Analog phone 1  
 Admin State: Enabled  
 Service Status: Up  
 Last Service Status Change: Fri Oct 30 04:03:46 2020  
 Physical Alarm Status: Normal

**Physical Layer**

Port Type: FXS  
 Analog Line Profile: United States  
 Relative Profile Adjustments:  
 Receive Gain: -6 dB [-11..0]  
 Transmit Gain: 0 dB [-5..5]

Figure 33: Ribbon SBC – configure FXS Port

### 5.3.8 Create FXS Profile

- To configure FXS profile navigate to **Settings > SIP > CAS > CAS Signaling Profiles > Create CAS Profile > FXS Profile**. Create FXS profiles for Fax as shown below

**FXS profile**

Description: FXS profile

**Loop Start FXS Properties**

Loop Start Type: Forward Disconnect  
 Forward Disconnect Duration: 700 \* ms [100..3000]  
 Disconnect Tone Generation: Enabled  
 Flashhook Signal Detection: Enabled  
 Maximum Flashhook Duration: 700 \* ms [50..1000]  
 Minimum Flashhook Duration: 200 \* ms [50..1000]  
 Inter-Digit Timeout: 4000 \* ms [250..30000]

Figure 34: Ribbon SBC – FXS Profile for Spectrum

### 5.3.9 Create Media Profiles

- To configure Media Profile navigate to **Settings > Media > Media Profiles > Create Media Profile > Fax Codec Profile**. Configure the Media Profile for T38 Fax as shown below

The screenshot shows a 'Fax Codec Configuration' dialog box for a 'T.38 Fax' profile. The fields are as follows:

Field	Value
Description	T.38
Codec	T.38 Fax
Maximum Rate	14400 b/s
Signaling Packet Redundancy	3 [0..7]
Payload Packet Redundancy	0 [0..3]
Error Correction Mode	Enabled
Training Confirmation Procedure	Send Over Network
Fallback to Passthrough	Enabled
Super G3 to G3 Fallback	Disabled

An 'Apply' button is located at the bottom right of the dialog.

Figure 35: Ribbon SBC – T38 Fax Profile for Spectrum

### 5.3.10 Create Media List

- To configure Media List navigate to **Settings > Media > Media List**. Configure the Media List for Spectrum and Teams as shown below

The screenshot displays the configuration interface for a Media List profile named 'Spectrum\_ML'. The 'Media Profiles List' section contains a single entry, 'MU-LAW', which is highlighted with a red box. To the right of this list are buttons for 'Up', 'Down', 'Add/Edit', and 'Remove'. Below the list, several configuration options are shown as dropdown menus or text boxes:

- SDES-SRTP Profile:** None (with a note: *Associated SIP SG Listen Ports should be TLS only.*)
- DTLS-SRTP Profile:** None
- Media DSCP:** 46 (with a note: *\* [0..63]*)
- RTCP Mode:** RTCP
- Dead Call Detection:** Disabled
- Silence Suppression:** Enabled

The interface is divided into three main sections:

- Gain Control:** Contains 'Receive Gain' and 'Transmit Gain', both set to 0 dB (range [-14..+6] dB).
- Digit Relay:** Contains 'Digit (DTMF) Relay Type' set to RFC 2833 and 'Digit Relay Payload Type' set to 101 (range [96..127]).
- Passthrough/Tone Detection:** Contains several options:
  - Modem Passthrough: Enabled
  - Fax Passthrough: Enabled
  - CNG Tone Detection: Disabled
  - Fax Tone Detection: Enabled
  - DTMF Signal to Noise: 0 dB (range [-3..+6] dB)
  - DTMF Minimum Level: -38 dBm0 (range [-48..-14] dBm0)

**Figure 36: Ribbon SBC – Media Profile for Spectrum**

**Spectrum\_ML**

Description:

Media Profiles List:  Up, Down, Add/Edit, Remove

SDES-SRTP Profile:  Associated SIP SG Listen Ports should be TLS only. +

DTLS-SRTP Profile:  +

Media DSCP:  \* [0..63]

RTCP Mode:

Dead Call Detection:

Silence Suppression:

**Gain Control**

Receive Gain:  [-14..+6] dB

Transmit Gain:  [-14..+6] dB

**Digit Relay**

Digit (DTMF) Relay Type:

Digit Relay Payload Type:  [96..127]

**Passthrough/Tone Detection**

Modem Passthrough:

Fax Passthrough:

CNG Tone Detection:

Fax Tone Detection:

DTMF Signal to Noise:  [-3..+6] dB

DTMF Minimum Level:  [-48..-14] dBm0

**Figure 37: Ribbon SBC – T38 Fax Profile for Spectrum**

Teams

Media Profiles List

G711A  
MU-LAW

Up

Down

Add/Edit \*

Remove

SDES-SRTP Profile SRTP\_Profile\_for\_MSTeams ▼

DTLS-SRTP Profile None ▼

Media DSCP 46 \* [0..63]

RTCP Mode RTCP ▼

Dead Call Detection Disabled ▼

Silence Suppression Enabled ▼

Associated SIP SG Listen Ports should be TLS only. +

+

**Gain Control**

Receive Gain  [-14..+6] dB

Transmit Gain  [-14..+6] dB

**Digit Relay**

Digit (DTMF) Relay Type RFC 2833 ▼

Digit Relay Payload Type  [96..127]

**Passthrough/Tone Detection**

Modem Passthrough Enabled ▼

Fax Passthrough Enabled ▼

CNG Tone Detection Disabled ▼

Fax Tone Detection Enabled ▼

DTMF Signal to Noise  [-3..+6] dB

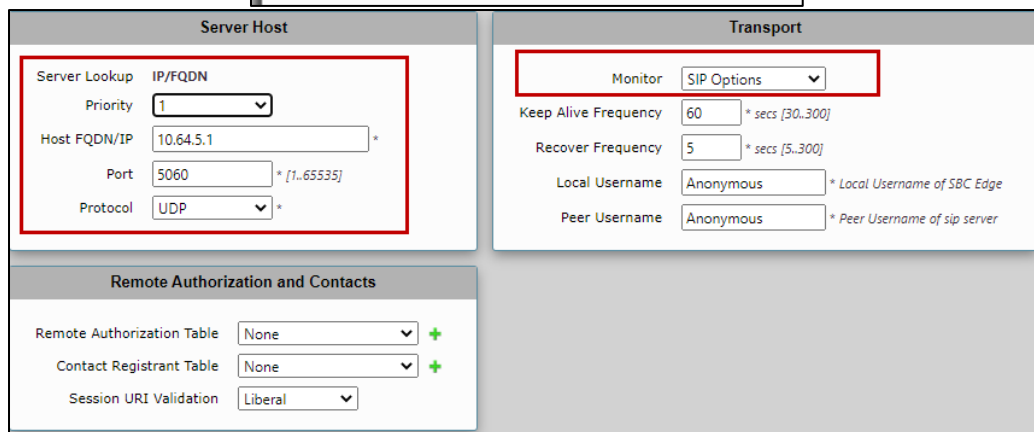
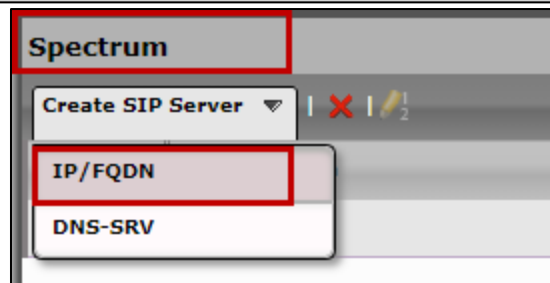
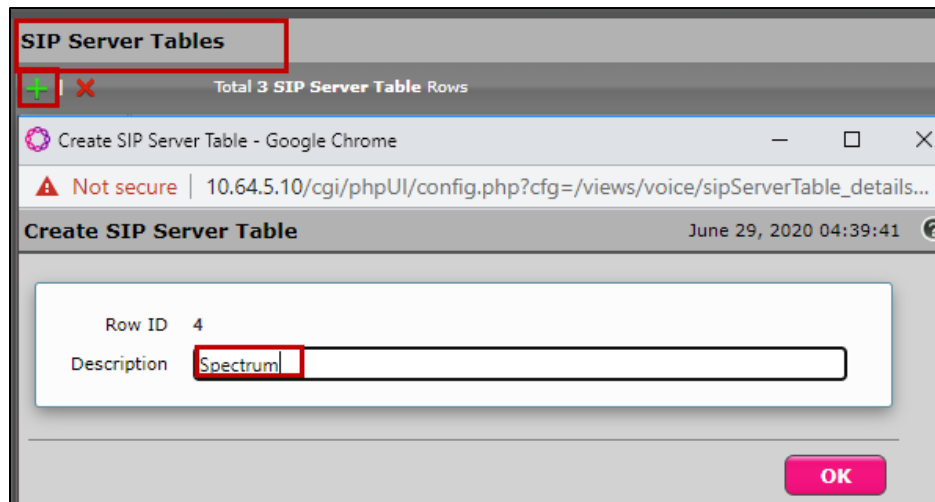
DTMF Minimum Level  [-48..-14] dBm0

**Figure 38: Ribbon SBC – Media Profile for Teams**



### 5.3.11 Create SIP Server Tables

- To configure SIP Server tables, navigate to **Settings > SIP > SIP Server Tables**. Click the + icon to create a new entry for Spectrum and Teams
- Select **Spectrum** from the left pane and select **IP/QDN** from the **Create SIP Server** as shown below
- Repeat the same procedure to create SIP Server for Teams



**Figure 39: Ribbon SBC – Spectrum SIP Server Configuration**

### Server Host

Server Lookup

Priority

Host FQDN/IP  \*

Host IP Version

Port  \* [1..65535]

Protocol  \*

TLS Profile  +

### Transport

Monitor

Keep Alive Frequency  \* secs [30..300]

Recover Frequency  \* secs [5..300]

Local Username  \* Local Username of SBC Edge

Peer Username  \* Peer Username of sip server

### Remote Authorization and Contacts

Remote Authorization Table  +

Contact Registrant Table  +

Session URI Validation

### Connection Reuse

Reuse

Sockets

Reuse Timeout

### Teams

June 26, 2020 09:14:32

Create SIP Server | X | ?

Total 3 SIP Server Rows

	Host / Domain	Server Lookup	Port	Protocol	Display Counters	Primary Key
<input type="checkbox"/>	sip.pstnhub.microsoft.com	IP/FQDN	5061	TLS	<a href="#">Counters</a>	1
<input type="checkbox"/>	sip2.pstnhub.microsoft.com	IP/FQDN	5061	TLS	<a href="#">Counters</a>	2
<input type="checkbox"/>	sip3.pstnhub.microsoft.com	IP/FQDN	5061	TLS	<a href="#">Counters</a>	3

**Figure 40: Ribbon SBC – Teams SIP Server Configuration**

### 5.3.12 Create Signaling Groups

- Navigate to **Settings > signaling Groups**. Select **Create Signaling Group > SIP Signaling Group** and create Signaling group for Spectrum and Teams as shown below

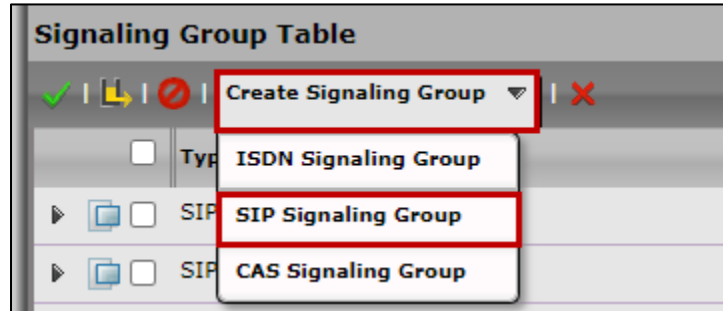


Figure 41: Ribbon SBC – Create SIP Signaling Group

SIP **Spectrum** Up [Counters](#) | [Channels](#) | [Sessions](#)

Admin State: Enabled  
Service Status: Up

### SIP Channels and Routing

Action Set Table: None  
**Call Routing Table: ToTeams**  
 No. of Channels: 60 \* [1..960]  
**SIP Profile: Spectrum\_Profile**  
 SIP Mode: Basic Call  
 Agent Type: Back-to-Back User Agent  
 Interop Mode: Standard  
**SIP Server Table: Spectrum**

### Media Information

Supported Audio/Fax Modes: DSP, Proxy, Direct  
 Supported Video/Application Modes: Disabled  
**Media List ID: Spectrum\_ML**  
**Play Ringback: Auto on 180/183**  
 Tone Table: Default Tone Table

Load Balancing: Round Robin  
 Channel Hunting: Most Idle  
 Notify Lync CAC Profile: Disable  
 Challenge Request: Disable  
 Outbound Proxy IP/FQDN:  
 Outbound Proxy Port: 5060 [1..65535]  
 No Channel Available Override: 34: No Circuit/Channel Available  
 Call Setup Response Timer: 255 [180..750] secs  
 Call Proceeding Timer: 180 [24..750] secs  
 QoE Reporting: Disabled  
 Use Register as Keep Alive: Enable  
 Forked Call Answered Too Soon: Disable

Play Congestion Tone: Disable  
**Early 183: Enable**  
 Allow Refresh SDP: Enable  
 Music on Hold: Disabled  
 RTCP Multiplexing: Disable

### Mapping Tables

SIP To Q.850 Override Table: Default (RFC4497)  
 Q.850 To SIP Override Table: Default (RFC4497)  
 Pass-thru Peer SIP Response Code: Enable

### SIP IP Details

**Signaling/Media Source IP: Ethernet 1 IP (10.64.5.10)**  
 Signaling DSCP: 40 \* [0..63]  
 NAT Traversal  
 ICE Support: Disabled  
 Static NAT - Outbound  
 Outbound NAT Traversal: None  
 Static NAT - Inbound  
 Detection: Disabled

### Listen Ports

Total 2 SIP Listen Port Rows

Port	Protocol	TLS Profile ID
5060	UDP	N/A
5060	TCP	N/A

Message Manipulation: Enabled

### Federated IP/FQDN

Total 1 SIP Federated IP Row

IP/FQDN	Netmask/Prefix
10.64.5.1	255.255.0.0

### Inbound Message Manipulation

Message Table List

Modify_Diversion Referred-by	Up	Down	Add/Edit	Remove
------------------------------	----	------	----------	--------

### Outbound Message Manipulation

Message Table List

Modify_Diversion Referred-by	Up	Down	Add/Edit	Remove
------------------------------	----	------	----------	--------

**Figure 42: Ribbon SBC – Spectrum SIP Signaling Group**

- Navigate to **Settings > signaling Groups**. Select **Create Signaling Group > CAS Signaling Group** and create Signaling group for Fax as shown below

The screenshot displays the configuration page for a CAS Signaling Group for Fax. The top section shows the group's basic information: Description (FAX), Line Type (Analog), and Admin State (Enabled). Below this are two main configuration panels: Channels and Routing, and CAS Protocol. The Channels and Routing panel includes settings for Direction (Bidirectional), Channel Hunting (Most Idle), Tone Table (Default Tone Table), Action Set Table (None), Call Routing Table (From Microsoft Teams to Spectru), and No Channel Available Override (34: No Circuit/Channel Available). The CAS Protocol panel includes settings for CAS Signaling Profile ((FXS) FXS profile), Supplementary Services Profile (None), Caller ID Type (Disabled), Play Ringback (Auto), and Call Forwarding Feature (Disable). At the bottom, the Assigned Channels table shows one channel with Port Name 1:1 and Channel Phone Number 46957.

Port Name	Channel Phone Number	Hotline Enabled	Hotline Number	Call Forwarding Activated	Call Forwarding Number
1:1	46957	No		No	

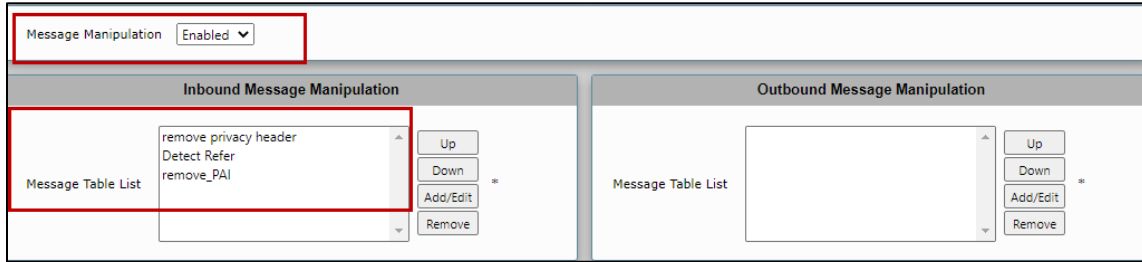
**Figure 43: Ribbon SBC – CAS Signaling Group for Fax**

- Note: RTCP Multiplexing and ICE Support is Enabled only when Media Bypass is Enabled

The screenshot displays the configuration for the 'Teams' SIP Signaling Group. Key settings include:

- SIP Channels and Routing:** Call Routing Table is set to 'ToSpectrum', SIP Profile is 'Teams\_Profile', and SIP Server Table is 'Teams'.
- Media Information:** Media List ID is 'Teams' and Play Ringback is 'Auto on 180/183'. RTCP Multiplexing is enabled.
- Call Handling:** Early 183 is enabled.
- SIP IP Details:** Signaling/Media Source IP is 'Ethernet 3 IP (192.65)', and ICE Support is 'Enabled' with 'Lite' mode.
- Listen Ports:** A listen port is configured for 5061 using TLS with the Teams\_Profile.
- Federated IP/FQDN:** A federated IP/FQDN is configured for sip-all.pstnhub.microsoft.com with netmask 255.255.255.255.

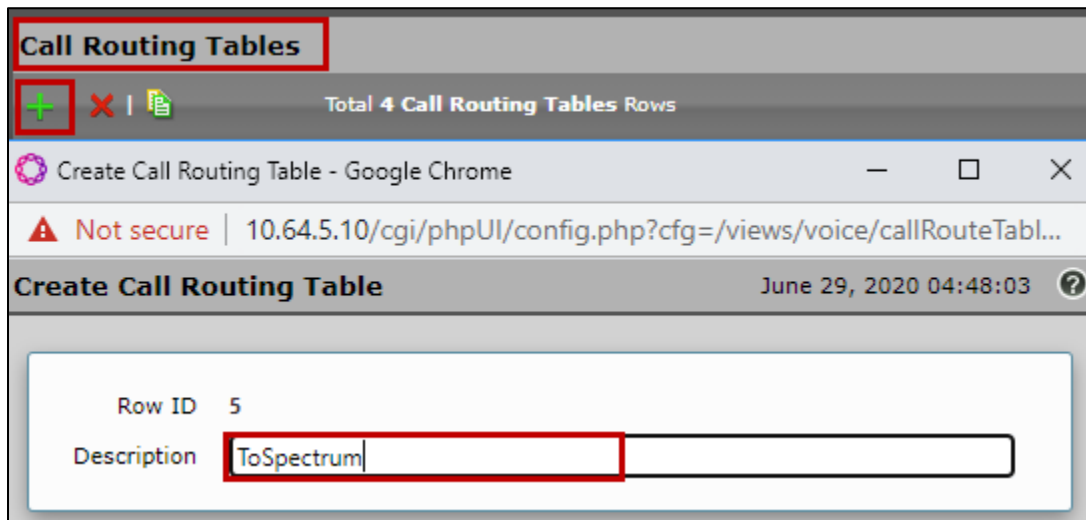
**Figure 44: Ribbon SBC – Teams SIP Signaling Group**



**Figure 45: Ribbon SBC – Teams SIP Signaling Group (cont.)**

### 5.3.13 Create Call Routing Table

- Navigate to **Settings > Call Routing > Call Routing Table**. Click on the + icon to create a new entry
- Create **Call routing table** for **Spectrum, Fax and Teams** as shown below



**Figure 46: Ribbon SBC – Create Call Routing Table**

1 **ToSpectrum** Normal (SIP) Spectrum

---

**Route Details**

Description: ToSpectrum

Admin State: Enabled

Route Priority: 1

Call Priority: Normal

Number/Name Transformation Table: ToSpectrum

Time of Day Restriction: None

---

**Destination Information**

Destination Type: Normal

Message Translation Table: None

Cause Code Reroutes: None

Cancel Others upon Forwarding: Disabled

Fork Call: No

Destination Signaling Groups: (SIP) Spectrum

Up, Down, Add/Edit, Remove

---

Enable Maximum Call Duration: Disabled

---

Media	Quality of Service
Audio/Fax Stream Mode: DSP	Quality Metrics Number of Calls: 10 [1..100]
Video/Application Stream Mode: Disabled	Quality Metrics Time Before Retry: 10 [1-60] min.
Media Transcoding: Enabled	Min. ASR Threshold: 0 % [0..100]
Media List: None	Enable Min MOS Threshold: Disabled
	Enable Max. R/T Delay: Enabled
	Max. R/T Delay: 65535 ms [1..65535]
	Enable Max. Jitter: Enabled
	Max. Jitter: 3000 ms [1..3000]

**Figure 47: Ribbon SBC – Create Call Routing Table to Spectrum**



Description	<input type="text" value="SpectrumtoFax"/>
Admin State	<input type="button" value="Enabled"/>
Route Priority	<input type="button" value="1"/>
Call Priority	<input type="button" value="Normal"/>
Number/Name Transformation Table	<input type="button" value="SpectrumToFax"/> +
Time of Day Restriction	<input type="button" value="None"/> +

---

**Destination Information**

Destination Type	<input type="button" value="Normal"/>
Message Translation Table	<input type="button" value="None"/> +
Cause Code Reroutes	<input type="button" value="None"/> +
Cancel Others upon Forwarding	<input type="button" value="Disabled"/>
Fork Call	<input type="button" value="No"/>
Destination Signaling Groups	<input type="text" value="(CAS) FAX"/> <input type="button" value="Up"/> <input type="button" value="Down"/> <input type="button" value="Add/Edit"/> <input type="button" value="Remove"/>
Enable Maximum Call Duration	<input type="button" value="Disabled"/>

---

Media	Quality of Service
Audio/Fax Stream Mode	Quality Metrics Number of Calls
<input type="button" value="DSP"/>	<input type="text" value="10"/> [1..100]
Video/Application Stream Mode	Quality Metrics Time Before Retry
<input type="button" value="Disabled"/>	<input type="text" value="10"/> [1-60] min.
Media Transcoding	Min. ASR Threshold
<input type="button" value="Enabled"/>	<input type="text" value="0"/> % [0..100]
Media List	Enable Min MOS Threshold
<input type="button" value="None"/> +	<input type="button" value="Disabled"/>
	Enable Max. R/T Delay
	<input type="button" value="Enabled"/>
	Max. R/T Delay
	<input type="text" value="65535"/> ms [1..65535]
	Enable Max. Jitter
	<input type="button" value="Enabled"/>
	Max. Jitter
	<input type="text" value="3000"/> ms [1..3000]

**Figure 48: Ribbon SBC – Create Call Routing Table to Fax**

Description	<input type="text" value="To Teams"/>
Admin State	Enabled ▾
Route Priority	2 ▾
Call Priority	Normal ▾
Number/Name Transformation Table	To Teams ▾ +
Time of Day Restriction	None ▾ +

---

Destination Information	
Destination Type	Normal ▾
Message Translation Table	None ▾ +
Cause Code Reroutes	None ▾ +
Cancel Others upon Forwarding	Disabled ▾
Fork Call	No ▾
Destination Signaling Groups	<input type="text" value="(SIP) Teams"/> <input type="button" value="Up"/> <input type="button" value="Down"/> <input type="button" value="Add/Edit"/> <input type="button" value="Remove"/>
Enable Maximum Call Duration	Disabled ▾

---

Media	Quality of Service
Audio/Fax Stream Mode	Quality Metrics Number of Calls
Video/Application Stream Mode	Quality Metrics Time Before Retry
Media Transcoding	Min. ASR Threshold
Media List	Enable Min MOS Threshold
	Enable Max. R/T Delay
	Max. R/T Delay
	Enable Max. Jitter
	Max. Jitter

**Figure 49: Ribbon SBC – Create Call Routing Table to Teams**

### 5.3.14 Create Transformation Table

- Navigate to **Settings > Call Routing > Transformation**. Click on the + icon to create a new entry for Spectrum, Fax and Teams as shown below

**Transformation**

Total 3 Transformation Tables Rows

Create Transformation Table - Google Chrome

Not secure | 10.64.5.10/cgi/phpUI/config.php?cfg=/views/voice/transformatio...

**Create Transformation Table** June 29, 2020 04:51:10

Row ID 4

Description

Description

Admin State

Match Type

**Input Field**

Type

Value

**Output Field**

Type

Value

**ToSpectrum**

Total 4 Transformation Entry Rows

Admin State	Input Field Type	Input Field Value	Output Field Type	Output Field Value	Match Type
<input type="checkbox"/>	Called Address/Number	011(.*)	Called Address/Number	011\1	Optional (Match One)
<input type="checkbox"/>	Called Address/Number	\+1(.*)	Called Address/Number	\1	Optional (Match One)
<input type="checkbox"/>	Calling Address/Number	\+1(.*)	Calling Address/Number	\1	Optional (Match One)
<input type="checkbox"/>	Called Address/Number	1800(.*)	Called Address/Number	1800\1	Optional (Match One)
<input type="checkbox"/>	Calling Address/Number	(.*)	Calling Address/Number	\1	Optional (Match One)
<input type="checkbox"/>	Called Address/Number	(.*)	Called Address/Number	\1	Optional (Match One)

Figure 50: Ribbon SBC – Create Transformation Table to Spectrum

**SpectrumToFax**

Total 1 Transformation Entry Row

Admin State	Input Field Type	Input Field Value	Output Field Type	Output Field Value
<input type="checkbox"/>	Called Address/Number	4695738(.*)	Called Address/Number	4695738\1

Description:

Admin State:

Match Type:

Input Field	Output Field
Type: <input type="text" value="Called Address/Number"/>	Type: <input type="text" value="Called Address/Number"/>
Value: <input type="text" value="4695738(*)"/>	Value: <input type="text" value="4695738\1"/>

Figure 51: Ribbon SBC – Create Transformation Table to Fax

**ToTeams**

June 26, 2020 10:33:...

Total 2 Transformation Entry Rows

Admin State	Input Field Type	Input Field Value	Output Field Type	Output Field Value	Match Type	Description
<input type="checkbox"/>	Called Address/Number	(.*)	Called Address/Number	+1\1	Optional (Match One)	ToTeams
<input type="checkbox"/>	Calling Address/Number	(.*)	Calling Address/Number	+1	Optional (Match One)	FROMAndContactandPAI...

Figure 52: Ribbon SBC – Create Transformation Table to Teams

### 5.3.15 Message Manipulations

- Message Manipulation rule for **Detect Refer** is created for Ribbon SBC to handle REFER message sent from Teams
- Navigate to **Settings > SIP > Message Manipulation > Message Rule Table**. Create a new entry for “**Detect Refer**” using the + icon

**Detect Refer** Optional REFER

Description:

Applicable Messages:

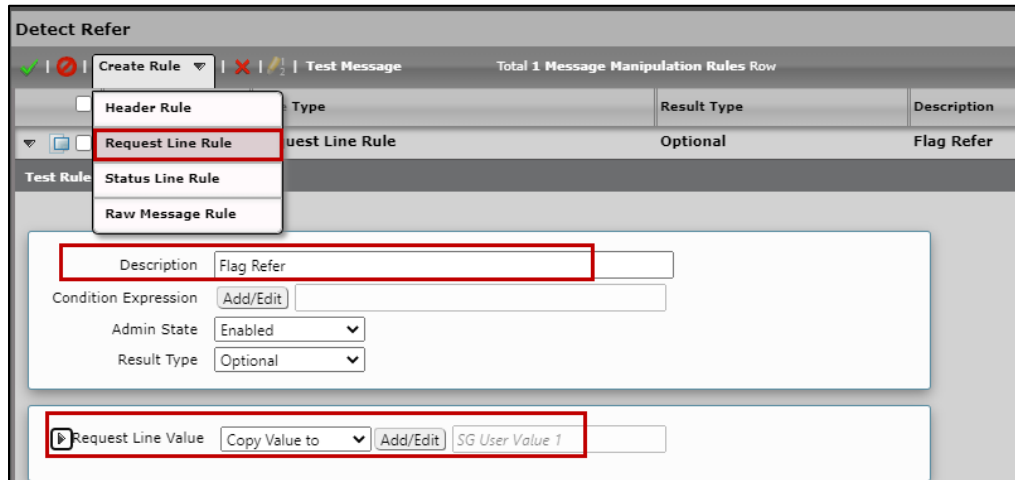
Message Selection:

Table Result Type:

Add/Edit Remove

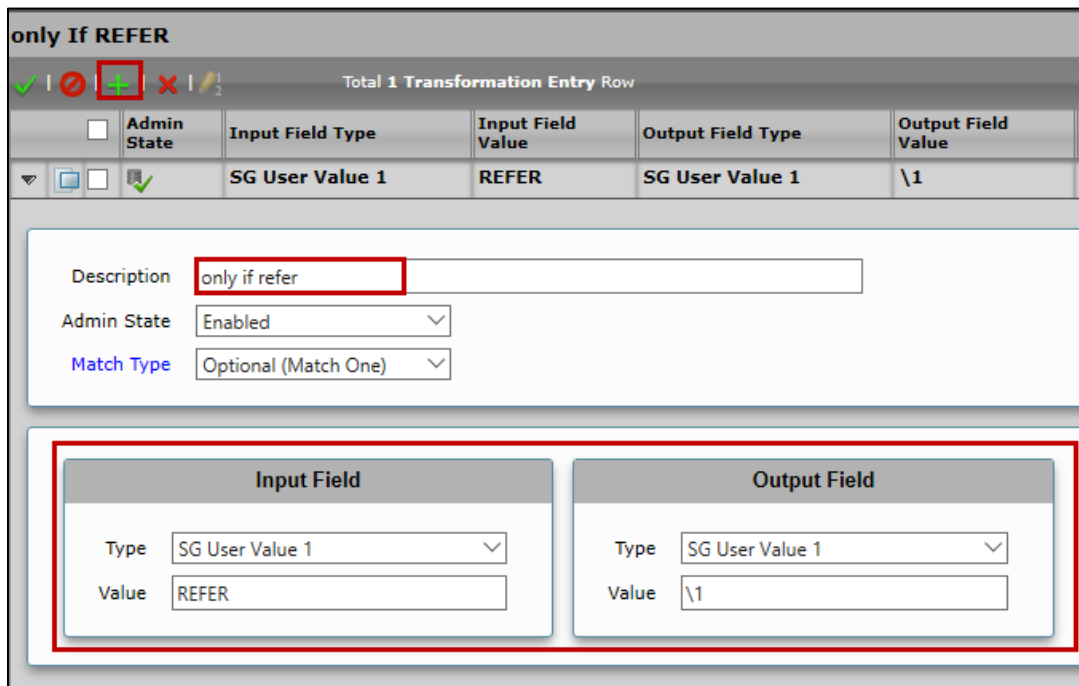
**Figure 53: Ribbon SBC – Message Manipulation towards Teams**

- Navigate to **Settings > SIP > Message Manipulation > Message Rule Tables > Detect Refer > Create Rule > Request Line Rule**



**Figure 54: Ribbon SBC – Message Manipulation towards Teams (cont.)**

- Navigate to **Settings > SIP > Call Routing > Transformation**. Click on the + icon to create a new Transformation Table entry for “only If REFER”. Select “only If REFER” from the left pane to configure REFER handling as shown below



**Figure 55: Ribbon SBC – Message Manipulation towards Teams (cont.)**

- Navigate to **Settings > Call Routing > Call Routing Table**. Click on the + icon to create a new Routing Table entry for “Refer to teams”. Select “Refer to Teams” from the left pane and Click on the + icon. Configure the Routing table for REFER towards Teams as shown below

**Refer to Teams**

Display Counters Total 1 Call Route Entry Row

Admin State	Priority	Transformation Table	Destination Type	First Signaling Group
<input type="checkbox"/>	1	only If REFER	Normal	(SIP) Teams

**Route Details**

Description:

Admin State:

Route Priority:

Call Priority:

Number/Name Transformation Table:

Time of Day Restriction:

**Destination Information**

Destination Type:

Message Translation Table:

Cause Code Reroutes:

Cancel Others upon Forwarding:

Fork Call:

Destination Signaling Groups:

Enable Maximum Call Duration:

**Media**

Audio/Fax Stream Mode:

Video/Application Stream Mode:

Media Transcoding:

Media List:

**Quality of Service**

Quality Metrics Number of Calls:  [1..100]

Quality Metrics Time Before Retry:  [1-60] min.

Min. ASR Threshold:  % [0..100]

Enable Min MOS Threshold:

Enable Max. R/T Delay:

Max. R/T Delay:  ms [1..65535]

Enable Max. Jitter:

Max. Jitter:  ms [1..3000]

**Figure 56: Ribbon SBC – Message Manipulation towards Teams (cont.)**

- Similarly Message Manipulation Rule is created to handle Privacy header from Teams. Navigate to **Settings > SIP > Message Manipulation > Condition Rule Table**. Create a rule for “**Match host in From header**” as shown below

**Condition Rule Table**  
Total 4 Condition Rule Table Rows

Match Type	Operation	Match Value Type	Match Value
from.uri.host	Regex	N/A	\.com

Description: Match host in FROM header

**Match Type**

Match Type: from.uri.host  
 Operation: Regex  
 Match Regex: \.com

**Figure 57: Ribbon SBC – Message Manipulation towards Spectrum (cont.)**

- Navigate to **Settings > SIP > Message Manipulation > Message Rule Tables** and create Header Rule for “**remove privacy header**” as shown below

**remove privacy header**  
Total 1 Message Manipulation

Admin State	Rule Type	Result Type
Enabled	Header Rule	Optional

Test Rule

Description: Remove Privacy header

Condition Expression: Add/Edit | '\$(4)'

Admin State: Enabled  
 Result Type: Optional  
 Header Action: Remove  
 Header Name: Privacy

**Message Rule Condition**

Match All Conditions

Match host in FROM he:

Apply Cancel

**Figure 58: Ribbon SBC – Message Manipulation towards Spectrum (cont.)**

- Navigate to **Settings > SIP > Message Manipulation > Message Rule Tables** and create Header Rule for “**Modify\_Diversion**” to remove +1 towards Spectrum as shown below

**Modify\_Diversion**

| Create Rule ▼ |  |  | Test Message Total 1 Message Manipulation Rule

Admin State	Rule Type	Result Type
<input type="checkbox"/>	Header Rule	Optional

**Test Rule**

Description:

Condition Expression:

Admin State:

Result Type:

Header Action:

Header Name:  \*

Header Ordinal Number:

---

**Header Value**

Display Name:

URI

URI Scheme	URI User Info	URI Host	URI Port
<input type="text" value="Ignore"/>	<input type="text" value="Modify"/>   <input type="text" value="Add/Edit"/>   Match: <input type="text" value="\\+1(\\d{10})"/>   Replace: <input type="text" value="\\1"/>	<input type="text" value="Modify"/>   <input type="text" value="Add/Edit"/>   <input type="text" value="'10.64.5.10'"/>	<input type="text" value="Modify"/>   <input type="text" value="Add/Edit"/>   <input type="text" value="'5060'"/>

**Figure 59: Ribbon SBC – Message Manipulation towards Spectrum (cont.)**



- Navigate to **Settings > SIP > Message Manipulation > Message Rule Tables** and create Header Rule for “Referred-by” to remove +1 towards Spectrum as shown below

**Referred-by**

Admin State:  Admin State | Rule Type: Header Rule | Result Type: Optional

Test Rule

Description: Referred-by

Condition Expression: Add/Edit

Admin State: Enabled

Result Type: Optional

Header Action: Modify

Header Name: Referred-By \*

Header Value

Display Name: Ignore

URI

URI Scheme: Ignore

URI User Info: Modify Add/Edit Match: +1(\d{10}) Replace: \1

URI Host: Modify Add/Edit 10.64.5.10

URI Port: Modify Add/Edit 5060

**Figure 60: Ribbon SBC – Message Manipulation towards Spectrum (cont.)**

- Navigate to **Settings > SIP > Message Manipulation > Message Rule Tables** and create Header Rule for “remove\_pai” to remove P-Asserted-Identity header sent from Teams as shown below

**remove\_pai**

Admin State:  Admin State | Rule Type: Header Rule | Result Type: Optional

Test Rule

Description: remove\_pai

Condition Expression: Add/Edit

Admin State: Enabled

Result Type: Optional

Header Action: Remove

Header Name: P-Asserted-Identity \*

Header Ordinal Number: All

**Figure 61: Ribbon SBC – Message Manipulation towards Spectrum (cont.)**

## 5.4 Spectrum ESBC Configuration

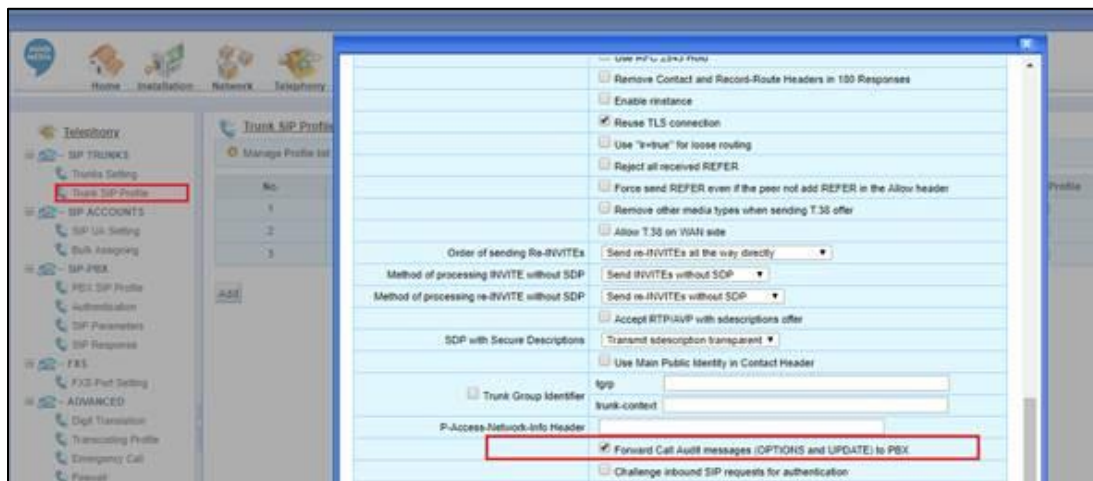
For enabling Session Audit in the ESBC, below are the configuration changes made.

1. ESBC SIP PBX profile needs to have the option selected to pass UPDATE messages from the SIP provider network as seen in the screenshot below;



**Figure 62: SIP PBX Profile**

2. The “Trunk SIP Profile” that is in use on the ESBC (default is the TWC SIP trunk profile) also needs to have the Forward Call Audit messages option selected.



**Figure 63: Trunk SIP Profile**

If both of these options are not enabled, the SIP audit messages will not be passed from the provider SIP trunk to the PBX.

## 5.5 Test Results

Test Case #	Test Case Description	Results	Notes
	<b>Inbound Calling Test Cases (Media Bypass Enabled)</b>		
1.1	Calling Party Disconnects Before Answer	Pass	
1.2	Calling Party Disconnects After Answer	Pass	
1.3	Called Party Disconnects After Answer	Pass	
1.4	Calling Party Times Out	Pass	Teams sends 408 Request Timeout
1.5	Calling Party Places Call on Hold	Pass	
1.6	Called Party Places Call on Hold	Pass	
1.7	Calling Party Disconnects during Hold	Pass	
1.8	Calling Party Presentation Restricted	Pass	
	<b>Outbound Calling Test Cases (Media Bypass Enabled)</b>		
1.9	Calling Party Disconnects Before Answer	Pass	
1.10	Calling Party Disconnects After Answer	Pass	
1.11	Called Party Disconnects After Answer	Pass	
1.12	Calling Party Times Out	Pass	
1.13	Calling Party Receives Busy	Pass	
1.14	Outbound call to Unprovisioned Subscriber	Pass	
1.15	Calling Number Presentation	Pass	
1.16	Conference	Pass	
1.17	Outbound Call Hold	Pass	
1.18	Outbound Call Hold	Pass	
	<b>Dialing Plan Test Cases (Media Bypass Enabled)</b>		
1.19	International Outbound Dialing	Pass	
1.20	800/866/877/888 Outbound Dialing	Pass	
	<b>Microsoft Teams Feature Test Cases (Media Bypass Enabled)</b>		
1.21	Outbound Call Forward Always	Pass	
1.22	Outbound Call Forward Always to an Out of Service Subscriber	Pass	
1.23	Outbound Call Forward Not Available (Ring No Answer)	Pass	
1.24	Inbound Call Blind Transfer to PSTN	Pass	
1.25	Inbound Call Consultative Transfer to PSTN	Pass	
1.26	Outbound Call Blind Transfer to another PSTN	Pass	
1.27	Outbound Call Consultative Transfer to another PSTN	Pass	
1.28	Outbound Call Consultative Call Transfer to another Teams user	Pass	

1.29	Call Waiting	Pass	
	<b>Early Media Test Cases (Media Bypass Enabled)</b>		
1.30	Terminate Early Media Outbound Call Before Answer	Pass	Spectrum sends Session Refresh every 15 minutes
1.31	Early Media Forward Call	Pass	
1.32	Simultaneous Call/Ring to teams delegates	Pass	
	<b>Session Audit Test Cases (Media Bypass Enabled)</b>		
1.33	Outbound, Wait for Session Audit	Pass	
1.34	Inbound Call, Wait for Session Audit during Hold	Pass	
	<b>DTMF Test Cases (Media Bypass Enabled)</b>		
1.35	Outbound DTMF (RFC2833)	Pass	
1.36	Inbound DTMF (RFC2833)	Pass	
	<b>Codec Test Cases (Media Bypass Enabled)</b>		
1.37	Codec Support – ITSP support G711 codec	Pass	
1.38	Codec Support – ITSP support G729 codec	Not Applicable	Spectrum offer only G711U codec
	<b>SRTP (Media Bypass Enabled)</b>		
1.39	Verify SRTP negotiated in outbound call	Pass	
1.40	Verify SRTP negotiated in inbound call	Pass	
	<b>SRTCP (Media Bypass Enabled)</b>		
1.41	Verify SRTCP packets	Pass	
1.42	Verify SRTCP packets	Pass	
	<b>Comfort Noise (Media Bypass Enabled)</b>		
1.43	Verify Comfort Noise Packets in outbound call	Pass	
1.44	Verify Comfort Noise Packets in inbound call	Pass	
	<b>Support For FailOver (Media Bypass Enabled)</b>		
1.45	Fail over	Pass	
	<b>SIP OPTIONS</b>		
1.46	SIP OPTIONS – SBC to Teams	Pass	
1.47	SIP OPTIONS – Teams to SBC	Pass	
	<b>Inbound Calling Test Cases (Media Bypass disabled)</b>		
2.1	Calling Party Disconnects Before Answer	Pass	
2.2	Calling Party Disconnects After Answer	Pass	
2.3	Called Party Disconnects After Answer	Pass	

2.4	Calling Party Times Out	Pass	Teams sends 408 Request Timeout
2.5	Calling Party Places Call on Hold	Pass	
2.6	Called Party Places Call on Hold	Pass	
2.7	Calling Party Disconnects during Hold	Pass	
2.8	Calling Party Presentation Restricted	Pass	
	<b>Outbound Calling Test Cases (Media Bypass disabled)</b>		
2.9	Calling Party Disconnects Before Answer	Pass	
2.10	Calling Party Disconnects After Answer	Pass	
2.11	Called Party Disconnects After Answer	Pass	
2.12	Calling Party Times Out	Pass	
2.13	Calling Party Receives Busy	Pass	
2.14	Outbound call to Unprovisioned Subscriber	Pass	
2.15	Calling Number Presentation	Pass	
2.16	Conference	Pass	
2.17	Outbound Call Hold	Pass	
2.18	Outbound Call Hold	Pass	
	<b>Dialing Plan Test Cases (Media Bypass disabled)</b>		
2.19	International Outbound Dialing	Pass	
2.20	800/866/877/888 Outbound Dialing	Pass	
	<b>Microsoft Teams Feature Test Cases (Media Bypass disabled)</b>		
2.21	Outbound Call Forward Always	Pass	
2.22	Outbound Call Forward Always to an Out of Service Subscriber	Pass	
2.23	Outbound Call Forward Not Available (Ring No Answer)	Pass	
2.24	Inbound Call Blind Transfer to PSTN	Pass	
2.25	Inbound Call Consultative Transfer to PSTN	Pass	
2.26	Outbound Call Blind Transfer to another PSTN	Pass	
2.27	Outbound Call Consultative Transfer to another PSTN	Pass	
2.28	Outbound Call Consultative Call Transfer to another Teams user	Pass	
2.29	Call Waiting	Pass	
	<b>Early Media Test Cases (Media Bypass disabled)</b>		
2.30	Terminate Early Media Outbound Call Before Answer	Pass	
2.31	Early Media Forward Call	Pass	
2.32	Simultaneous Call/Ring to teams delegates	Pass	
	<b>Session Audit Test Cases (Media Bypass disabled)</b>		
2.33	Outbound, Wait for Session Audit	Pass	Spectrum sends Session Refresh every 15 minutes

2.34	Inbound Call, Wait for Session Audit during Hold	Pass	
	<b>DTMF Test Cases (Media Bypass disabled)</b>		
2.35	Outbound DTMF (RFC2833)	Pass	
2.36	Inbound DTMF (RFC2833)	Pass	
	<b>Codec Test Cases (Media Bypass disabled)</b>		
2.37	Codec Support – ITSP support G711 codec	Pass	
2.38	Codec Support – ITSP support G729 codec	Not Applicable	Spectrum offers only G711U codec
	<b>SRTP (Media Bypass disabled)</b>		
2.39	Verify SRTP negotiated in outbound call	Pass	
2.40	Verify SRTP negotiated in inbound call	Pass	
	<b>SRTCP (Media Bypass disabled)</b>		
2.41	Verify SRTCP packets	Pass	
2.42	Verify SRTCP packets	Pass	
	<b>Comfort Noise (Media Bypass disabled)</b>		
2.43	Verify Comfort Noise Packets in outbound call	Pass	
2.44	Verify Comfort Noise Packets in inbound call	Pass	
	<b>Support For FailOver (Media Bypass disabled)</b>		
2.45	Fail over	Pass	
	<b>Fax</b>		
3.1	T.38 Fax- G3 CPE to PSTN fax - G3-G3	Pass	Voice call is sent through G711. Spectrum offers only G711 codec
3.2	T.38 Fax- G3 CPE to PSTN fax - G3-SG3	Pass	
3.3	T.38 Fax- G3 CPE from PSTN fax - G3-G3	Pass	Voice call is sent through G711. Spectrum offers only G711 codec
3.4	T.38 Fax- G3 CPE from PSTN fax - SG3-G3	Pass	
3.5	T.38 Fax- SG3 CPE to PSTN fax - SG3-G3	Pass	
3.6	T.38 Fax- SG3 CPE to PSTN fax - SG3-SG3	Pass	Ribbon 1K supports only G3 with maximum speed of 14,400 b/s
3.7	T.38 Fax- SG3 CPE from PSTN fax - G3-SG3	Pass	
3.8	T.38 Fax- SG3 CPE from PSTN fax - SG3-SG3	Pass	Ribbon 1K supports only G3 with maximum speed of 14,400 b/s
3.9	G711 Fax Pass-Through- G3 CPE to PSTN fax - G3-G3	Pass	

3.10	G711 Fax Pass-Through- G3 CPE to PSTN fax - G3-SG3	Pass	
3.11	G711 Fax Pass-Through- G3 CPE from PSTN fax - G3-G3	Pass	
3.12	G711 Fax Pass-Through- G3 CPE from PSTN fax - SG3-G3	Pass	
3.13	G711 Fax Pass-Through- SG3 CPE to PSTN fax - SG3-G3	Pass	
3.14	G711 Fax Pass-Through- SG3 CPE to PSTN fax - SG3-SG3	Pass	
3.15	G711 Fax Pass-Through- SG3 CPE from PSTN fax - G3-SG3	Pass	
3.16	G711 Fax Pass-Through- SG3 CPE from PSTN fax -SG3-SG3	Pass	Ribbon 1K supports only G3 with maximum speed of 14,400 b/s
3.17	Fall back to G711 from T.38- Outbound Fax	Pass	Spectrum Innomedia SBC accepts both T38 and G711 Fax re-INVITE. Fax is sent with T38
3.18	Fall back to G711 from T.38- Inbound Fax	Pass	Spectrum Innomedia SBC accepts both T38 and G711 Fax re-INVITE. Fax is sent with T38
3.19	T.38-Fax-Multiple Pages(30) Inbound Fax	Pass	
3.20	T.38 Fax- Multiple Pages(30) Outbound Fax	Pass	
3.21	G.711 Pass-Through-Fax-Multiple Pages(30) Inbound Fax	Pass	
3.22	G.711 Pass-Through- Multiple Pages(30) Outbound Fax	Pass	