Oracle SBC with Microsoft Teams Operator Connect

Technical Application Note

ORACLE
COMMUNICATIONS

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Contents

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1 Revision History

Document Version	Description	Revision Date
1.0	Initial release	21-03-2022
1.1	Updated Certificate-records	28-03-2023
1.2	General Amendments	02-08-2024
1.3	Updated tls-global parameter	20-08-2024

2 Intended Audience

This document describes how to connect the Oracle SBC to Microsoft Teams Operator Connect. This paper is intended for IT or telephony professionals.

Note: To zoom in on screenshots of Web GUI configuration examples, press Ctrl and +.

3 Validated Oracle Software Versions

All testing was successfully conducted with the Oracle Communications SBC versions:

SCZ840 or above.

These software releases with the configuration listed below can run on any of the following products:

- AP 1100
- AP 3900
- AP 3950 (Release SCZ9.0.0 Only)
- AP 4600
- AP 4900 (Release SCZ9.0.0 Only)
- AP 6350
- AP 6300
- VME

Please visit https://docs.microsoft.com/en-us/microsoftteams/direct-routing-border-controllers for further information.

4 Related Documentation

4.1 Oracle SBC

- https://docs.oracle.com/en/industries/communications/session-border-controller/9.0.0/aclireference/acli-reference-guide.pdf

- https://docs.oracle.com/en/industries/communications/session-border-controller/9.0.0/releasenotes/sbc-release-notes.pdf

- https://docs.oracle.com/en/industries/communications/session-border-controller/9.0.0/configuration/sbc-configuration-guide.pdf

4.2 Microsoft Teams

https://docs.microsoft.com/en-us/microsoftteams/operator-connect-plan

5 About Operator Connect

Operator Connect is Microsoft's operator-managed service for bringing PSTN calling to Teams. Operator Connect makes it simple to bring your operator to Teams. With Operator Connect, if your existing carrier is a participant in the Microsoft Operator Connect program, they can manage PSTN calling and Session Border Controllers (SBCs).With Operator Connect, if your existing operator is a participant in the Microsoft Operator Connect Program, they can manage the service for bringing PSTN calling to Teams. The Operator Connect program provides the following benefits:

- **Leverage existing contracts or find a new operator.** You keep your preferred operator and contracts or choose a new one from a selection of participating operators to meet your business needs.
- **Operator-managed infrastructure.** Your operator manages the PSTN calling services and Session Border Controllers (SBCs), allowing you to save on hardware purchase and management.
- **Faster, easier deployment.** You can quickly connect to your operator and assign phone numbers to users -– all from the Teams admin center.
- **Enhanced support and reliability.** Operators provide technical support and shared service level agreements to improve support service, while direct peering powered by Azure creates a one-to-one network connection for enhanced reliability.

For a list of operators participating in the Microsoft Operator Connect Program and the countries or regions where their service is available, see the Microsoft 365 Operator Connect directory.

5.1 Planning Operator Routing

To enable phone number assignments with Operator Connect, make sure your users are:

- Teams Phone licensed.
- In TeamsOnly mode. Note that the user needs to be in TeamsOnly mode, but your entire organization does not.

5.2 Media Bypass vs Non Media Bypass

Note: Microsoft Operator Connect does not work in media bypass mode.

Media bypass enables you to shorten the path of media traffic and reduce the number of hops in transit for better performance. With media bypass, media is kept between the Oracle Session Border Controller (SBC) and the client instead of sending it via the Microsoft Phone System. Media bypass leverages protocols called **Interactive Connectivity Establishment** (ICE) on the Teams client and Advanced Media Termination ICE lite on the Oracle SBC. These protocols enable Operator Connect to use the most direct media path for optimal quality.

6 Oracle SBC Configuration

This chapter provides step-by-step guidance on how to configure Oracle SBC for interworking with Microsoft Operator Connect.

There are two methods for configuing the OCSBC, ACLI, or GUI.

For the purposes of this note, we'll be providing both OCSBC GUI the CLI for all configuration examples.We will also provide complete ACLI running-configuration at the end of the Application Note.

This guide assumes the OCSBC has been installed, management interface has been configured, product selected and entitlements have been assigned. Also, web-server-config has been enabled for GUI access. If you require more information on how to install your SBC platform, please refer to the ACLI configuration guide.

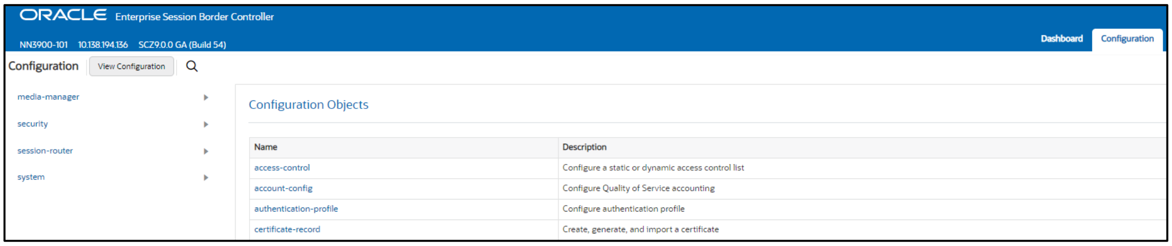
To access the OCSBC GUI, enter the management IP address into a web brower.
When the login screen appears, enter the username and password to access the OCSBC.

Once you have access to the OCSBC GUI, at the top, click the Configuration Tab. This will bring up the OCSBC Configuration Objects List on the left hand side of the screen.

Any configuration parameter not specifically listed below can remain at the OCSBC default value and does not require a change for the connection to MSFT Teams Operator Connect to function properly.

Please Note there is no GUI on Oracle Service provider SBC.

Note: the configuration examples below were captured from a system running the latest GA software, 9.0.0



Name	Description
access-control	Configure a static or dynamic access control list
account-config	Configure Quality of Service accounting
authentication-profile	Configure authentication profile
certificate-record	Create, generate, and import a certificate

6.1 System-Config

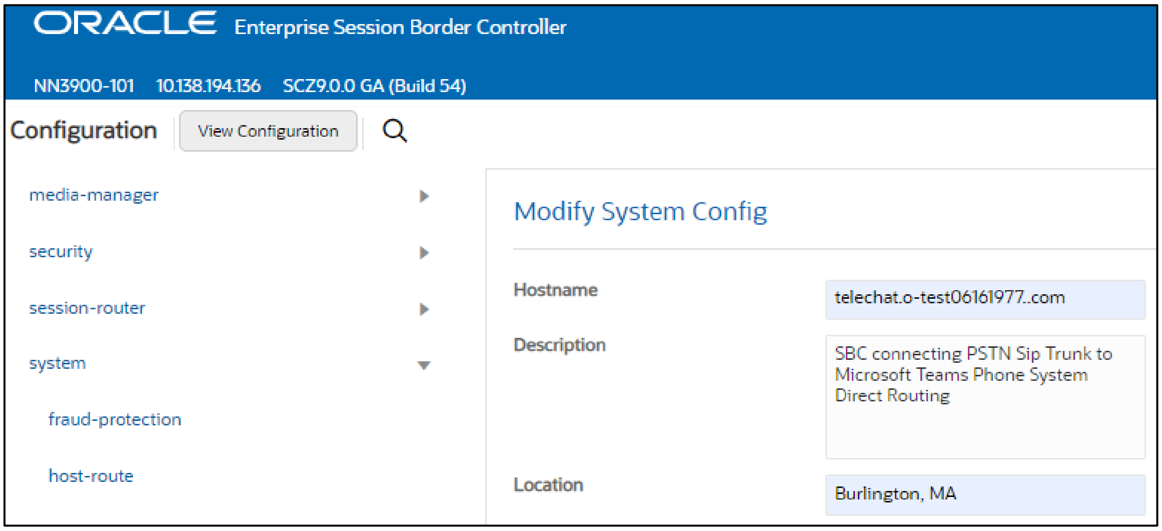
To enable system level functionality for the OCSBC, you must first enable the system-config
.

- GUI Path: system/system-config

Note: The following parameters are optional but recommended for system config

- Hostname
- Description

- Location
- Default Gateway (recommended to be the same as management interface gateway)
- Transcoding Core (This field is only required if you have deployed a VME SBC)



Modify System Config

Hostname: telechat.o-test06161977..com

Description: SBC connecting PSTN Sip Trunk to Microsoft Teams Phone System Direct Routing

Location: Burlington, MA

- Click OK at the bottom.

To configure system-config from ACLI –

ACLI Path: config t→system→system-config

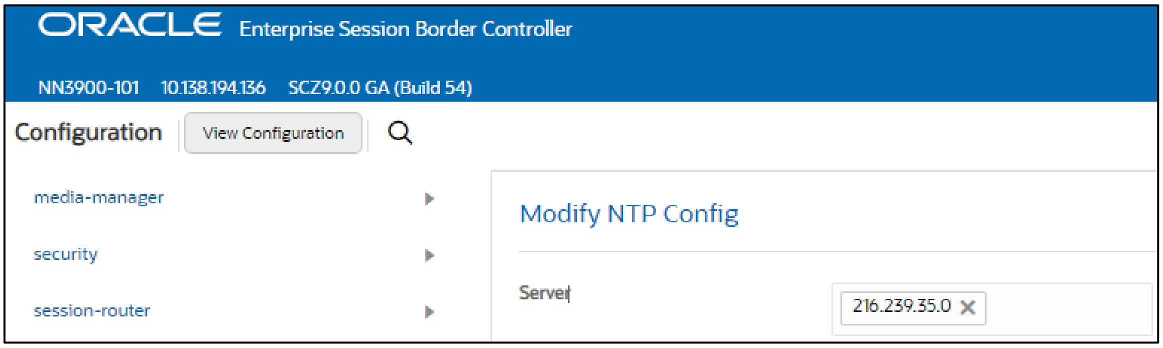
```
system-config
        hostname                                oraclesbc.com
        description                           SBC connecting PSTN Sip Trunk to Microsoft Operator
Connect
        location                            Burlington, MA
        transcoding-cores                           1
```

- Perform a save and activate configuration for changes to take effect.

6.1.1 NTP-Sync

You can use the following example to connect the Oracle SBC to any network time servers you have in your network. This is an optional configuration but recommended.

GUI Path: system/ntp-config



ORACLE Enterprise Session Border Controller
NN3900-101 10.138.194.136 SCZ9.0.0 GA (Build 54)
Configuration
View Configuration
media-manager
security
session-router
Modify NTP Config

Server 216.239.35.0

- Select OK at the bottom

To configure ntp-config from ACLI –

ACLI Path: config t→system→ntp-sync

```
ntp-config
     server                          216.239.35.0
```

- Perform a save and activate configuration for changes to take effect.

Now we’ll move on configuring network connection on the SBC.

6.2 Network Configuration

To connect the SBC to network elements, we must configure both physical and network interfaces. For the purposes of this example, we will configure two physical interfaces, and two network interfaces. One to communicate with MSFT Teams Operator Connect, the other to connect to PSTN Network.
The slots and ports used in this example may be different from your network setup.

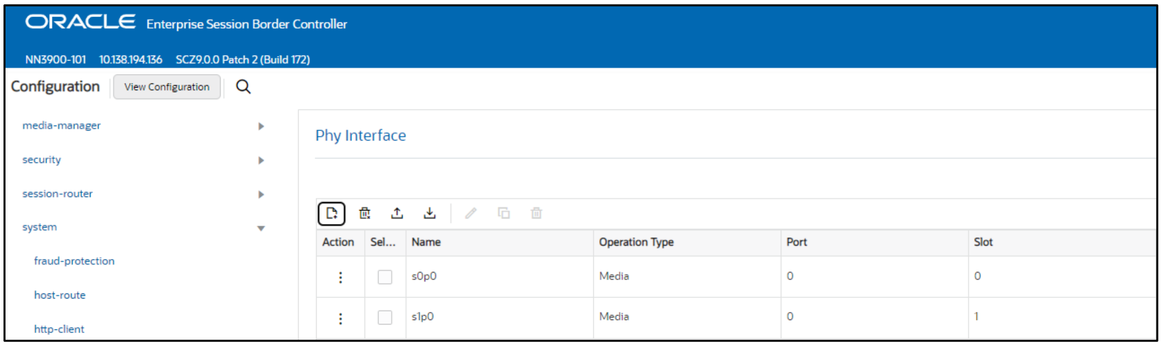
6.2.1 Physical Interfaces

GUI Path: system/phy-interface

- Click Add, use the following table as a configuration example:

Config Parameter	Teams	PSTN
Name	s0p0	S1p0
Operation Type	Media	Media
Slot	0	1
Port	0	0

Note: Physical interface names, slot and port may vary depending on environment



Action	Sel...	Name	Operation Type	Port	Slot
⋮	□	s0p0	Media	0	0
⋮	□	s1p0	Media	0	1

To configure phy-interface from ACLI –

ACLI Path: config t→system→phy-interface

```
phy-interface
        name                            s0p0
        operation-type                      Media
phy-interface
        name                            s1p0
        operation-type                      Media
        slot
```

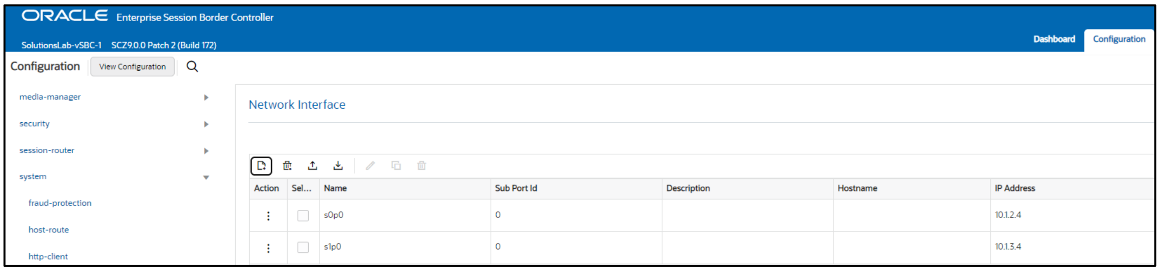
- Perform a save and activate configuration for changes to take effect.

6.2.2 Network Interfaces

GUI Path: system/network-interface

- Click Add, use the following table as a configuration example:

Configuration Parameter	Teams	PSTN
Name	s1p0	s0p0
IP Address	10.1.3.4	10.1.2.4
Netmask	255.255.255.0	255.255.255.0
Gateway	10.1.3.1	10.1.2.1
DNS Primary IP	8.8.8.8	
DNS Domain	Telechat.o-test06161977.com	



Action	Sel...	Name	Sub Port Id	Description	Hostname	IP Address
⋮	□	s0p0	0			10.1.2.4
⋮	□	s1p0	0			10.1.3.4

- Click OK at the bottom of each after entering config information.

To configure network-interface from ACLI –
ACLI Path: config t→system→network-interface

```
network-interface
        name                        s0p0
        ip-address                   10.1.2.4
        netmask                      255.255.255.0
        gateway                      10.1.2.1
network-interface
        name                        s1p0
        ip-address                   10.1.3.4
        netmask                      255.255.255.0
        gateway                      10.1.3.1
        dns-ip-primary                 8.8.8.8
        dns-ip-backup1                  8.8.4.4
        dns-ip-backup2                  9.9.9.9
        dns-domain                     telechat.o-test06161977.com
```

- Perform a save and activate configuration for changes to take effect.

Next, we'll configure the necessary elements to secure signaling and media traffic between the Oracle SBC and Microsoft Teams Operator Connect.

6.3 Security Configuration

This section describes how to configure the SBC for both TLS and SRTP communication with Microsoft Operator Connect.

Note:Operator Connect Trunk can also use TCP/RTP Protocol.Use of MAPS (Microsoft Azure Peering Service) Transport is a MUST for Network to Network Connection between the Oracle SBC and Operator Connect.Traffic sent through 3rd Part Internet is not supported.For the purpose of the Application Note we have provided TLS/SRTP method of connectivity between Oracle SBC and Microsoft Operator Connect.

When Using TLS/SRTP Microsoft Operator Connect recommends TLS connections from SBC's for SIP traffic, and SRTP for media traffic. It requires a certificate signed by Certificate Authorities (CAs) that are part of the **Microsoft Trusted Root Certificate Program**. A list of currently supported Certificate Authrities can be found at:**Public trusted certificate for the SBC.** These are same as Direct Routing Supported CAs.

6.3.1 Certificate Records

"Certificate-records" are configuration elements on Oracle SBC which capture information for a TLS certificate such as common-name, key-size, key-usage etc.

This section walks you through how to configure certificate records, create a certificate signing request, and import the necessary certificates into the SBC's configuration.

GUI Path: security/certificate-record

For the purposes of this application note, we'll create three certificate records. They are as follows:

- SBC Certificate (end-entity certificate)
- DigiCert RootCA Cert (Root CA used to sign the SBC's end entity certificate)
- BaltimoreRoot CA Cert (Microsoft Presents the SBC a certficate signed by this authority)
- DigiCert Global G2 Cert (Microsoft Presents the SBC a certificate signed by this authority)

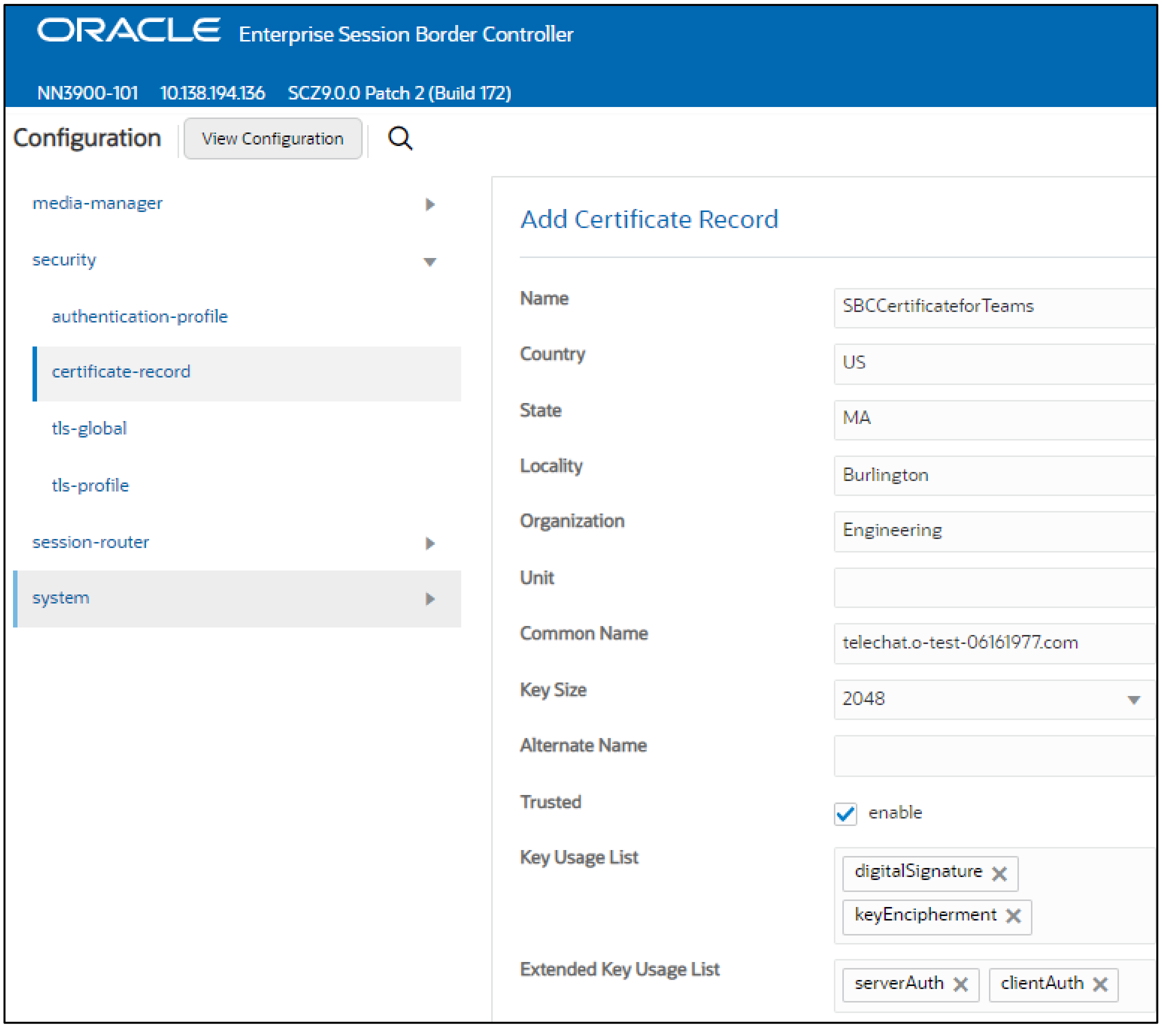
Note: The DigiCert RootCA is only part of this example, as that is the Authority we used to sign our SBC certificate. You would replace this with the root and/or intermediate certificates used to sign the CSR generated from your SBC.

6.3.1.1 SBC End Entity Certificate

The SBC's end entity certificate is the certificate the SBC presents to Microsoft to secure the connection. The only requirements when configuring this certificate is the common name must contain the SBC's FQDN. In this example our common name will be **telechat.o-test06161977.com.** You must also give it a name. All other fields are optional, and can remain at default values.

To Configure the certificate record:

Click Add, and use the following example to configure the SBC certificate



Add Certificate Record

Name: SBCCertificateforTeams
Country: US
State: MA
Locality: Burlington
Organization: Engineering
Unit:
Common Name: telechat.o-test-06161977.com
Key Size: 2048
Alternate Name:
Trusted: ☑ enable
Key Usage List: digitalSignature ✕ keyEncipherment ✕
Extended Key Usage List: serverAuth ✕ clientAuth ✕

- Click OK at the bottom

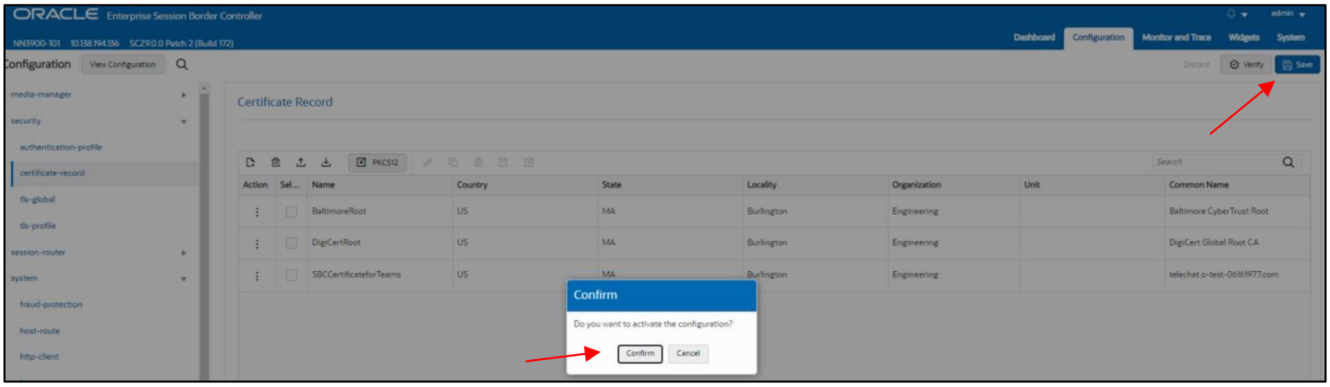
To configure certificate-record from ACLI –

ACLI Path: config t→security→certificate-record

```
certificate-record
        name                          SBCCertificateforTeams
        state                       California
        locality                    Redwood City
        organization                     Oracle Corporation
        unit                       Oracle CGBU-LABS BOSTON
        common-name                           telechat.o-test06161977.com
```

- Perform a save and activate configuration for changes to take effect.

At this point, before generating a certificate signing request, or importing any of the Root CA certs, we must **save and activate** the configuration of the SBC.



Certificate Record

Action	Sel...	Name	Country	State	Locality	Organization	Unit	Common Name
⋮	□	BaltimoreRoot	US	MA	Burlington	Engineering		Baltimore CyberTrust Root
⋮	□	DigiCertRoot	US	MA	Burlington	Engineering		DigiCert Global Root CA
⋮	□	SBCCertificateforTeams	US	MA	Burlington	Engineering		telechat.o-test-06161977.com

Confirm

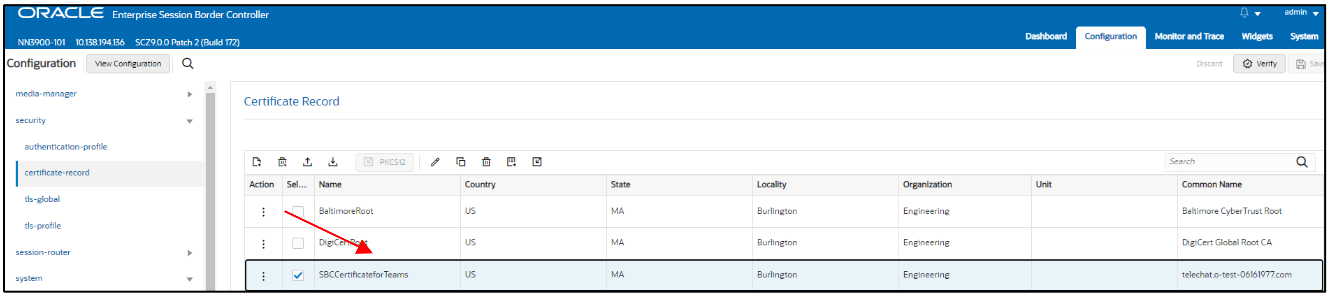
Do you want to activate the configuration?

6.3.1.2 Generate Certificate Signing Request

Now that the SBC’s certificate has been configured, create a certificate signing request for the SBC’s end entity only.

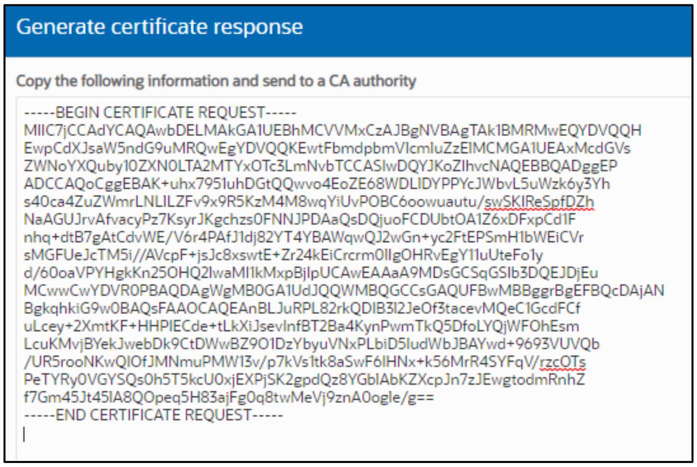
This is not required for any of the Root CA or intermidiate certificates that have been created.

On the certificate record page in the Oracle SBC GUI, select the SBC’s end entity certificate that was created above, and click the “generate” tab at the top:



Certificate Record

Action	Sel...	Name	Country	State	Locality	Organization	Unit	Common Name
⋮	□	BaltimoreRoot	US	MA	Burlington	Engineering		Baltimore CyberTrust Root
⋮	□	DigiCertRoot	US	MA	Burlington	Engineering		DigiCert Global Root CA
⋮	☑	SBCCertificateforTeams	US	MA	Burlington	Engineering		telechat.o-test-06161977.com



Copy the following information and send to a CA authority

```
-----BEGIN CERTIFICATE REQUEST-----
MIIC7jCCAdYCAQAwbDELMAkGA1UEBhMCVVMxCzAJBgNVBAgTAk1BMRMwEQYDVQQH
EwpCdXJsaW5ndG9uMRQwEgYDVQQKEwtFbmdpbmVlcmluZzEIMCMGA1UEAxMcdGVs
ZWNoYXQuby10ZXN0LTA2MTYxOTc3LmNvbTCCASIwDQYJKoZIhvcNAQEBBQADggEP
ADCCAQoCggEBAK+uhx7951uhDGtQQwvo4EoZE68WDLIDYPPYcJWbvL5uWzk6y3Yh
s40ca4ZuZWmrLNLILZFv9x9R5KzM4M8wqYiUvPOBC6oowuautu/swSKIReSpfDZh
NaAGUJrvAfvacyPz7KsyrJKgchzs0FNNJPDAaQsDQjuoFCDUbtOA1Z6xDFxpCd1F
nhq+dtB7gAtCdvWE/V6r4PAfJ1dj82YT4YBAWqwQJ2wGn+yc2FtEPSmH1bWEiCVr
sMGFUeJcTM5i//AVcpF+jsJc8xswtE+Zr24kEiCrcrm0IlgOHRvEgY11uUteFo1y
d/60oaVPYHgkKn25OHQ2lwaMI1kMxpBjIpUCAwEAAaA9MDsGCSqGSIb3DQEJDjEu
MCwwCwYDVR0PBAQDAgWgMB0GA1UdJQQWMBQGCCsGAQUFBwMBBggrBgEFBQcDAjAN
BgkqhkiG9w0BAQsFAAOCAQEAnBLJuRPL82rkQDIB3I2JeOf3tacevMQeC1GcdFCf
uLcey+2XmtKF+HHPIECde+tLkXiJsevInfBT2Ba4KynPwmTkQ5DfoLYQjWFOhEsm
LcuKMvjBYekJwebDk9CtDWwBZ9O1DzYbyuVNxPLbiD5ludWbJBAYwd+9693VUVQb
/UR5rooNKwQIOfJMNmuPMW13v/p7kVs1tk8aSwF6IHNx+k56MrR4SYFqV/rzcOTs
PeTYRy0VGYSQs0h5T5kcU0xjEXPjSK2gpdQz8YGbIAbKZXcpJn7zJEwgtodmRnhZ
f7Gm45Jt45IA8QOpeq5H83ajFg0q8twMeVj9znA0ogle/g==
-----END CERTIFICATE REQUEST-----
```

Copy/paste the text that gets printed on the screen as shown above and upload to your CA server for signature.

To perform the Steps From ACLI use the below command –

```
generate-certificate-request SBCCertificateforTeams
```

This Step generates a text on Screen as shown below –

```
-----BEGIN CERTIFICATE REQUEST-----
MIIC4zCCAcsCAQAwazELMAkGA1UEBhMCVVMxCzAJBgNVBAgTAk1BMRMwEQYDVQQ
H
EwpCdXJsaW5ndG9uMRQwEgYDVQQKEwtFbmdpbmVlcmluZzEkMCIGA1UEAxMbdGVs
ZWNoYXQuby10ZXN0MDYxNjE5NzcuY29tMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8A
MIIBCgKCAQEAr3AmjF15PcIcWiB/kFExUGNHQHIbkJi28MDbcprO/KLXIHQysSnw
UWz34XLBfLQ6rS4MLyEMR8Nt8GGNSIWKiR431LsX7L+yGWvRjcBFP6DIHtH0Vuqm
ixVaUJpg5luPY6SvT1shyu26iLIBsLfem43tbKq5jz/jrvaUzyhlCvAQ23c1oS5a
D4UiF2mNOuSqxvmkx50a3/BNYbKecLNOxvKQyyTMgffNpASbZuW+eMEUKI5iB+AB
/AAoZRP4bn4qlE3wn8pJsNm8Pjxy4hbz24ySgmaN9iXpP1FdRw0TemfCsNazZRuK
DsviWJfunZYTzRfDe5pJToMH4u1zt2fK1QIDAQABoDMwMQYJKoZIhvcNAQkOMSQw
IjALBgNVHQ8EBAMCBaAwEwYDVR0lBAwwCgYIKwYBBQUHAwEwDQYJKoZIhvcNAQEL
BQADggEBADD5Y+u08LxmTMIsJ2Rjc8cgPZocTqBDXN0tp27S4FuB/01ikBBdG3YV
Ffp7/Q8ZeFHHgU/rMzeF8Gpo9Cc6JUGGux3/ws8ZkgRBxsNlG276i7pFN1vCIjEP
89AGxtryioRMc4kcdPpLJNQ10Qx1zKobHMTftGLDI6jN2pvn3zYHH8qA9V/1/yKa
3n0j33EuTrvTlQ5P4IgyVJqSBkdI29T1gXY6O8JVFLCQefTrF4TLc6teNzxXMdPw
PHoPu9hM3scGOWOHQnODXOFeq2AxBQzAa0/Cjf7Bw3l3POmMcIOawgDecZ8UjHpJ
lznX9/Gxg5X+S2QkHjNmPK+JuePqX4I=
-----END CERTIFICATE REQUEST-----
```

Copy/paste the text that gets printed on the screen as shown above and upload to your CA server for signature.

Also note, at this point, **another save and activate is required** before you can import the certificates to each certificate record created above.

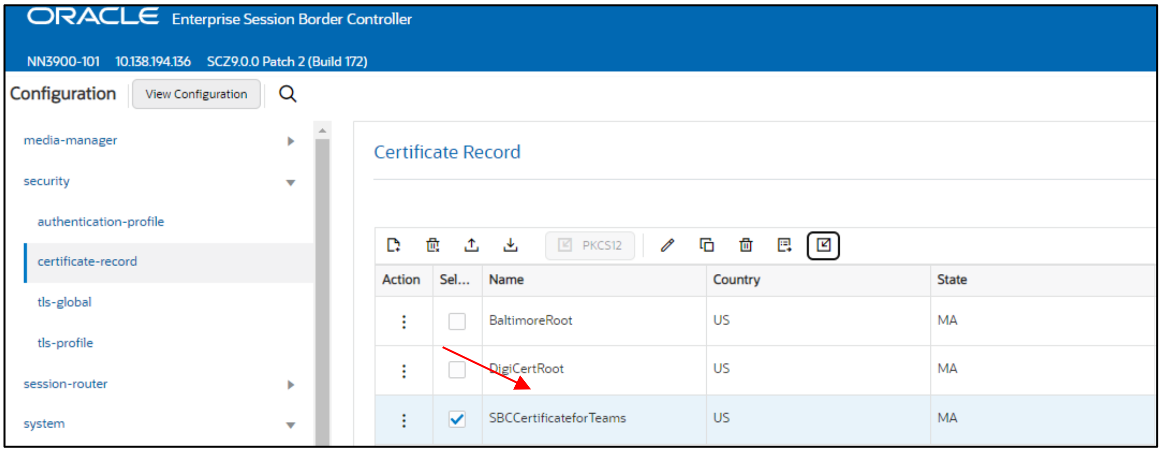
Once you have received the signed certificate back from your signing authority, we can now import all certificates to the SBC configuration.

6.3.1.3 Import Certificates to SBC

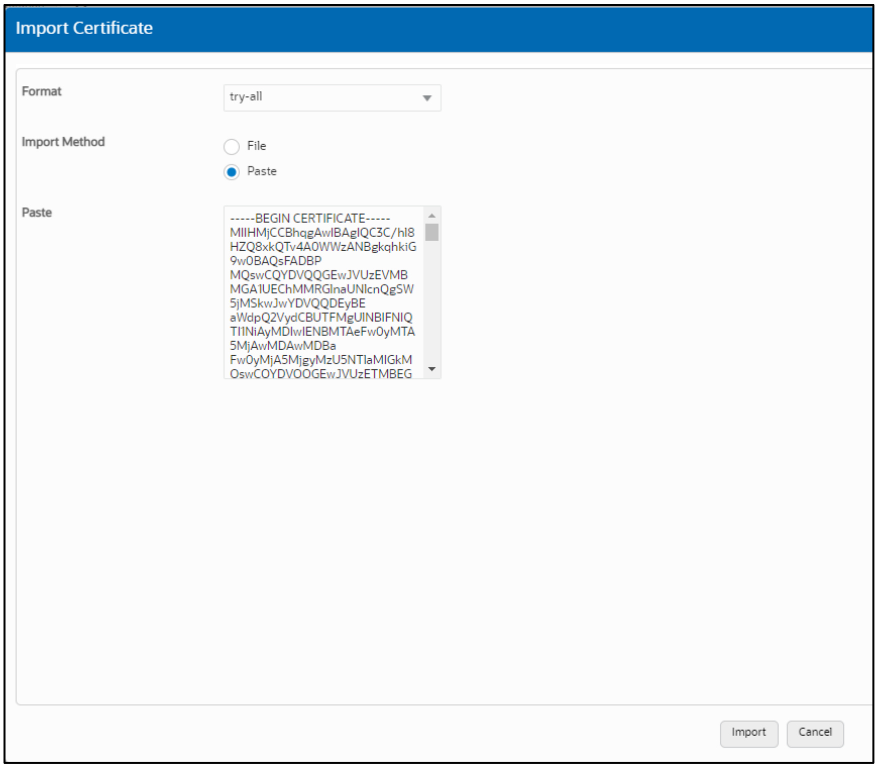
Once certificate signing request has been completed – import the signed certificate to the SBC.

Please note – all certificates including root and intermediate certificates are required to be imported to the SBC.

Once all certificates have been imported, issue a third **save/activate** from the WebGUI to complete the configuration of certificates on the Oracle SBC.



Action	Sel...	Name	Country	State
⋮	□	BaltimoreRoot	US	MA
⋮	□	DigiCertRoot	US	MA
⋮	☑	SBCCertificateforTeams	US	MA



Format: try-all

Import Method: ○ File ● Paste

Paste:

```
-----BEGIN CERTIFICATE-----
MIIHMjCCBhqgAwIBAgIQC3C/hl8
HZQ8xkQTv4A0WWzANBgkqhkiG
9w0BAQsFADBP
MQswCQYDVQQGEwJVUzEVMB
MGA1UEChMMRGlnaUNlcnQgSW
5jMSkwJwYDVQQDEyBE
aWdpQ2VydCBUTFMgUlNBIFNIQ
TI1NiAyMDIwIENBMTAeFw0yMTA
5MjAwMDAwMDBa
Fw0yMjA5MjgyMzU5NTlaMIGkM
OswCQYDVQQGEwJVUzETMBEG
```

Once pasted in the text box, select Import at the bottom, then **save and activate** your configuration.

To import the certificate from ACLI follow below procedure -

```
import-certificate try-all SBCCertificateforTeams

The System will show a prompt as below -


IMPORTANT:
        Please enter the certificate in the PEM format.
        Terminate the certificate with ";" to exit.......

Enter the Signed Certificate text as shown below-
```

```
-----BEGIN CERTIFICATE REQUEST-----
MIIC4zCCAcsCAQAwazELMAkGA1UEBhMCVVMxCzAJBgNVBAgTAk1BMRMwEQYDVQQH
EwpCdXJsaW5ndG9uMRQwEgYDVQQKEwtFbmdpbmVlcmluZzEkMCIGA1UEAxMbdGVs
ZWNoYXQuby10ZXN0MDYxNjE5NzcuY29tMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8A
MIIBCgKCAQEAr3AmjF15PcIcWiB/kFExUGNHQHIbkJi28MDbcprO/KLXIHQysSnw
UWz34XLBfLQ6rS4MLyEMR8Nt8GGNSIWKiR431LsX7L+yGWvRjcBFP6DIHtH0Vuqm
ixVaUJpg5luPY6SvT1shyu26iLlBsLfem43tbKq5jz/jrvaUzyhlCvAQ23c1oS5a
D4UiF2mNOuSqxvmkx50a3/BNYbKecLNOxvKQyyTMgffNpASbZuW+eMEUKI5iB+AB
/AAoZRP4bn4qlE3wn8pJsNm8Pjxy4hbz24ySgmaN9iXpP1FdRw0TemfCsNazZRuK
DsviWJfunZYTzRfDe5pJToMH4u1zt2fK1QIDAQABoDMwMQYJKoZIhvcNAQkOMSQw
IjALBgNVHQ8EBAMCBaAwEwYDVR0lBAwwCgYIKwYBBQUHAwEwDQYJKoZIhvcNAQEL
BQADggEBADD5Y+u08LxmTMIsJ2Rjc8cgPZocTqBDXN0tp27S4FuB/01ikBBdG3YV
Ffp7/Q8ZeFHHgU/rMzeF8Gpo9Cc6JUGGux3/ws8ZkgRBxsNlG276i7pFN1vCIjEP
89AGxtryioRMc4kcdPpLJNQ10Qx1zKobHMTftGLDI6jN2pvn3zYHH8qA9V/1/yKa
3n0j33EuTrvTlQ5P4IgyVJqSBkdI29T1gXY6O8JVFLCQefTrF4TLc6teNzxXMdPw
PHoPu9hM3scGOWOHQnODXOFeq2AxBQzAa0/Cjf7Bw3l3POmMcIOawgDecZ8UjHpJ
lznX9/Gxg5X+S2QkHjNmPK+JuePqX4I=
-----END CERTIFICATE REQUEST-----;
```

save and activate your configuration.

6.3.1.4 Root CA and Intermediate Certificates

DigiCert Root CA

The DigitCertRoot, is the root CA certificate used to sign the SBC's end entity certificate. As mentioned above, your root CA and/or intermediate certificate may differ. This is for example purposes only.

Baltimore Root

Microsoft presents a certificate to the SBC which is signed by Baltimore Cyber Baltimore CyberTrust Root. To trust this certificate, your SBC must have the certificate listed as a trusted ca certificate.

You can download this certificate here: https://cacerts.digicert.com/BaltimoreCyberTrustRoot.crt.pem

DigiCert Global Root G2

Microsoft presents a certificate to the SBC which is signed by DigiCert Global Root G2. To trust this certificate, your SBC must have the certificate listed as a trusted ca certificate.

You can download this certificate here: https://cacerts.digicert.com/DigiCertGlobalRootG2.crt.pem

Please use the following table as a configuration reference: Modify the table according to the certificates in your environment.

Config Parameter	Baltimore Root	DigiCert Root CA	DigiCert Root CA
Common Name	Baltimore CyberTrust Root	DigiCert Global Root CA	DigiCert Global Root CA
Key Size	2048	2048	2048
Key-Usage-List	digitalSignature keyEncipherment	digitalSignature keyEncipherment	digitalSignature keyEncipherment
Extended Key Usage List	serverAuth	serverAuth	serverAuth
Key algor	rsa	rsa	rsa
Digest-algor	Sha256	Sha256	Sha256

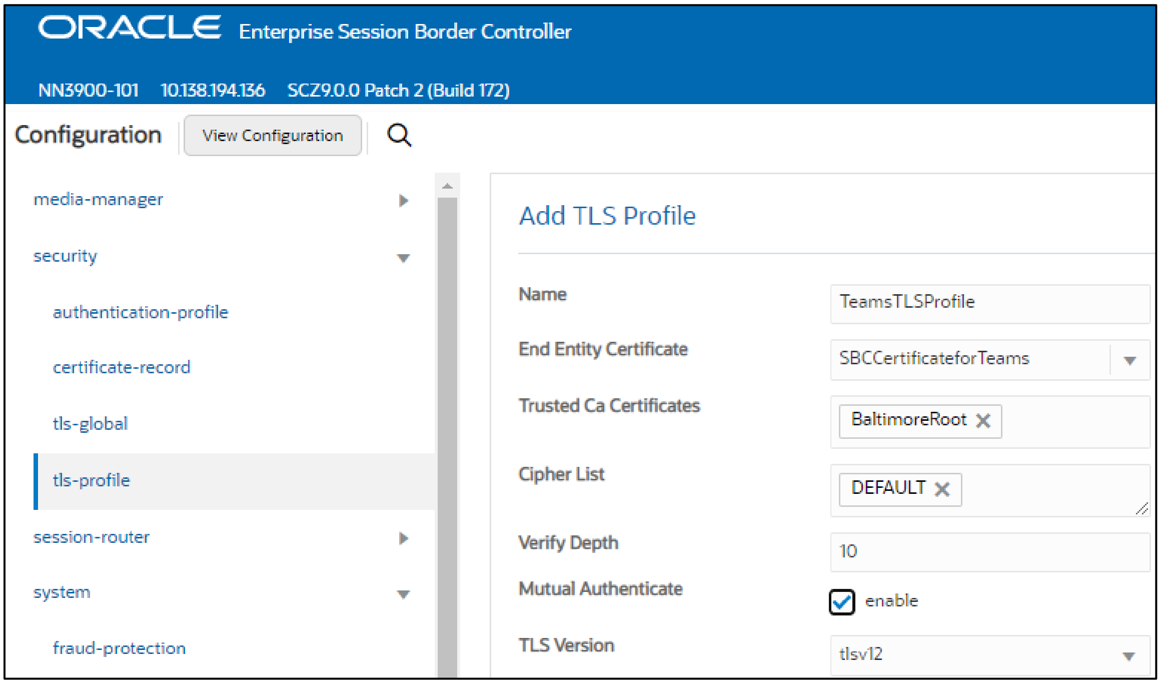
Repeat the Steps mentioned in Section 6.3.1.3 to import all the Root CA Certificates to the SBC.

6.3.2 TLS Profile

TLS profile configuration on the SBC allows for specific certificates to be assigned.

GUI Path: security/tls-profile

- Click Add, use the example below to configure



Add TLS Profile

Name: TeamsTLSProfile

End Entity Certificate: SBCCertificateforTeams

Trusted Ca Certificates: BaltimoreRoot

Cipher List: DEFAULT

Verify Depth: 10

Mutual Authenticate: ☑ enable

TLS Version: tlsv12

- Select OK at the bottom

To configure tls-profile from ACLI –

ACLI Path: config t→security→tls-profile

```
tls-profile
        name                                TeamsTLSProfile
        end-entity-certificate                   SBCCertificateforTeams
        trusted-ca-certificates                   BaltimoreRoot
        mutual-authenticate                        enabled
```

- Perform a save and activate configuration for changes to take effect.

Next, we'll move to securing media between the SBC and Microsoft Teams Operator Connect.

6.3.3 Media Security

This section outlines how to configure support for media security between the OCSBC and Microsoft Teams Operator Connect.

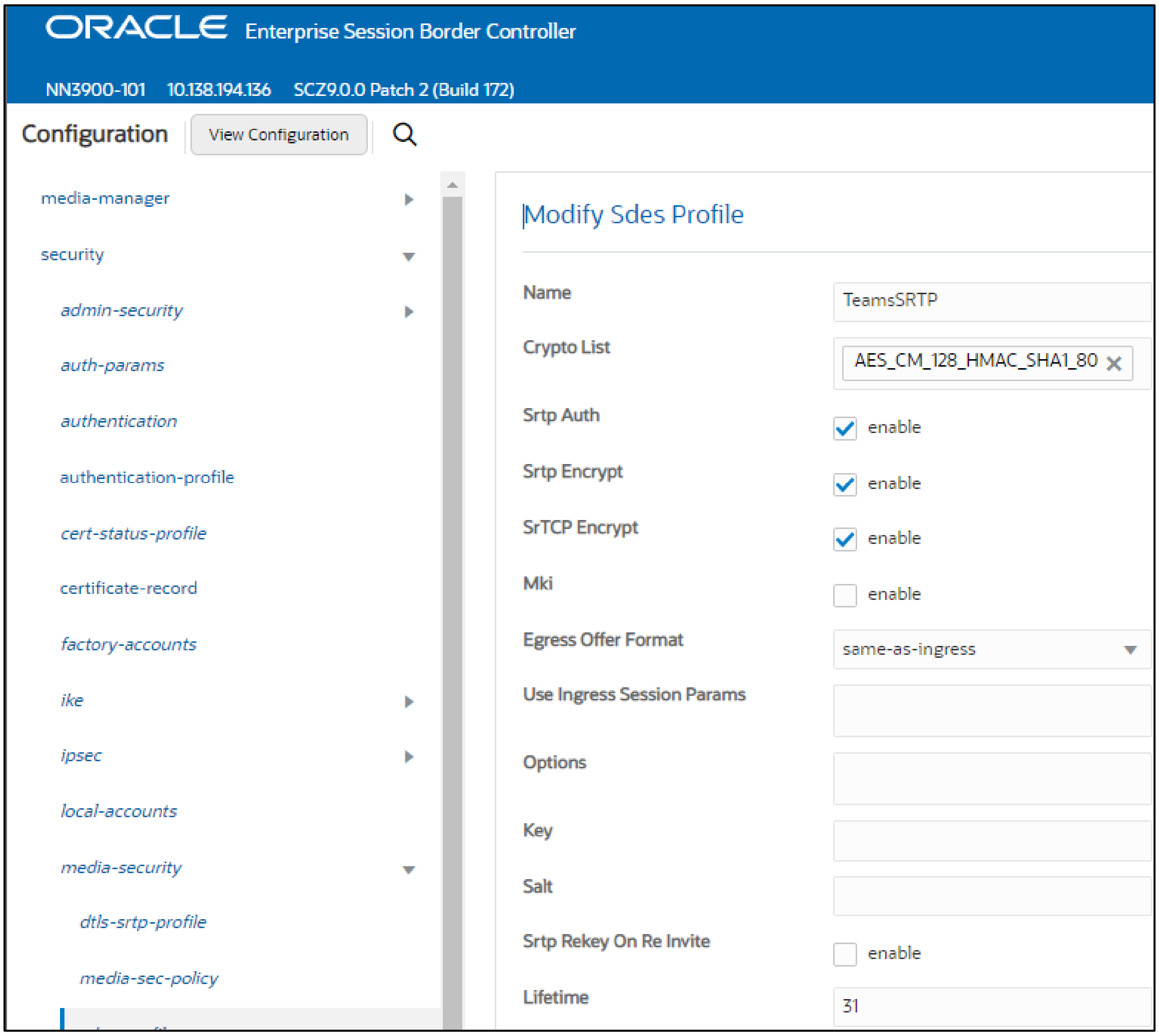
6.3.3.1 SDES-Profile

This is the first element to be configured for media security, where the algorithm and the crypto's to be used are configured. The only crypto-suite option supported by Microsoft is AES_CM_128_HMAC_SHA1_80 and must be included in the crypto list

In the SBC's GUI, on the bottom left, you will need to enable the switch "Show All" to access the media security configuration elements.

GUI Path: security/media-security/sdes-profile

- Click Add, and use the example below to configure



Modify Sdes Profile

Name	TeamsSRTP
Crypto List	AES_CM_128_HMAC_SHA1_80
Srtp Auth	☑ enable
Srtp Encrypt	☑ enable
SrTCP Encrypt	☑ enable
Mki	□ enable
Egress Offer Format	same-as-ingress
Use Ingress Session Params	
Options	
Key	
Salt	
Srtp Rekey On Re Invite	□ enable
Lifetime	31

- Select OK at the bottom

To configure sdes-profile from ACLI –

ACLI Path: config t→security→media-security→sdes-profile

```
sdes-profile
        name                                  TeamsSRTP
        crypto-list                          AES_CM_128_HMAC_SHA1_80
        srtp-auth                             enabled
        srtp-encrypt                            enabled
        srtcp-encrypt                            enabled
        mki                                 disabled
        egress-offer-format                         same-as-ingress
        use-ingress-session-params
        options
        key
        salt
        srtp-rekey-on-re-invite                     disabled
        lifetime                             31
```

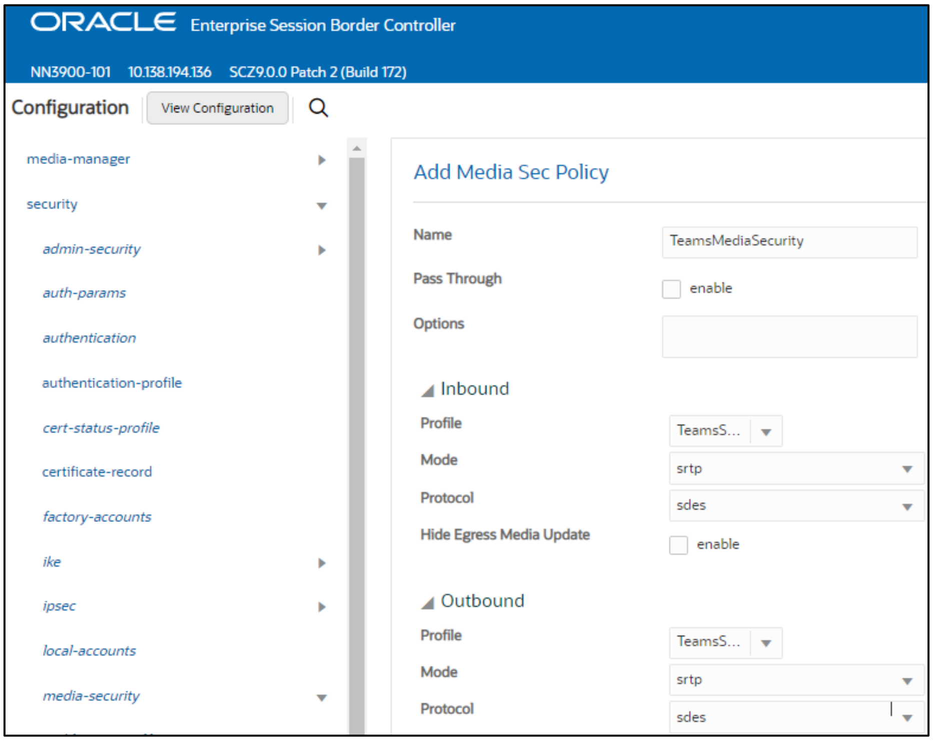
- Perform a save and activate configuration for changes to take effect.

6.3.3.2 Media Security Policy

Media-sec-policy instructs the SBC how to handle the SDP received/sent under a realm (RTP, SRTP or any) and, if SRTP needs to be used, the sdes-profile that needs to be used

In this example, we are configuring two media security policies. One to secure and decrypt media toward Microsoft Teams, the other for non-secure media facing PSTN.

GUI Path: security/media-security/media-sec-policy
Click Add, use the examples below to configure

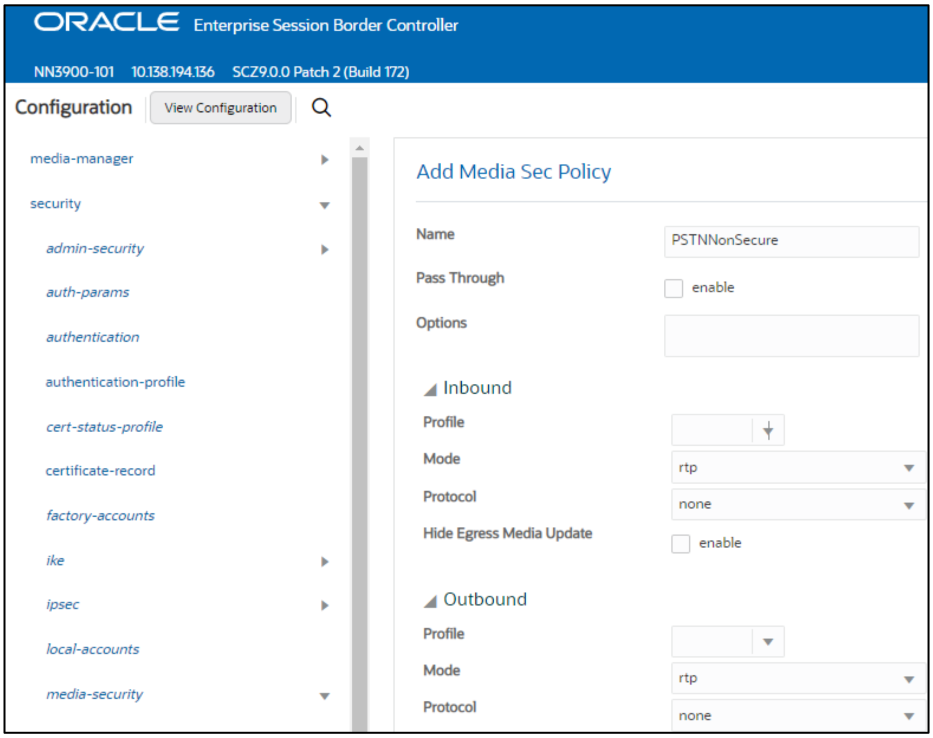


Add Media Sec Policy

Name: TeamsMediaSecurity
Pass Through: □ enable
Options:

Inbound
Profile: TeamsS...
Mode: srtp
Protocol: sdes
Hide Egress Media Update: □ enable

Outbound
Profile: TeamsS...
Mode: srtp
Protocol: sdes



Add Media Sec Policy

Name: PSTNNonSecure

Pass Through: □ enable

Options:

Inbound

Profile:

Mode: rtp

Protocol: none

Hide Egress Media Update: □ enable

Outbound

Profile:

Mode: rtp

Protocol: none

- Select OK at the bottom of each when finished

To configure media security from ACLI.

ACLI Path: config t→security→media-security→media-sec-policy

```
media-sec-policy
        name                                    PSTNNonSecure
        pass-through                            disabled
        options
        inbound
                profile
                mode                            rtp
                protocol                        none
                hide-egress-media-update                disabled
        outbound
                profile
                mode                            rtp
                protocol                        none
media-sec-policy
        name                                    TeamsMediaSecurity
        pass-through                            disabled
        options
        inbound
                profile                         TeamsSRTP
                mode                            srtp
                protocol                        sdes
                hide-egress-media-update                disabled
        outbound
                profile                         TeamsSRTP
                mode                            srtp
                protocol                        sdes
```

- Perform a save and activate configuration for changes to take effect.

This finishes the security configuration portion of the application note. We’ll now move on to configuring media and transcoding.

6.4 Transcoding Configuration

Transcoding is the ability to convert between media streams that are based upon disparate codecs. The OCSBC supports IP-to-IP transcoding for SIP sessions, and can connect two voice streams that use different coding algorithms with one another

6.4.1 Media Profiles

For different codecs and media types, you can setup customized media profiles that serve to police media values and define media bandwidth policies.

SILK & CN offered by Microsoft teams are using a payload type which is different than usual, so to support this, we configure the following media profiles on the SBC.

This is an optional configuration, and only needs to be implemented on the SBC if you are planning to use the SILK codec or wideband comfort noise between the SBC and Microsoft Operator Connect.

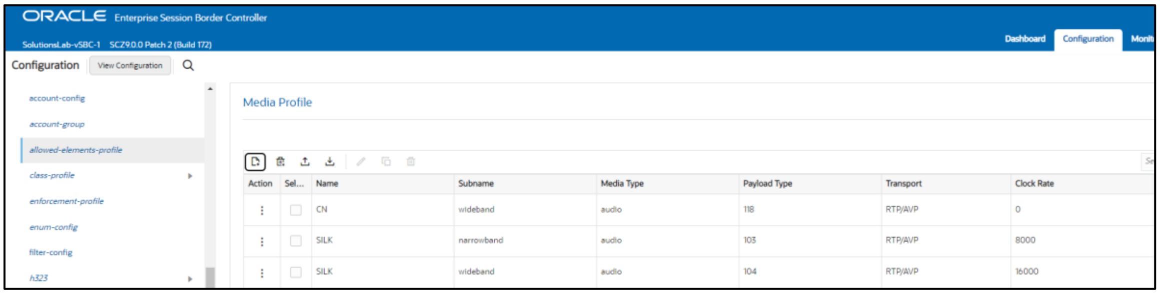
GUI Path: session-router/media-profile

Configure three media profiles to support the following:

- Silk Wideband
- Silk Narrowband
- CN

Click Add, then use the table below as an example to configure each:

Parameters	Silk	Silk	CN
Surname	narrowband	wideband	wideband
Payload-Type	103	104	118
Clock-rate	8000	16000	0



Action	Sel...	Name	Subname	Media Type	Payload Type	Transport	Clock Rate
⋮	□	CN	wideband	audio	118	RTP/AVP	0
⋮	□	SILK	narrowband	audio	103	RTP/AVP	8000
⋮	□	SILK	wideband	audio	104	RTP/AVP	16000

- Select OK at the bottom or each after entering the required values.

To configure media-profile from ACLI –

ACLI Path: config t→session-router→media-profile

```
media-profile
        name                        CN
        subname                       wideband
        payload-type                   118
media-profile
        name                        SILK
        subname                       narrowband
        payload-type                   103
        clock-rate                   8000
media-profile
        name                        SILK
        subname                       wideband
        payload-type                   104
        clock-rate                   16000
```

- Perform a save and activate configuration for changes to take effect.

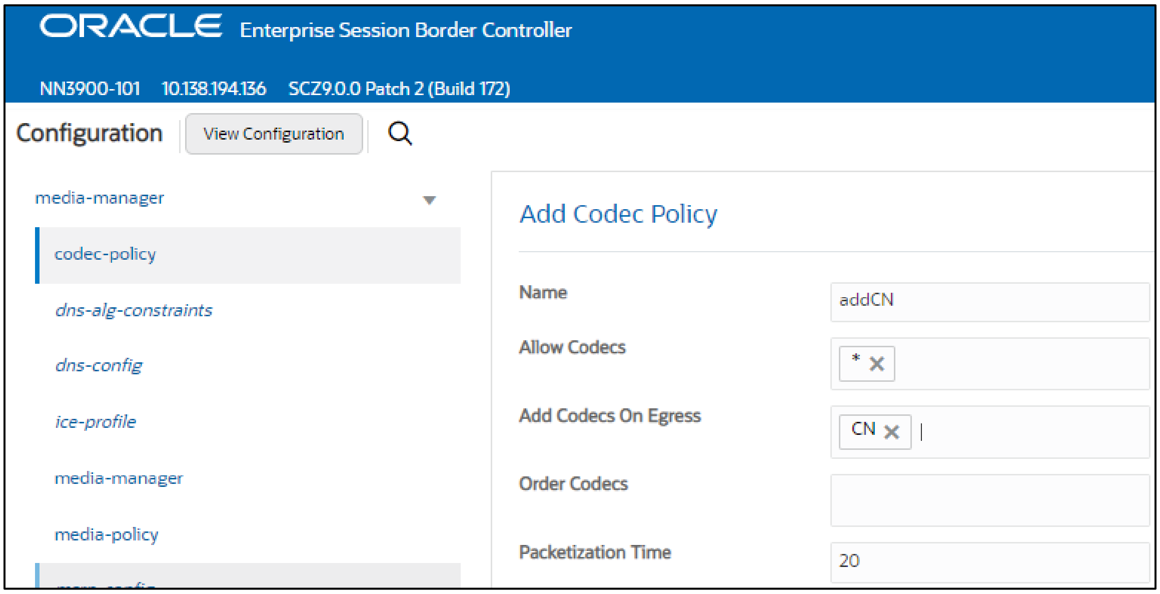
6.4.2 Codec Policies

Codec policies are sets of rules that specify the manipulations to be performed on SDP offers allowing the Oracle SBC the ability to add, strip, and reorder codecs for SIP sessions.

While transcoding media codecs is optional, Microsoft does require the SBC generate Comfort Noise and RTCP packets towards Teams if the connection on the other side of the SBC (PSTN, IPPBX, etc..) does not support either. To satisfy this requirement, the SBC uses transcoding resources to generate those packets, which does require a codec policy be configured and assigned.

GUI Path: media-manager/codec-policy

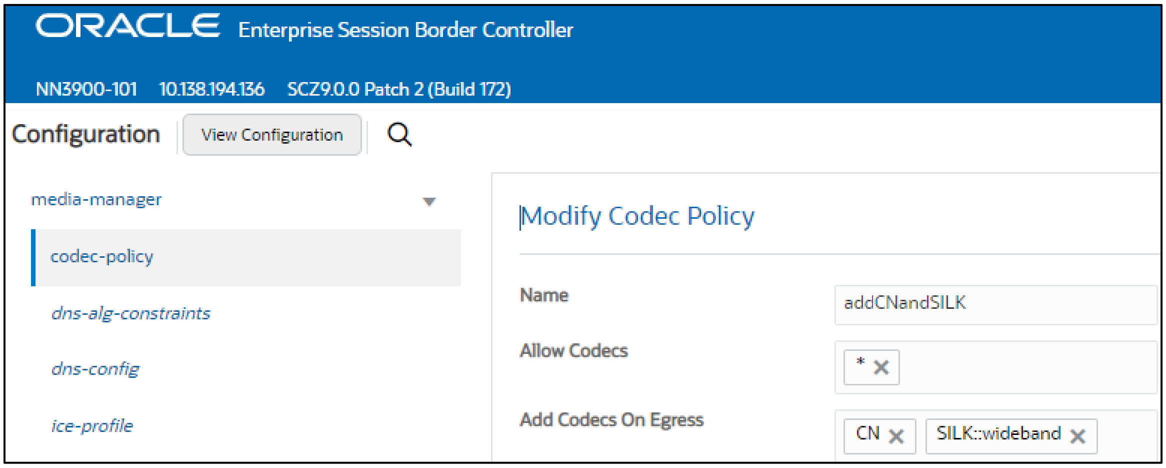
Here is an example config of a codec policy used for the SBC to generate CN packets towards Teams.



Add Codec Policy

Name	addCN
Allow Codecs	*
Add Codecs On Egress	CN
Order Codecs	
Packetization Time	20

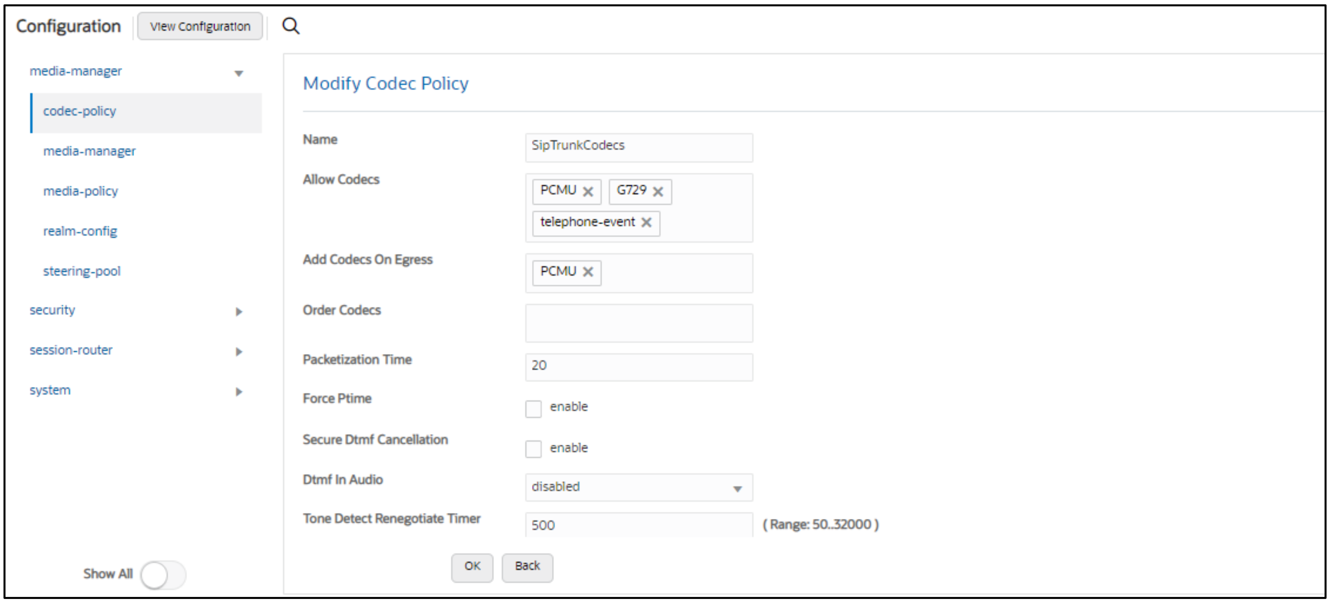
If you have chosen to configure the [media profiles]() in the previous section to use SILK or wideband CN, you would set your codec policy to add them on egress. Here is an example:


ORACLE Enterprise Session Border Controller
NN3900-101 10.138.194.136 SCZ9.0.0 Patch 2 (Build 172)
Configuration
View Configuration
media-manager
codec-policy
dns-alg-constraints
dns-config
ice-profile

Modify Codec Policy

Name	addCNandSILK
Allow Codecs	*
Add Codecs On Egress	CN SILK::wideband

Lastly, since some SIP Trunks may have issues with the codecs being offered by Microsoft Teams, you can create another codec policy to remove unwanted or unsupported codecs from the request/responses to your Sip Trunk provider.



Configuration | View Configuration

- media-manager
  - codec-policy
  - media-manager
  - media-policy
  - realm-config
  - steering-pool
- security
- session-router
- system

Show All

Modify Codec Policy

Name	SipTrunkCodecs
Allow Codecs	PCMU ✕ G729 ✕ telephone-event ✕
Add Codecs On Egress	PCMU ✕
Order Codecs	
Packetization Time	20
Force Ptime	□ enable
Secure Dtmf Cancellation	□ enable
Dtmf In Audio	disabled
Tone Detect Renegotiate Timer	500 (Range: 50..32000)

OK | Back

- Select OK at the bottom

To configure codec-policy from ACLI –

ACLI Path: config t→media-manager→codec-policy

```
codec-policy
        name                                SipTrunkCodecs
        allow-codecs                            PCMU G729 telephone-event
        add-codecs-on-egress                        PCMU
codec-policy
        name                                addCNandSilk
        allow-codecs                            *
        add-codecs-on-egress                        CN SILK::wideband
```

- Perform a save and activate configuration for changes to take effect.

Caveat – On SCZ8.x release if both SILK WB and CN:wideband are configured as a media profile in the configuration you will not be able to add CN in add-codecs-on-egress parameter on the codec-policy.

```
media-profile
        name                                CN
        subname                               wideband
        payload-type                           118
        clock-rate                            16000

media-profile
        name                                SILK
        subname                               wideband
        payload-type                           104
        clock-rate                            16000
```

```
(codec-policy)# add-codecs-on-egress CN
% Invalid Input
    Item "CN" invalid value
        Added codec must be transcodable
```

As a workaround please follow below steps –

1) Remove the CN media-profile
2) Then add the required codec-policy.
3) Save the configuration
4) Add the CN media-profile back
5) Save the configuration
6) Activate the config.

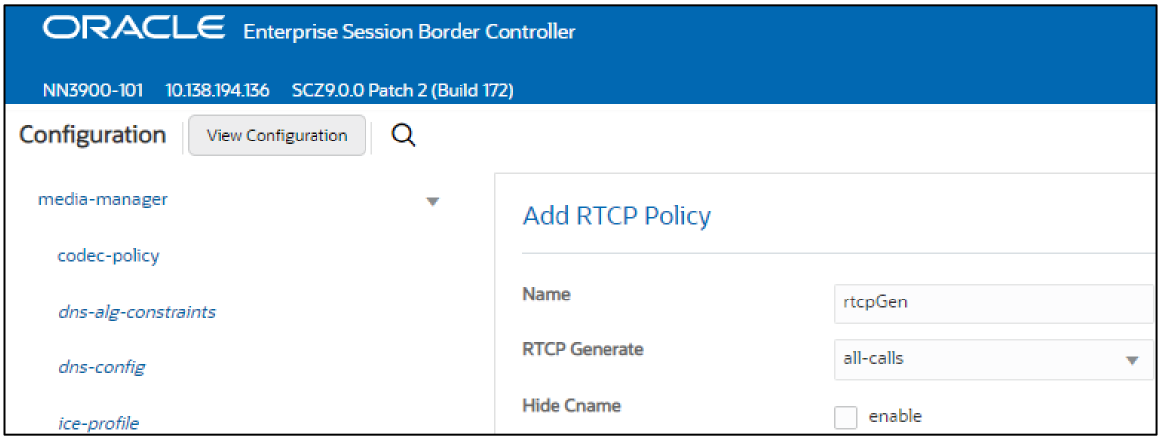
The issue is resolved in SCZ9.x stream of Oracle SBC release.

6.4.3 RTCP Policy

The following RTCP policy needs to be configured for the Oracle SBC to generate RTCP sender reports toward Microsoft Teams.

GUI Path: media-manager/rtcp-policy

- Click Add, use the example below as a configuration guide


ORACLE Enterprise Session Border Controller
NN3900-101 10.138.194.136 SCZ9.0.0 Patch 2 (Build 172)
Configuration
View Configuration
media-manager
codec-policy
dns-alg-constraints
dns-config
ice-profile

Add RTCP Policy

Name: rtcpGen
RTCP Generate: all-calls
Hide Cname: □ enable

FYI, for the SBC to generate RTCP sender reports to Teams, the realm in which this policy is assigned must also have a codec policy assigned. This is to evoke the required transcoding resources needed to generate RTCP packets.

- Select OK

To configure rtcp-policy from ACLI –

ACLI Path: config t→media-manger→rtcp-policy

```
rtcp-policy
        name                         rtcpGen
        rtcp-generate                  all-calls
        hide-cname                     disabled
```

- Perform a save and activate configuration for changes to take effect.

This concludes the configuration for transcoding and Advanced Media Termination options on the SBC. We can now move to setup Media.

6.5 Media Configuration

This section will guide you through the configuration of media manager, realms, and steering pools, all of which are required for the SBC to handle signaling and media flows toward Teams and PSTN.

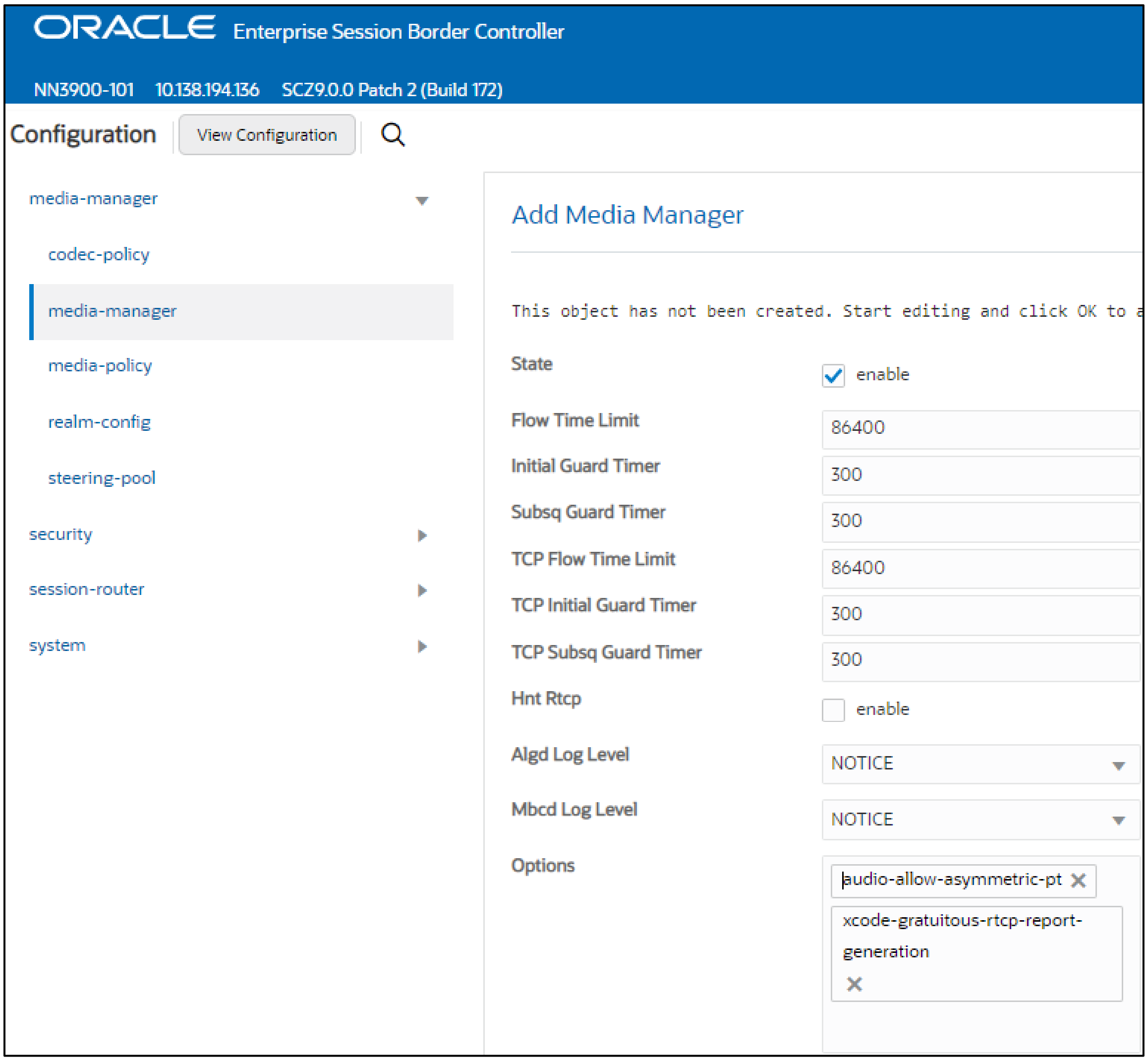
6.5.1 Media Manager

To configure media functionality on the SBC, you must first enabled the global media manager

GUI Path: media-manager/media-manager

The following two hidden options are recommended for the global media manager when interfacing with Microsoft Teams Operator Connect.

- audio-allow-asymmetric-pt: Provides transcoding support for asymmetric dynamic payload types enables the Oracle® Session Border Controller to perform transcoding when the RTP is offered with one payload type and is answered with another payload type.
- xcode-gratuitous-rtcp-report-generation: This option allows the Oracle SBC to generate a Real-Time Transport Control Protocol (RTCP) Receiver Report separately from the default Sender-Receiver Report (RFC 3550). This option requires a reboot to take effect.



Add Media Manager

This object has not been created. Start editing and click OK to a

State	☑ enable
Flow Time Limit	86400
Initial Guard Timer	300
Subsq Guard Timer	300
TCP Flow Time Limit	86400
TCP Initial Guard Timer	300
TCP Subsq Guard Timer	300
Hnt Rtcp	□ enable
Algd Log Level	NOTICE
Mbcd Log Level	NOTICE
Options	audio-allow-asymmetric-pt ✕ xcode-gratuitous-rtcp-report-generation ✕

- Click OK at the bottom

To configure media-manager from ACLI –

ACLI Path: config t→media-manager→media-manager-config

```
media-manager
        state                                   enabled
options                                 audio-allow-asymmetric-pt
                                           xcode-gratuitous-rtcp-report-generation
```

- Perform a save and activate configuration for changes to take effect.

6.5.2 Realm Config

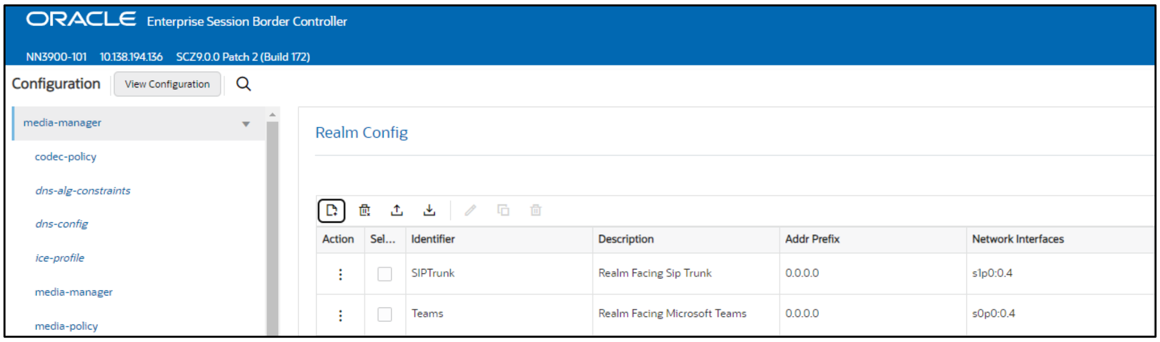
Realms are a logical distinction representing routes (or groups of routes) reachable by the Oracle® Session Border Controller and what kinds of resources and special functions apply to those routes.
Realms are used as a basis for determining ingress and egress associations to network interfaces.
.
GUI Path; media-manger/realm-config

- Click Add and use the following table as a configuration example for the realms. The following parameters are all required unless mentioned as optional below.

Config Parameter	Teams Realm	PSTN Realm
Identifier	Teams	SipTrunk
Network Interface	s0p0:0	s1p0:0
Mm in realm	☑	☑
Media Sec policy	TeamsSecurityPolicy	PSTNNonSecure
Teams-FQDN	telechat.o-test06161977.com	
Teams-fqdn-in-uri	☑	
Sdp-inactive-only	☑	
RTCP mux	☑	
Codec policy	addCN	SipTrunkCodecs
RTCP policy	rtcpGen	
Access-control-trust-level	HIGH	HIGH

Also notice the realm configuration where we assign some of the elements configured earlier in this document.

- Network Interface
- Media Security Policy
- Codec Policy (optional on the PSTN Realm)
- RTCP Policy



Action	Sel...	Identifier	Description	Addr Prefix	Network Interfaces
⋮	□	SIPTrunk	Realm Facing Sip Trunk	0.0.0.0	s1p0:0.4
⋮	□	Teams	Realm Facing Microsoft Teams	0.0.0.0	s0p0:0.4

- Select OK at the bottom of each

To configure realm-config from ACLI –

ACLI Path - config t→media-manger→realm-config

```
realm-config
        identifier                          SipTrunk
        description                           Realm facing PSTN
        network-interfaces                        s0p0:0.4
        mm-in-realm                             enabled


       media-sec-policy                         PSTNNonSecure
        access-control-trust-level                  high
        codec-policy                              SipTrunkCodecs
        ringback-trigger                          refer
        ringback-file                           ringback10sec.pcm
realm-config
        identifier                          Teams
        description                           Realm facing Teams
        network-interfaces                        s1p0:0.4
        mm-in-realm                             enabled
        media-sec-policy                          TeamsMediaSecurity
        rtcp-mux                              enabled
        ice-profile                          ice
        teams-fqdn                              telechat.o-test06161977.com
        teams-fqdn-in-uri                         enabled
        sdp-inactive-only                         enabled
        access-control-trust-level                  high
        codec-policy                              addCN
        rtcp-policy                           rtcpGen
```

- Perform a save and activate configuration for changes to take effect.

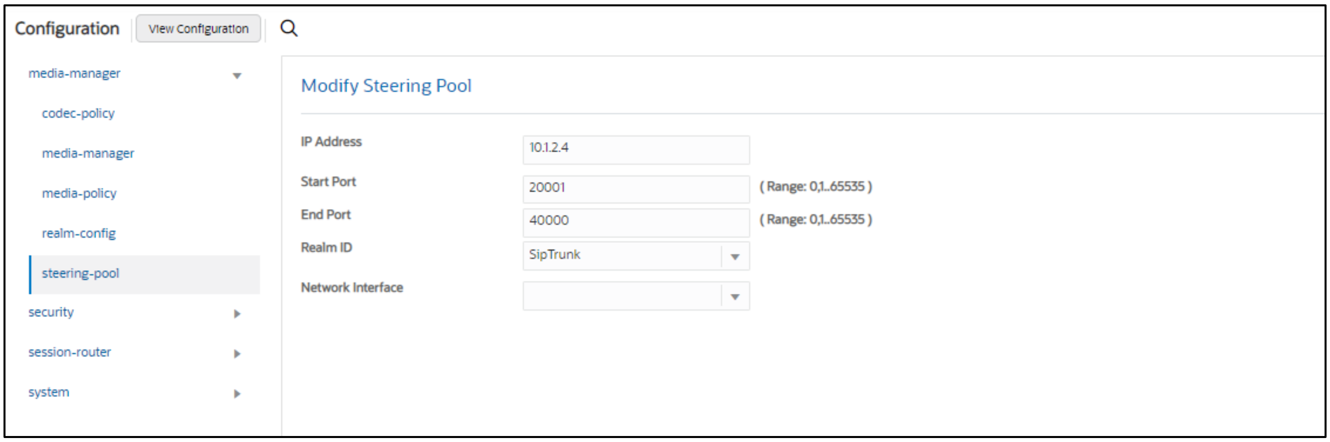
6.5.3 Steering Pools

Steering pools define sets of ports that are used for steering media flows through the OCSBC.
These selected ports are used to modify the SDP to cause receiving session agents to direct their media toward this system.

We configure one steering pool for PSTN. The other facing Teams.

GUI Path: media-manger/steering-pool

- Click Add, and use the below examples to configure



Modify Steering Pool

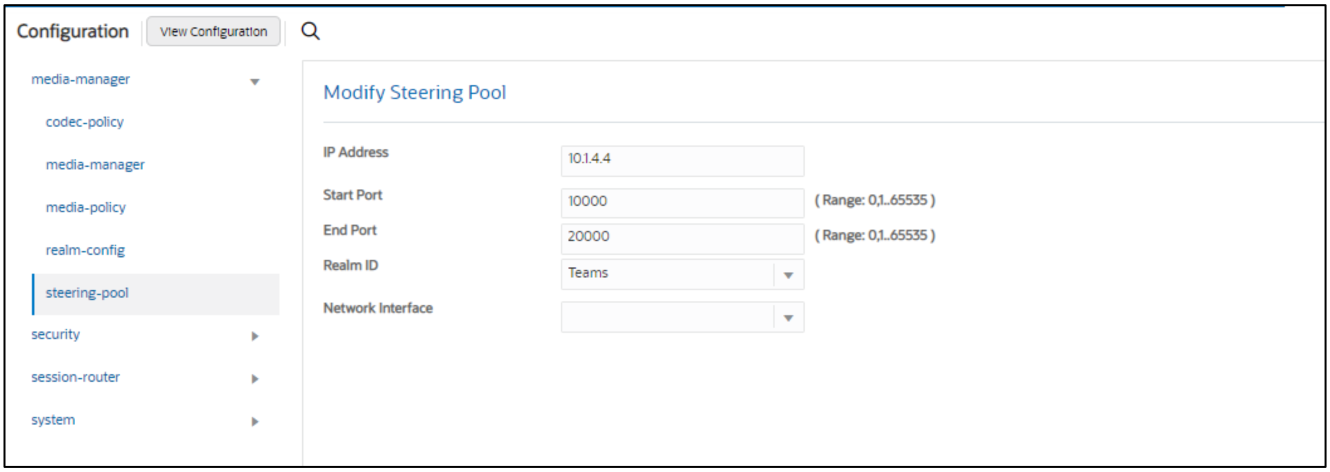
IP Address: 10.1.2.4

Start Port: 20001 (Range: 0,1..65535)

End Port: 40000 (Range: 0,1..65535)

Realm ID: SipTrunk

Network Interface:



Modify Steering Pool

IP Address: 10.1.4.4

Start Port: 10000 (Range: 0,1..65535)

End Port: 20000 (Range: 0,1..65535)

Realm ID: Teams

Network Interface:

- Select OK at the bottom

To configure steering pool from ACLI

ACLI Path: config t→media-manger→steering-pool

```
steering-pool
        ip-address                  10.1.2.4
        start-port                 20001
        end-port                   40000
        realm-id                    SipTrunk

steering-pool
        ip-address                  10.1.4.4
        start-port                 10000
        end-port                    20000
        realm-id                    Teams
```

- Perform a save and activate configuration for changes to take effect.

We will now work through configuring what is needed for the SBC to handle SIP signaling.

6.6 Sip Configuration

This section outlines the configuration parameters required for processing, modifying, and securing sip signaling traffic.

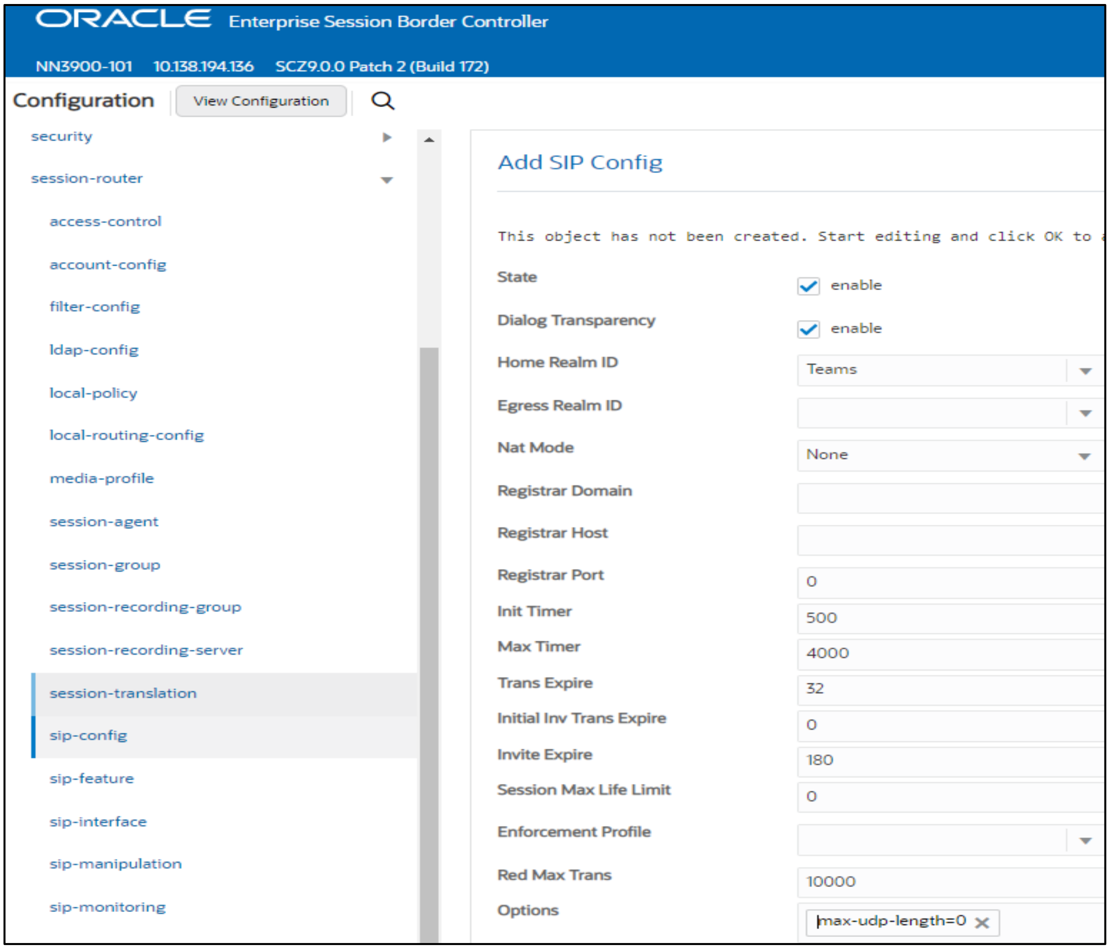
6.6.1 Sip-Config

To enable sip related objects on the Oracle SBC, you must first configure the global Sip Config element:

GUI Path: session-router/sip-config

There are only two recommended changes/additions to the global Sip Config.

- Set the home realm ID parameter to Teams Realm,
  and add the following hidden option:
- Max-udp-length=0: Setting this option to zero (0) forces sip to send fragmented UDP packets. Using this option, you override the default value of the maximum UDP datagram size (1500 bytes; sipd requires the use of SIP/TCP at 1300 bytes).



Add SIP Config

This object has not been created. Start editing and click OK to

State	☑ enable
Dialog Transparency	☑ enable
Home Realm ID	Teams
Egress Realm ID	
Nat Mode	None
Registrar Domain	
Registrar Host	
Registrar Port	0
Init Timer	500
Max Timer	4000
Trans Expire	32
Initial Inv Trans Expire	0
Invite Expire	180
Session Max Life Limit	0
Enforcement Profile	
Red Max Trans	10000
Options	max-udp-length=0

- Select OK at the bottom

To configure sip config from ACLI.

ACLI Path: config t→session-router→sip-config

```
sip-config
        home-realm-id                          Teams
        options                            max-udp-length=0
        allow-pani-for-trusted-only            disabled
        add-ue-location-in-pani               disabled
        npli-upon-register                   disabled
```

- Perform a save and activate configuration for changes to take effect.

6.6.2 Replaces Header Support

The Oracle® Session Border Controller supports the Replaces header in SIP messages according to RFC 3891. The header, included within SIP INVITE messages, provides a mechanism to replace an existing early or established dialog with a different dialog. The different dialog can be used for Microsoft Teams services such as call parking, attended call transfer and various conferencing features.

The Oracle SBC's support for Replaces header is required to properly interwork with Microsoft Teams, but Microsoft Teams does not support the use of Replaces header. In other words, Microsoft sends Replaces to the SBC, the SBC should not send Replaces to Microsoft.

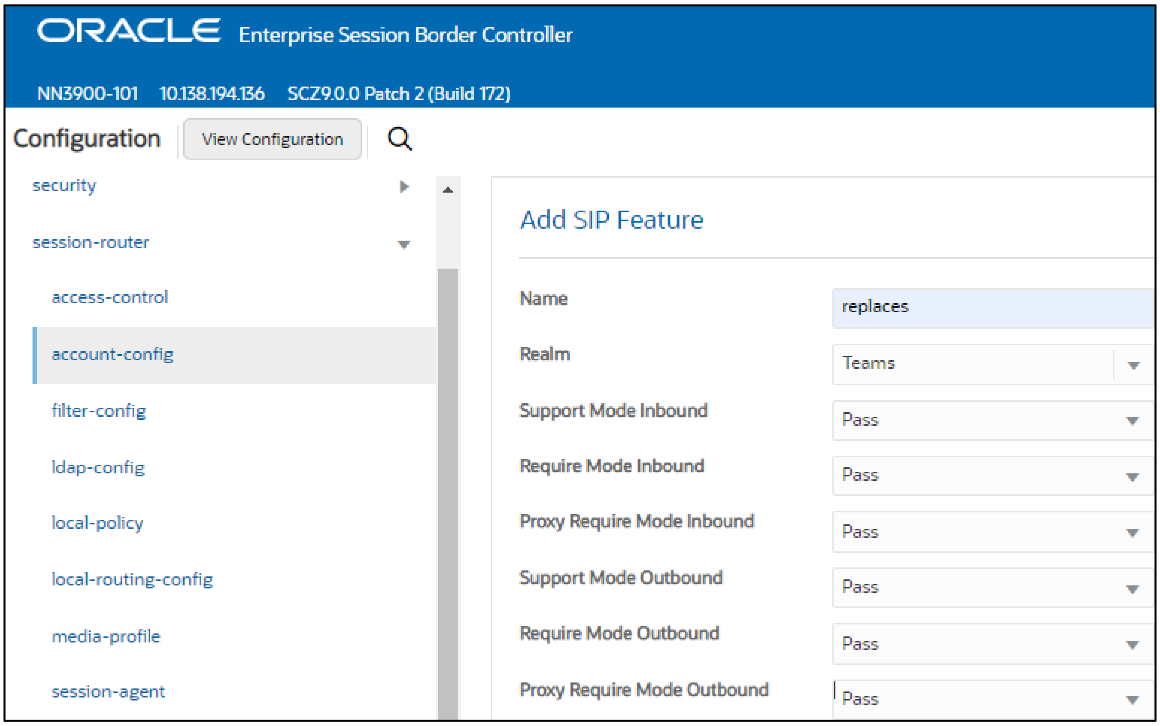
To configure support for Replaces, we configure the following:

6.6.2.1 Sip Feature

The sip feature configuration element allows the SBC to support the Replaces value in the SIP Require and Supported Headers to and from Microsoft Teams.

GUI Path: session-router/sip-feature

Click add and use the following to configure:



Add SIP Feature

Name	replaces
Realm	Teams
Support Mode Inbound	Pass
Require Mode Inbound	Pass
Proxy Require Mode Inbound	Pass
Support Mode Outbound	Pass
Require Mode Outbound	Pass
Proxy Require Mode Outbound	Pass

- Click OK at the bottom

To configure sip feature from ACLI

ALCI Path: config t→session-router→sip-feature

```
sip-feature
        name                                          replaces
        realm                                        Teams
        require-mode-inbound                                 Pass
       require-mode-outbound                                 Pass
```

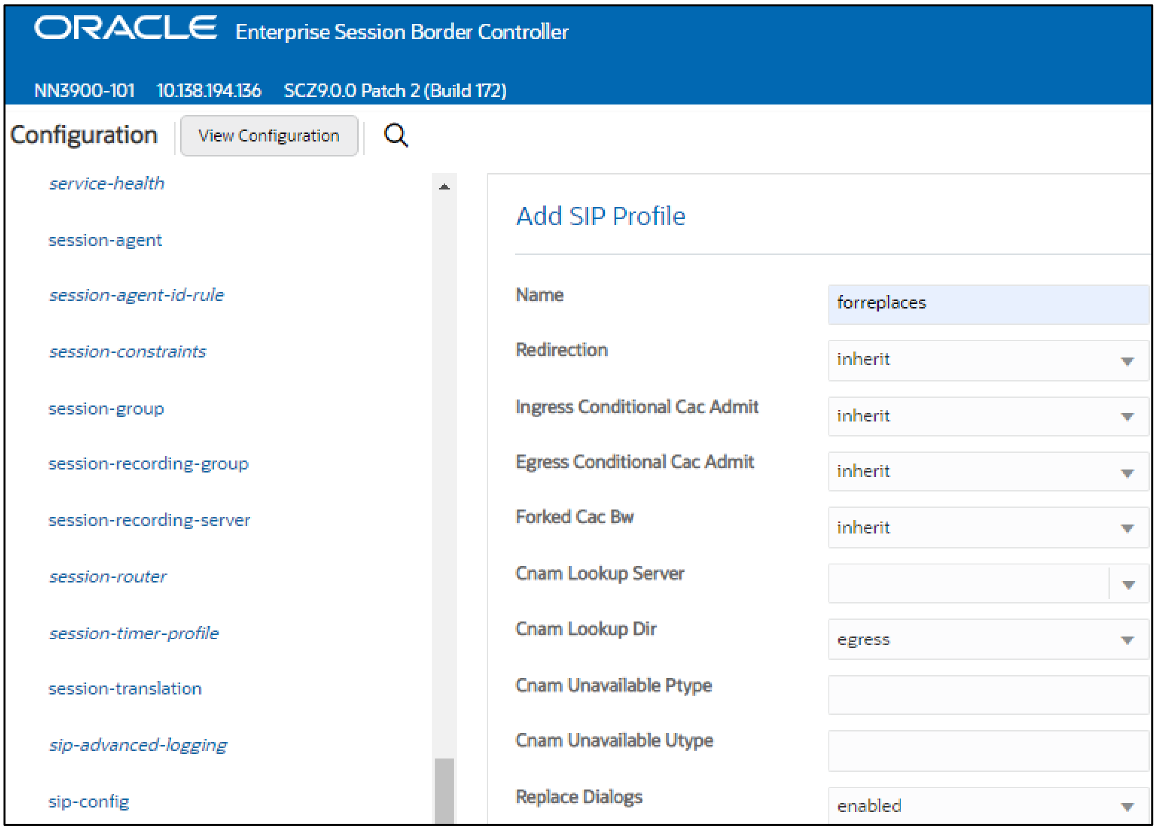
- Perform a save and activate configuration for changes to take effect.

6.6.2.2 Sip Profile

Sip Profile, once configured and assigned to a sip interface, will act on a Replaces header when received by Microsoft teams to replace a dialog.

GUI Path: session-router/sip-feature

The toggle switch “Show All” on the bottom left must be enabled to reveal the sip-profile option.



Add SIP Profile

Name	forreplaces
Redirection	inherit
Ingress Conditional Cac Admit	inherit
Egress Conditional Cac Admit	inherit
Forked Cac Bw	inherit
Cnam Lookup Server	
Cnam Lookup Dir	egress
Cnam Unavailable Ptype	
Cnam Unavailable Utype	
Replace Dialogs	enabled

- Click OK at the bottom

To configure sip profile from ACLI

ALCI Path: config t→session-router→sip-profile

```
sip-profile
        name                                    forreplaces
        replace-dialogs                             enabled
```

- Perform a save and activate configuration for changes to take effect.

6.6.3 Sip Interface

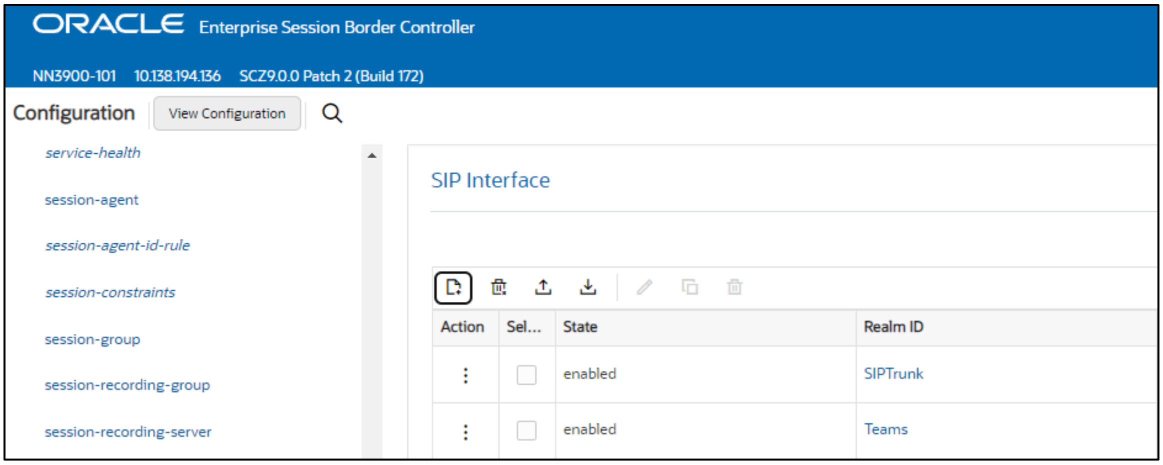
The SIP interface defines the transport addresses (IP address and port) upon which the Oracle SBC receives and sends SIP messages

Configure two sip interfaces, one associated with PSTN Realm, and the other for Teams.

GUI Path: session-router/sip-interface

Click Add, and use the table below as an example to configure:

Config Parameter	SipTrunk	Teams
Realm ID	SipTrunk	Teams
Sip-Profile		fireplaces
Sip Port Config Parameter	**Sip Trunk**	**Teams**
Address	10.1.2.4	10.1.3.4
Port	5060	5061
Transport protocol	UDP	TLS
TLS profile		TeamsTLSProfile
Allow anonymous	agents-only	all



SIP Interface

Action	Sel...	State	Realm ID
⋮	□	enabled	SIPTrunk
⋮	□	enabled	Teams

Notice this is where we assign the TLS profile configured under the Security section of this guide, and the sip-profile which allows the SBC to act on the Replaces header when received by Microsoft Teams.

- Select OK at the bottom of each when applicable

To configure sip interface from ACLI

ACLI Path: config t→session-router→sip-interface

```
sip-interface
        realm-id                          SipTrunk
        sip-port
                address                        10.1.2.4
                allow-anonymous                    agents-only
sip-interface
        realm-id                          Teams
        sip-port
                address                        10.1.3.4
                port                         5061
                transport-protocol                TLS
                tls-profile                   TeamsTLSProfile
                allow-anonymous                    all
        in-manipulationid                 Checkfor183
        sip-profile                      forreplaces
```

- Perform a save activate for changes to take effect.

6.6.4 Session Agents

Session Agents are configuration elements which are trusted agents that can both send and receive traffic from the Oracle SBC with direct access to the trusted data path.

GUI Path: session-router/session-agent

Microsoft provides four (4) regional FQDN’s for PSTN Hub (NOAM, EMEA, APAC, OCEA),These FQDNs must be configured as Session-Agents in the order of the served market. For e.g. If SBC primarily serves NOAM market(s) you MUST configure their environment to target the NOAM FQDN first.

Following 4 FQDNs must be configured as Session-Agents on Oracle SBC.

NOAM: sip-us.gcs.pstnhub.microsoft.com

EMEA: sip-eu.gcs.pstnhub.microsoft.com

APAC: sip-as.gcs.pstnhub.microsoft.com

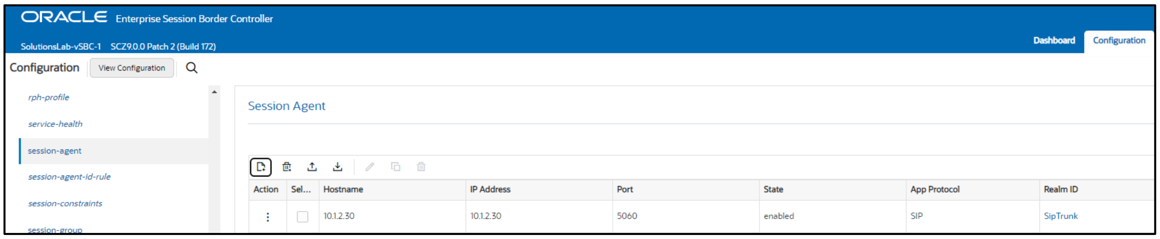
OCEA: sip-au.gcs.pstnhub.microsoft.com

- Click Add, and use the table below to configure:

Config parameter	Session Agent 1	Session Agent 2	Session Agent 3	Session Agent 3
Hostname	sip-us.gcs.pstnhub.microsoft.com	sip-eu.gcs.pstnhub.microsoft.com	sip-as.gcs.pstnhub.microsoft.com	sip-au.gcs.pstnhub.microsoft.com
Port	5061	5061	5061	5061
Transport method	StaticTLS	StaticTLS	StaticTLS	StaticTLS
Realm ID	Teams	Teams	Teams	Teams

Ping Method	OPTIONS	OPTIONS	OPTIONS	OPTIONS
Ping Interval	60	60	60	60
Refer Call Transfer	enabled	enabled	enabled	enabled
Ping Response	☑	☑	☑	☑

Next, we’ll configure a session agent for PSTN.



Action	Sel...	Hostname	IP Address	Port	State	App Protocol	Realm ID
⋮	□	10.1.2.30	10.1.2.30	5060	enabled	SIP	SipTrunk

- Select OK at the bottom

To configure session agents from ACLI

ACLI Path: config t→session-router→session-agent

```
session-agent
      hostname                          10.1.2.5
      ip-address                       10.1.2.5
      realm-id                       SipTrunk
      ping-method                        OPTIONS
      ping-interval                   30
      ping-response                      enabled
      out-manipulationid                  ACME_NAT_TO_FROM_IP
      refer-call-transfer               enabled
session-agent
      hostname                          sip-as.gcs.pstnhub.microsoft.com
      port                           5061
      transport-method                    StaticTLS
      realm-id                       Teams
      ping-method                        OPTIONS
      ping-interval                   60
      ping-response                      enabled
      refer-call-transfer               enabled
session-agent
      hostname                          sip-au.gcs.pstnhub.microsoft.com
      port                           5061
      transport-method                    StaticTLS
      realm-id                       Teams
      ping-method                        OPTIONS
      ping-interval                   60
      ping-response                      enabled
      refer-call-transfer               enabled
session-agent
      hostname                          sip-eu.gcs.pstnhub.microsoft.com
      port                           5061
      transport-method                    StaticTLS
      realm-id                       Teams
      ping-method                        OPTIONS
      ping-interval                   60
      ping-response                      enabled
      refer-call-transfer               enabled
session-agent
      hostname                          sip-us.gcs.pstnhub.microsoft.com
      port                           5061
      transport-method                    StaticTLS
      realm-id                       Teams
      ping-method                        OPTIONS
      ping-interval                   60
      ping-response                      enabled
      refer-call-transfer               enabled
```

- Perform a save and activate configuration for changes to take effect.

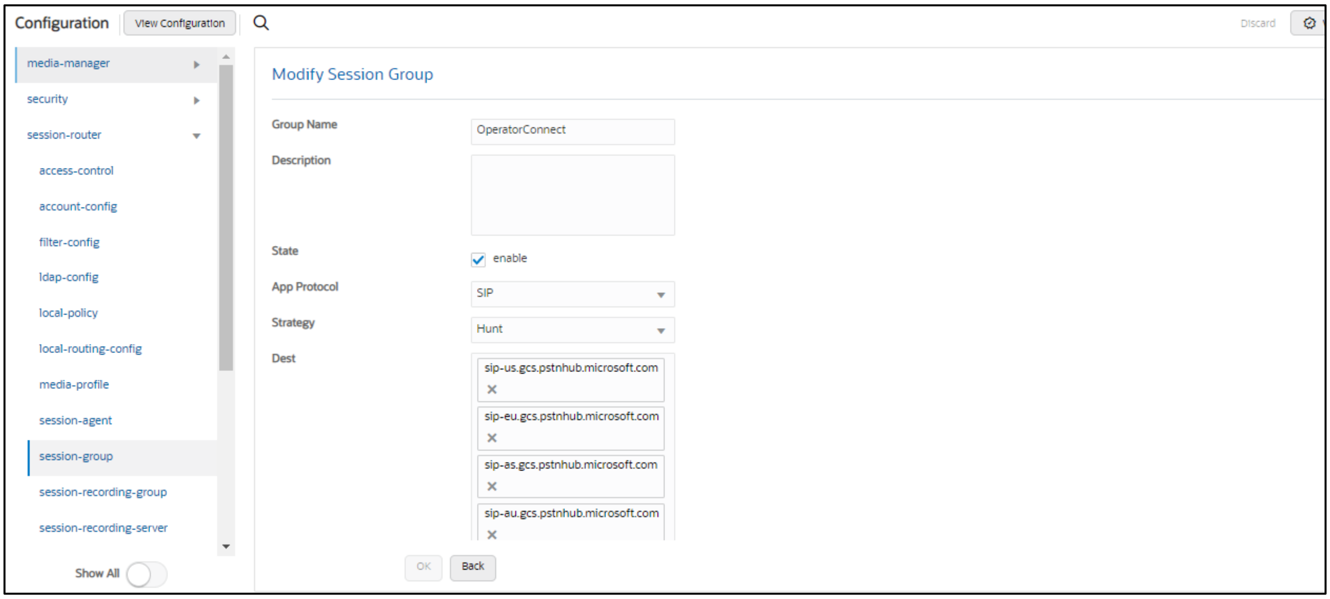
6.6.5 Session Group

A session agent group allows the SBC to create a load balancing model:

All three Teams session agents configured above will be added to the group. The session agents listed under destination must be in this order, and the strategy must be set to HUNT.

GUI Path: session-router/session-group

- Click Add, and use the following as an example to configure:



Group Name: OperatorConnect
Description:
State: ☑ enable
App Protocol: SIP
Strategy: Hunt
Dest: sip-us.gcs.pstnhub.microsoft.com ✕ sip-eu.gcs.pstnhub.microsoft.com ✕ sip-as.gcs.pstnhub.microsoft.com ✕ sip-au.gcs.pstnhub.microsoft.com ✕

- Click OK at the bottom

To configure session group from ACLI

ACLI Path: config t→session-router→session-group

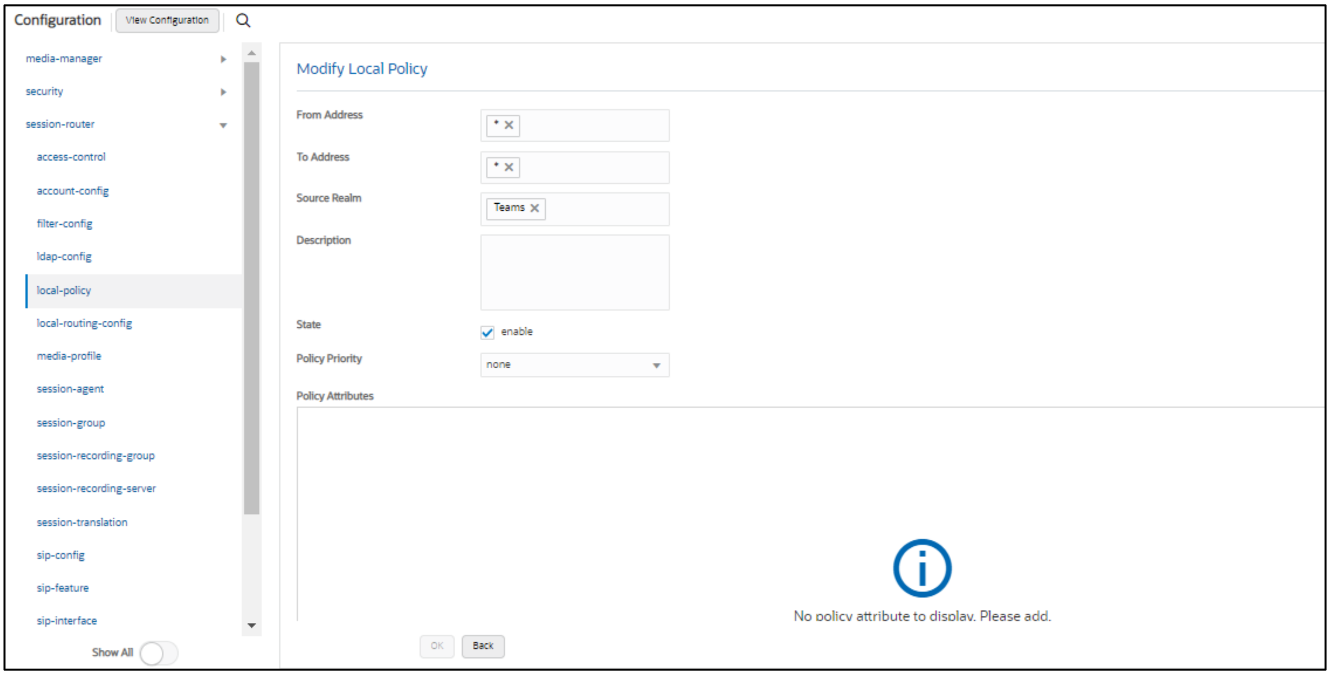
```
session-group
      group-name                         OperatorConnect
      dest                          sip-us.gcs.pstnhub.microsoft.com
                                  sip-eu.gcs.pstnhub.microsoft.com
                                  sip-as.gcs.pstnhub.microsoft.com
                                  sip-au.gcs.pstnhub.microsoft.com
```

- Perform a save and activate configuration for changes to take effect.

6.7 Routing Configuration

Now that a majority of the signaling, security and media configuration is in place, we can configure the SBC to route calls from one end of the network to the other. The SBC has multiple routing features that can be utilized, but for the purposes of this example configuration, we’ll configure local policies to route calls from Microsoft Teams to our Sip trunk, and vice versa…

GUI Path: session-router/local-policy



Modify Local Policy

From Address: * ✕

To Address: * ✕

Source Realm: Teams ✕

Description:

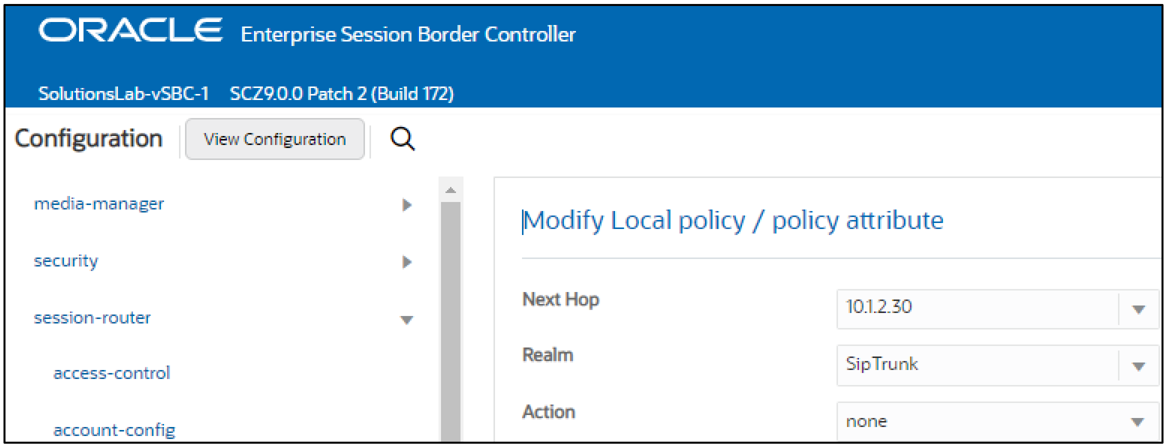
State: ☑ enable

Policy Priority: none

Policy Attributes

No policy attribute to display. Please add.

After entering values for to and from address and source realm, click Add under policy attribute to configure the next hop destination.



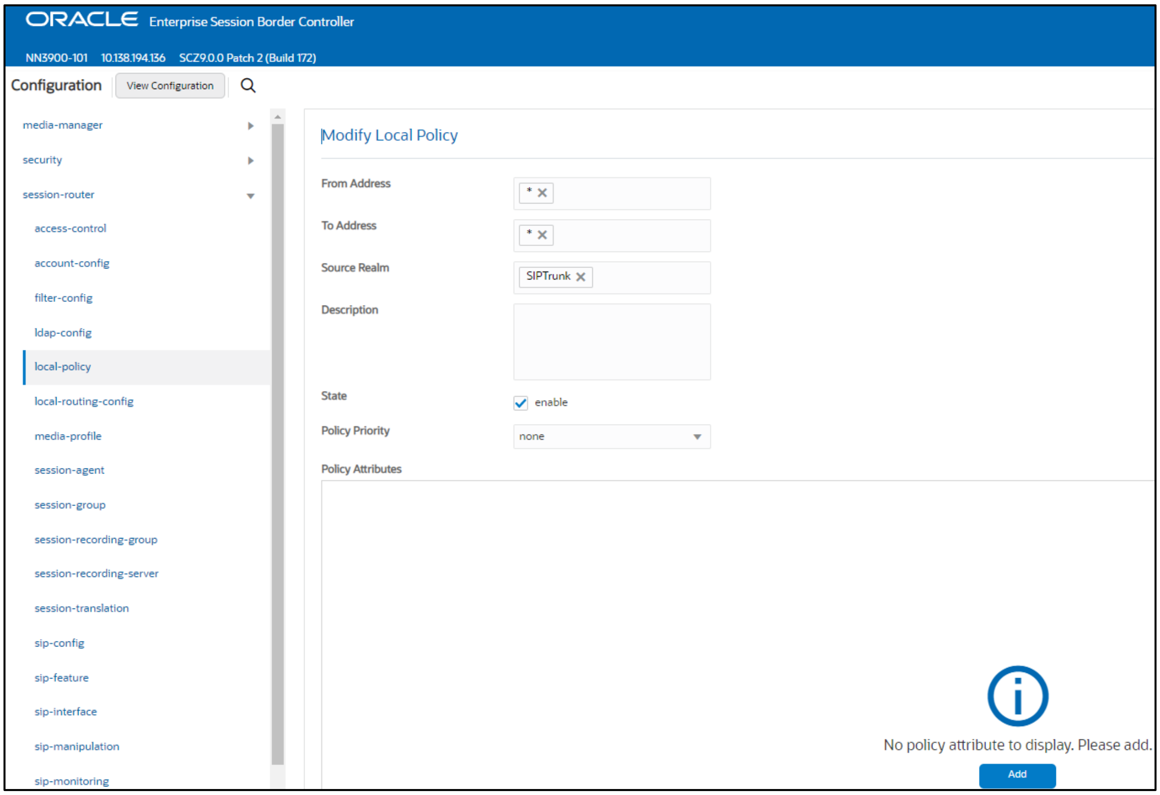
Modify Local policy / policy attribute

Next Hop: 10.1.2.30

Realm: SipTrunk

Action: none

Next, we’ll setup routing from our SIP Trunk to Microsoft Teams:



Modify Local Policy

From Address: * ×

To Address: * ×

Source Realm: SIPTrunk ×

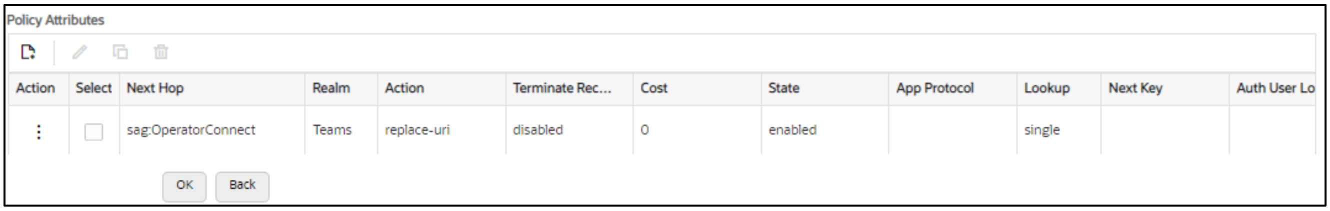
Description:

State: ☑ enable

Policy Priority: none

Policy Attributes

No policy attribute to display. Please add.



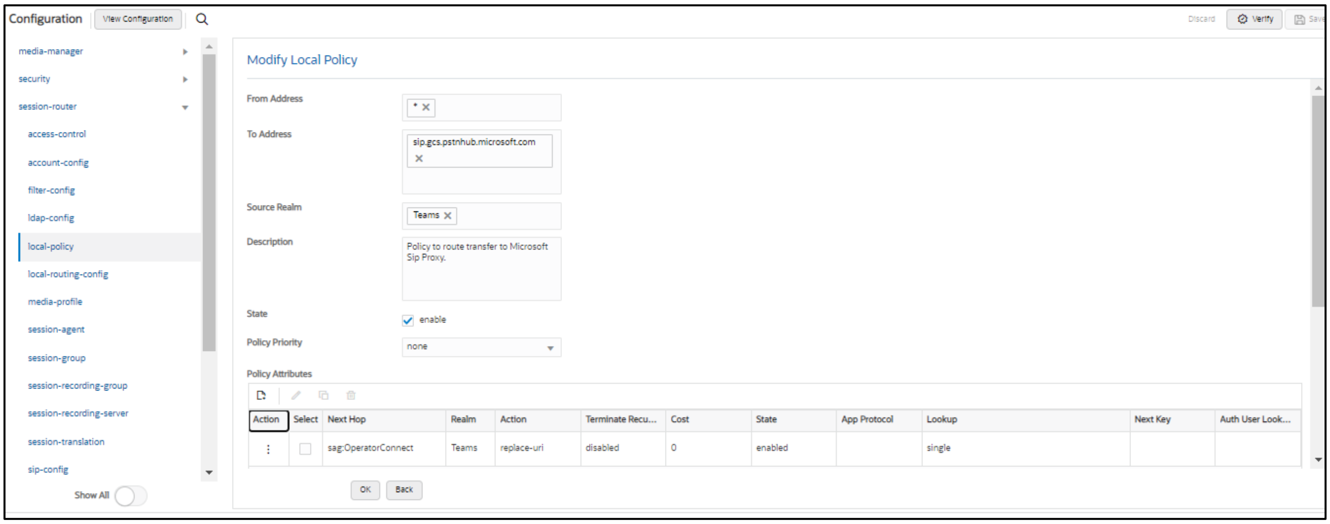
Policy Attributes

Action	Select	Next Hop	Realm	Action	Terminate Rec...	Cost	State	App Protocol	Lookup	Next Key	Auth User Lo
⋮	□	sag:OperatorConnect	Teams	replace-uri	disabled	0	enabled		single		

Select OK when applicable on each screen

Local Policy for Call Transfers -

All transfers that use an SIP Refer message must go through the Microsoft Teams infrastructure. When the Microsoft SIP proxy sends an SIP Refer message to the Oracle SBC, an SIP Invite message should be returned to the SIP proxy, not to PSTN or to any other destination. It is true even if the call is transferred to an external PSTN number. To accommodate this requirement, we can configure another routing policy on the Oracle SBC to ensure call Invites generated by the SBC off SIP REFER’s are routed properly.



Modify Local Policy

From Address: * ✕

To Address: sip.gcs.pstnhub.microsoft.com ✕

Source Realm: Teams ✕

Description: Policy to route transfer to Microsoft Sip Proxy.

State: ☑ enable

Policy Priority: none

Policy Attributes

Action	Select	Next Hop	Realm	Action	Terminate Recu...	Cost	State	App Protocol	Lookup	Next Key	Auth User Look...
⋮	□	sag:OperatorConnect	Teams	replace-uri	disabled	0	enabled		single		

To configure local policy from ACLI

ACLI Path: config t→session-router→local-policy

```
local-policy
        from-address                                    *
        to-address                                    *
        source-realm                                    SipTrunk
        description                                   Route calls from PSTN to Microsoft Teams Phone System Direct
Routing
        policy-attribute
                next-hop                                     sag:OperatorConnect
                realm                                      Teams
                action                                     replace-uri
local-policy
        from-address                                    *
        to-address                                    *
        source-realm                                    Teams
        description                                   Route Calls from Teams Phone System Direct Routing to PSTN
        policy-attribute
                next-hop                                     10.1.2.30
                realm                                      SipTrunk

local-policy
        from-address                                    *
        to-address                                    sip.gcs.pstnhub.microsoft.com
        source-realm                                    Teams
        policy-attribute
                next-hop                                     sag:OperatorConnect
                realm                                      Teams
                action                                     replace-uri
```

- Perform a save and activate configuration for changes to take effect.

6.8 SIP Access Controls

The Oracle Session Border Controller (SBC) family of products are designed to increase security when deploying Voice over IP (VoIP) or Unified Communications (UC) solutions. Properly configured, Oracle's SBC family helps protect IT assets, safeguard confidential information, and mitigate risks—all while ensuring the high service levels which users expect from the corporate phone system and the public telephone network.

Please note, DDOS values are specific to platform and environment. For more detailed information please refer to the Oracle Communications SBC Security Guide.

https://docs.oracle.com/en/industries/communications/session-border-controller/9.0.0/security/security-guide.pdf

However. While some values are environment specific, there are some basic security parameters that can be implemented on the SBC that will help secure your setup.

1. On all public facing interfaces, create Access-Controls to only allow sip traffic from trusted IP's with a trust level of high

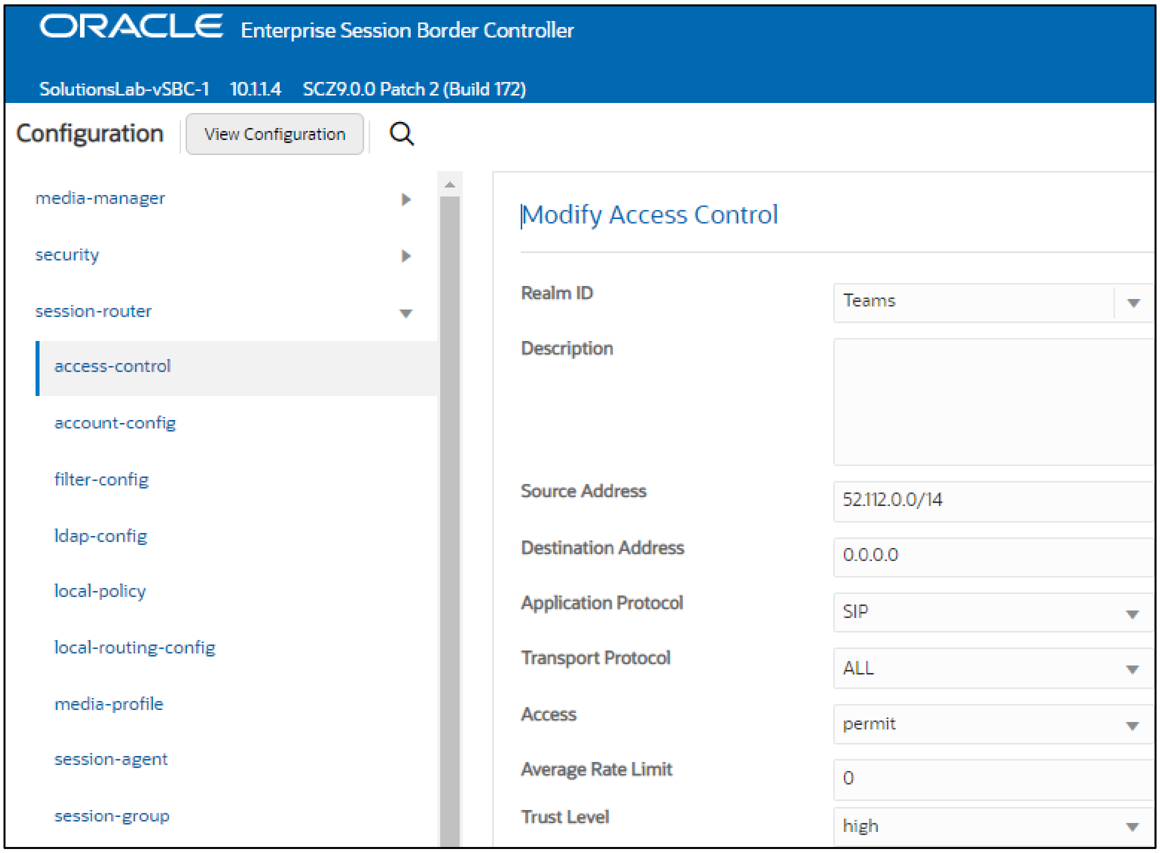
2. Set the access control trust level on public facing realms to HIGH

Microsoft Teams has two subnets, 52.112.0.0/14 and 52.120.0.0/14 that must be allowed to send traffic to the SBC. Both must be configured as an access control on the Oracle SBC and associated with the realm facing Teams.

Use this example to create ACL's for all MSFT Teams subnets. This example can be followed for any of the public facing interfaces, i.e., Sip Trunk, etc…

GUI Path: session-router/access-control

Use this example to create ACL's for both MSFT Teams subnets, 52.112.0.0/14, and 52.120.0.0/14.



Modify Access Control

Realm ID: Teams
Description:
Source Address: 52.112.0.0/14
Destination Address: 0.0.0.0
Application Protocol: SIP
Transport Protocol: ALL
Access: permit
Average Rate Limit: 0
Trust Level: high

- Select OK at the bottom

To configure access control from ACLI

ACLI Path: config t→session-router→access-control

```
access-control
        realm-id                      Teams
        source-address                      52.112.0.0/14
        application-protocol                 SIP
        trust-level                  high
access-control
        realm-id                      Teams
        source-address                      52.120.0.0/14
        application-protocol                 SIP
        trust-level                  high
access-control
        realm-id                      SipTrunk
        source-address                      68.68.117.67
        application-protocol                 SIP
        trust-level                  high
```

- Perform a save and activate configuration for changes to take effect.

This concludes the required configuration of the SBC to properly interface with Microsoft Teams Operator Connect.

7 Verify Connectivity

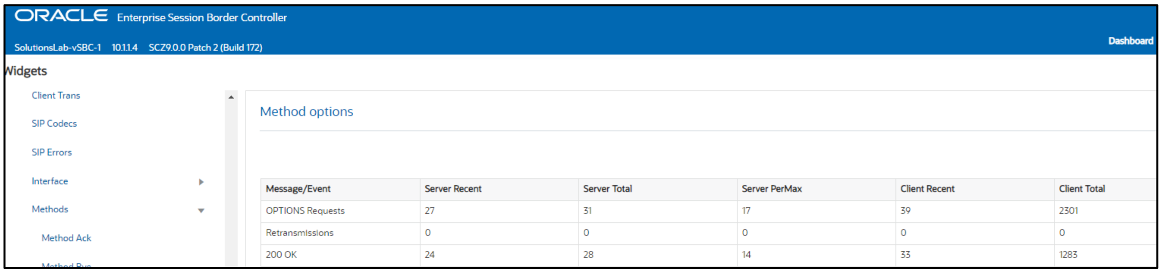
7.1 Oracle SBC Options Pings

While in the Oracle SBC GUI, Utilize the "Widgets" to check for OPTIONS to and from the SBC.

- At the top, click "Widgets"

This brings up the Widgets menu on the left hand side of the screen

GUI Path: Signaling/SIP/Method Options


ORACLE Enterprise Session Border Controller
SolutionsLab-vSBC-1 10.1.1.4 SCZ9.0.0 Patch 2 (Build 172)
Dashboard
Widgets
Client Trans
SIP Codecs
SIP Errors
Interface
Methods
Method Ack

Method options

Message/Event	Server Recent	Server Total	Server PerMax	Client Recent	Client Total
OPTIONS Requests	27	31	17	39	2301
Retransmissions	0	0	0	0	0
200 OK	24	28	14	33	1283

- Looking at both the **Server Recent** and **Client Recent**, verify the counters are showing OPTIONS Requests and 200OK responses.

8 Syntax Requirements for SIP Invite and SIP Options:

This section covers high-level requirements to SIP syntax of Invite and Options messages. The information can be used as a first step during troubleshooting when calls don't go through. From our experience most of the issues are related to the wrong syntax of SIP messages.

Microsoft includes a customer header - **X-MS-TenantId**: that contains the specific customer's O365 Tenant ID. This is used to differentiate different customers transiting within the SBC configured as Trunk for Operator Connect.

Note: The information is masked in the below example for security purpose.

8.1 Terminology

- Recommended – not required, but to simplify the troubleshooting, it is recommended to configure as in examples as follow
- Must – strict requirement, the system does not work without the configuration of these parameters

8.2 Requirements for INVITE Messages and Final Responses.

Contact Header-Invite and Final Response

- Must have the FQDN sub-domain of the Oracle SBC.
- **Syntax: Contact: <phone number>@< subdomain FQDN >:<SBC Port>;<transport type>**

Picture 1 Example of an Inbound INVITE from Microsoft and 200OK message response from the SBC.

```
INVITE sip:+17813496949@telechat.o-
test06161977.com:5061;user=phone;transport=tls SIP/2.0
FROM: Synergy
User1<sip:+17814437240@sip.gcs.pstnhub.microsoft.com:5061;user=phone>;tag=220aa9
537af94492aa6b7f32098a9bff
TO: <sip:+17813496949@telechat.o-test06161977.com:5061;user=phone>
CSEQ: 1 INVITE
CALL-ID: 42fdbe39728f5b73a124af7481009dea
MAX-FORWARDS: 70
VIA: SIP/2.0/TLS 52.115.0.35:5061;branch=z9hG4bKa618de9d
RECORD-ROUTE: <sip:sip-eu.gcs.pstnhub.microsoft.com:5061;transport=tls;lr>
CONTACT: <sip:api-du-b-jawe.pstnhub.microsoft.com:443;x-i=3a449007-a3fa-40a4-
b0d1-ecaa2f648b15;x-
c=42fdbe39728f5b73a124af7481009dea/d/28/55de76a681a34c2ca8e51a5f6dd97ceb>
CONTENT-LENGTH: 652
MIN-SE: 300
SUPPORTED: timer
USER-AGENT: Microsoft.PSTNHub.SIPProxy v.2021.5.28.7 i.EUWE.0
CONTENT-TYPE: application/sdp
ALLOW: INVITE,ACK,OPTIONS,CANCEL,BYE,NOTIFY
SESSION-EXPIRES: 1800
X-MS-TenantId: XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

```
SIP/2.0 200 Ok
FROM: Synergy
User1<sip:+17814437240@sip.gcs.pstnhub.microsoft.com:5061;user=phone>;tag=220aa9
537af94492aa6b7f32098a9bff
TO: <sip:+17813496949@telechat.o-
test06161977.com:5061;user=phone>;tag=12ff15510a030100
CSEQ: 1 INVITE
CALL-ID: 42fdbe39728f5b73a124af7481009dea
VIA: SIP/2.0/TLS 52.115.0.35:5061;branch=z9hG4bKa618de9d
Record-Route: <sip:sip-eu.gcs.pstnhub.microsoft.com:5061;transport=tls;lr>
Contact: <sip:+17813496949@telechat.o-
test06161977.com:5061;user=phone;transport=tls>;sip.ice
Allow: ACK, BYE, CANCEL, INVITE, OPTIONS, PRACK, REFER
Server: T7100/1.0
Content-Type: application/sdp
```

Picture 2 Example of an Outbound INVITE from Oracle SBC and 200OK message response from Microsoft.

```
INVITE sip:17814437243@sip-
us.gcs.pstnhub.microsoft.com:5061;user=phone;transport=tls SIP/2.0
Via: SIP/2.0/TLS 20.65.42.129:5061;branch=z9hG4bKbv84u130a0ploamklum0.1
Max-Forwards: 53
From: <sip:+918130313388@telechat.o-
test06161977.com:5060;user=phone>;tag=1f3d2cf80a020100
To: <sip:+17814437243@20.110.144.248:5060;user=phone>
Call-ID: 1-1f3d2cf80a020100.4e254b4f@68.68.117.67
CSeq: 2 INVITE
Contact: <sip:+918130313388@telechat.o-
test06161977.com:5061;user=phone;transport=tls>;sip.ice
Allow: ACK, BYE, CANCEL, INVITE, OPTIONS, PRACK, REFER
User-Agent: T7100/3.0
Supported: 100rel,replaces
Content-Type: application/sdp
Content-Length: 465
X-MS-SBC: Oracle/VM/8.4.0p10
```

```
SIP/2.0 200 OK
FROM: <sip:+918130313388@telechat.o-
test06161977.com:5060;user=phone>;tag=1f3d2cf80a020100
TO:
<sip:+17814437243@20.110.144.248:5060;user=phone>;tag=c428e41bffffffff441c10fdf2
9ff1d1
CSEQ: 2 INVITE
CALL-ID: 1-1f3d2cf80a020100.4e254b4f@68.68.117.67
VIA: SIP/2.0/TLS 10.1.4.4:5061;branch=z9hG4bKbv84u130a0ploamklum0.1
RECORD-ROUTE: <sip:sip-us.gcs.pstnhub.microsoft.com:5061;transport=tls;lr>
CONTACT: <sip:api-du-a-usea.pstnhub.microsoft.com:443;x-i=5b91f474-e551-4193-
aafd-3402ebf9515a;x-
c=460859ece4ce5d59b176f00581a1415c/s/1/853ad12525314f64ae4677a23afdc208>
CONTENT-LENGTH: 1285
CONTENT-TYPE: application/sdp
ALLOW: INVITE,ACK,OPTIONS,CANCEL,BYE,NOTIFY
SERVER: Microsoft.PSTNHub.SIPProxy v.2022.2.14.2 i.USEA.4
X-MS-TenantId: XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```

8.3 Requirements for SIP Options.

Below are the Microsoft requirements for SIP Options Message.

- The SBC MUST support the SIP OPTIONS method and respond to an incoming SIP OPTIONS request based on RFC 3261.
- The SBC MUST NOT respond with SIP/2.0 405 Method Not Supported or 215 SIP/2.0 501 Not Implemented.
- The OPTIONS pings from SBC MUST NOT exceed a frequency of one transaction every 60 seconds for each configured trunk and MUST NOT be more less frequent than one 229 transaction every 180 seconds for each configured trunk.
- Microsoft will not initiate OPTIONS pings to SBC until it receives OPTIONS pings from the SBC.
- The CONTACT header MUST contain the FQDN of the trunk and MUST specify both the port and protocol (e.g., 5061 and TLS)
- **Syntax: Contact: <phone number>@< subdomain FQDN >:<SBC Port>;<transport type>**
- Microsoft will not include the ACCEPT header and will ignore any body text in the response.

Picture 3 - Example of SIP OPTIONS message from Oracle SBC to Microsoft.

```
OPTIONS sip:sip-us.gcs.pstnhub.microsoft.com:5061;transport=tls SIP/2.0
Via: SIP/2.0/TLS 20.65.42.129:5061;branch=z9hG4bKdik4l8206025aqb9v510
Call-ID: c75cbb319998591b44c2c7e20e8f717b0000g30@10.1.4.4
To: sip:ping@sip-us.gcs.pstnhub.microsoft.com
From: sip:ping@telechat.o-test06161977.com;tag=bba52bd57d6bd688fde828d05f2a71830000g30
Max-Forwards: 70
CSeq: 7 OPTIONS
Contact: sip:ping@telechat.o-test06161977.com:5061;transport=tls;sip.ice
Expires: 60
Route: sip:52.115.54.0:5061;transport=tls;lr
X-MS-SBC: Oracle/VM/8.4.0p10
Content-Length: 0
```

Picture 4 - Example of SIP OPTIONS message from Microsoft to Oracle SBC.

```
OPTIONS sip:ping@telechat.o-test06161977.com:5061;transport=tls SIP/2.0
FROM: <sip:sip-us.gcs.pstnhub.microsoft.com:5061>;tag=89a53e30-276b-4596-a761-0ac7c919a859
TO: <sip:ping@telechat.o-test06161977.com>
CSEQ: 1 OPTIONS
CALL-ID: 92542534-cad5-4501-a418-b9f6304bf45b
MAX-FORWARDS: 70
VIA: SIP/2.0/TLS 52.115.54.0:5061;branch=z9hG4bK728aa3f0
CONTACT: <sip:sip-us.gcs.pstnhub.microsoft.com:5061>
CONTENT-LENGTH: 0
USER-AGENT: Microsoft.PSTNHub.SIPProxy v.2022.2.14.2 i.USEA.3
ALLOW: INVITE,ACK,OPTIONS,CANCEL,BYE,NOTIFY
```

9 Appendix A

9.1 Oracle SBC TDM with Teams

Oracle® designed the Time Division Multiplexing (TDM) functionality for companies planning to migrate from TDM to SIP trunks by using a hybrid TDM-SIP infrastructure, rather than adopting VoIP-SIP as their sole means of voice communications. The TDM interface on the Oracle® Session Border Controller (SBC) provides switchover for egress audio calls, when the primary SIP trunk becomes unavailable. You can use TDM with legacy PBXs and other TDM devices.

- Only the Acme Packet 1100 and the Acme Packet 3900 platforms support TDM, which requires the optional TDM card.
- TDM supports bidirectional calls as well as unidirectional calls.
- TDM operations require you to configure TDM Config and TDM Profile, as well as local policies for inbound and outbound traffic.
- The software upgrade procedure supports the TDM configuration.
- Options for the Acme Packet 1100 and the Acme Packet 3900 platforms include CallingLine Identification Presentation (CLIP) and Connected-Line Identification Presentation (COLP).
- Options for the Acme Packet 1100 platform include the four-port Primary Rate Interface (PRI), the Euro ISDN Basic Rate Interface (BRI), and the Foreign Exchange OfficeForeign Exchange Subscriber (FXO-FXS) card.

9.1.1 Interface Requirements

- PRI—Digium1TE133F single-port or Digium 1TE435BF four-port card.
- BRI—Digium 1B433LF four-port card
- FXS—Digium 1A8B04F eight-port card, green module (ports 1-4)
- FXO—Diguim 1A8B04F eight-port card, red module (ports 5-8)

Oracle SBC Time Division Multiplexing (TDM) functionality has been fully tested with Microsoft Teams Phone System Direct Routing.

For further information on the setup and configuration of TDM on the Oracle SBC, please refer to the TDM Configuration Guide

10 Appendix B

10.1 Oracle SBC deployed behind NAT

The Support for SBC Behind NAT SPL plug-in changes information in SIP messages to hide the end point located inside the private network.

The specific information that the Support for SBC Behind NAT SPL plug-in changes depends on the direction of the call, for example, from the NAT device to the SBC or from the SBC to the NAT device.

Configure the Support for SBC Behind NAT SPL plug-in for each SIP interface that is connected to a NAT device. One public-private address pair is required for each SIP interface that uses the SPL plug-in, as follows.

- The private IP address must be the same IP as configured on both the SIP Interface and Steering Pool
- The public IP address must be the public IP address of the NAT device

Here is an example configuration with SBC Behind NAT SPL config.

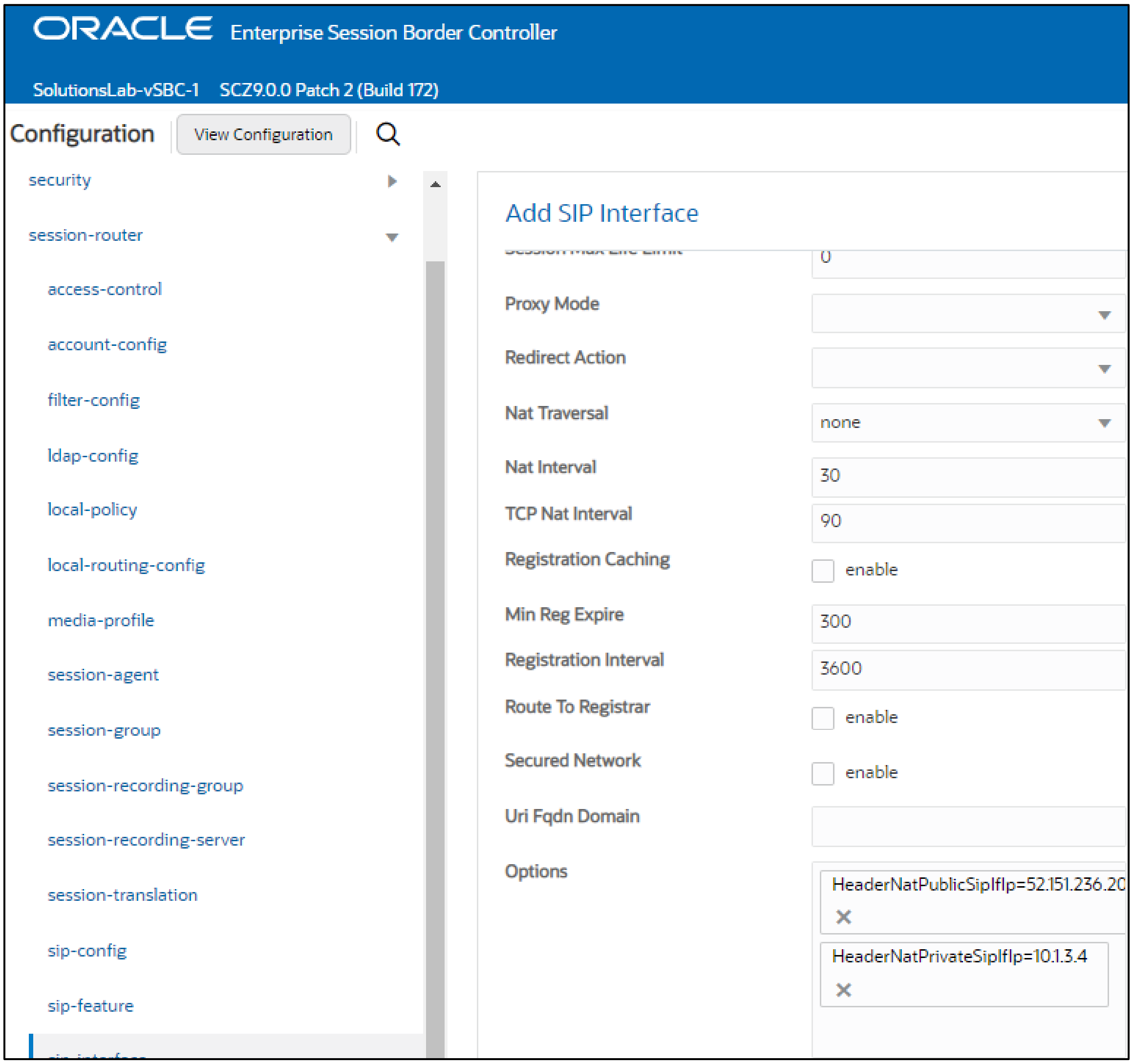
The SPL is applied to the Teams side SIP interface.

GUI Path: session-router/sip-interface

HeaderNatPublicSipIfIp=52.151.236.203,HeaderNatPrivateSipIfIp=10.1.3.4

HeaderNatPublicSipIfIp is the public interface ip

HeaderNatPrivateSipIfIp is the private ip.



Proxy Mode

Redirect Action

Nat Traversal: none

Nat Interval: 30

TCP Nat Interval: 90

Registration Caching: □ enable

Min Reg Expire: 300

Registration Interval: 3600

Route To Registrar: □ enable

Secured Network: □ enable

Uri Fqdn Domain

Options: HeaderNatPublicSipIfIp=52.151.236.20 ✕ HeaderNatPrivateSipIfIp=10.1.3.4 ✕

To configure header NAT SPL from ACLI

ACLI Path: config t→session-router→sip-interface

Choose the sip interface on which the header NAT SPL needs to be applied. Under spl-options add the entry as per example shared below.

```
spl-options
HeaderNatPublicSipIfIp=20.110.144.248,HeaderNatPrivateSipIfIp=10.1.2.4
```

- Perform a save and activate configuration for changes to take effect.

You will need to apply these options to every sip interface on the SBC that is connected through a NAT.

10.2 Ring back on Inbound Calls to Teams and Early Media

In certain deployments, on certain call flows, PSTN callers may experience silence on inbound calls to Microsoft Teams instead of an expected ring back tone.

When Teams receives an INVITE, after sending a 183 with SDP response back to the Oracle SBC, Teams does not play ring back. Microsoft's expectation is the Oracle SBC will signal appropriately to the Sip Trunk in order for local ring back to be generated.

To properly signal the trunk to play the ring back, the SBC presents a 180 Ringing response to the trunk instead of the 183 Session Progress received from Teams.

In order to accommodate the 183 with SDP message that signal early media in cases of simultaneous ringing set to IVR, etc.… we inspect the SDP of the 183 received before converting it to 180 Ringing.

If the SDP of the 183 does not contain the IP address of SBC (which is the case when Teams clients have simultaneous ringing set to IVRs), we use a sip manipulation to strip the SDP from the 183. Next, we convert the 183 response to a 180 Ringing before forwarding it to the Sip Trunk.

Due to the complexity of this sip manipulation, the SBC ACLI output has been provided.

GUI Path: Session Router/sip-manipulation

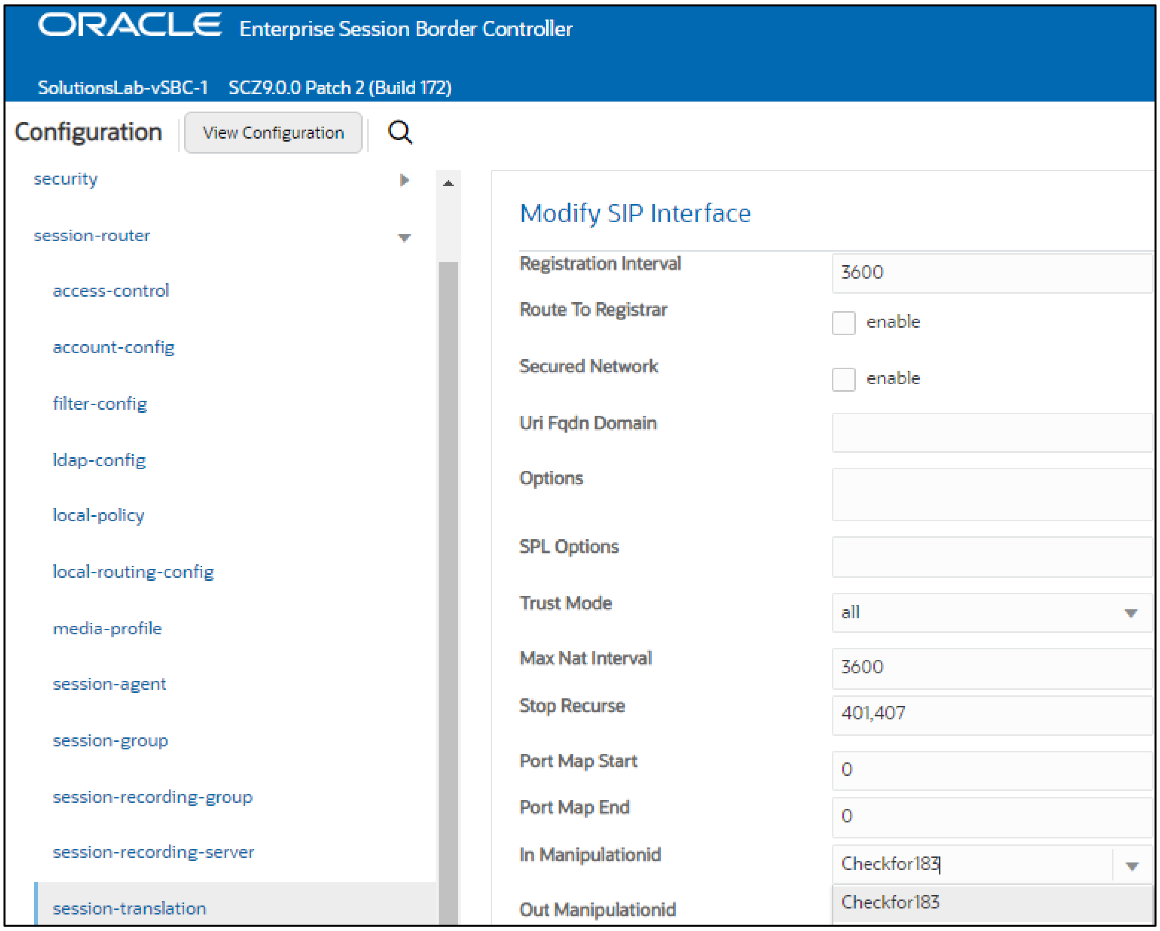
ACLI Path: config t→session-router→sip-manipulation

This sip manipulation will be applied as the in-manipulation on the Teams Sip Interface.

```
sip-manipulation
    name                        Checkfor183
    header-rule
        name                        check183
        header-name                    @status-line
        action                     manipulate
        msg-type                     reply
        methods                      Invite
        element-rule
            name                        is183
            type                       status-code
            action                     store
            comparison-type                 pattern-rule
            match-value                   183
    mime-sdp-rule
        name                        if183
        msg-type                     reply
        methods                      Invite
        action                     manipulate
        comparison-type                 boolean
        match-value                   $check183.$is183
        sdp-session-rule
            name                        au
            action                     manipulate
            sdp-line-rule
                name                        checkclineforsbcip
                type                      c
                action                     store
                comparison-type                 pattern-rule
                match-value                   ^(.(?!(10.1.3.4))).*$
    mime-sdp-rule
        name                        delete183SDP
        msg-type                     reply
        methods                      Invite
        action                     delete
        comparison-type                 boolean
        match-value                   $if183.$au.$checkclineforsbcip
    header-rule
        name                        change183to180
        header-name                    @status-line
        action                     manipulate
        comparison-type                 boolean
        match-value                   $if183.$au.$checkclineforsbcip
        element-rule
            name                        changestatus
            type                       status-code
            action                     replace
            match-value                   183
            new-value                    180
        element-rule
            name                       changereasonphrase
            type                       reason-phrase
            action                     replace
            match-value                Session Progress
           new-value                   Ringing
```

This sip manipulation will be applied as the In Manipulationid on the Teams Sip Interface:

GUI Path: Session Router/Sip Interface



Modify SIP Interface

Registration Interval	3600
Route To Registrar	□ enable
Secured Network	□ enable
Uri Fqdn Domain	
Options	
SPL Options	
Trust Mode	all
Max Nat Interval	3600
Stop Recurse	401,407
Port Map Start	0
Port Map End	0
In Manipulationid	Checkfor183
Out Manipulationid	Checkfor183

To apply the sip manipulation on the Teams sip interface from ACLI

ACLI Path: config t→session-router→sip-interface

Put the sip manipulation on the ‘in-manipulationid’ configuration object.

```
in-manipulationid                    Checkfor183
```

- Perform a save and activate configuration for changes to take effect.

10.3 Oracle SBC Local Media Playback

10.3.1 Ring back on Transfer

During a call transfer initiated by Microsoft Teams, the calling party does not hear a ring back tone while the Oracle SBC is acting on the sip REFER received from Microsoft. In order to avoid this period of silence, we utilize the Oracle SBC’s local playback feature.

Once configured, the Oracle SBC has the ability to generate ring back upon receipt of the sip REFER from Microsoft.

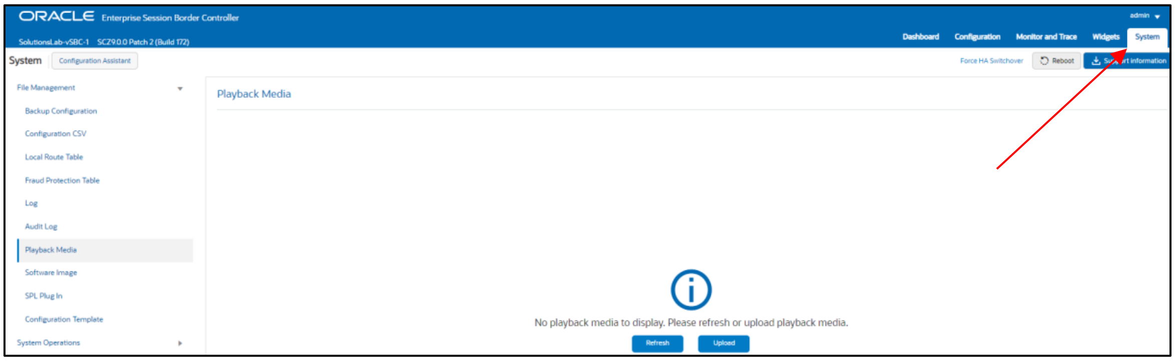
First, you must create a media file.

10.3.1.1 Media Files

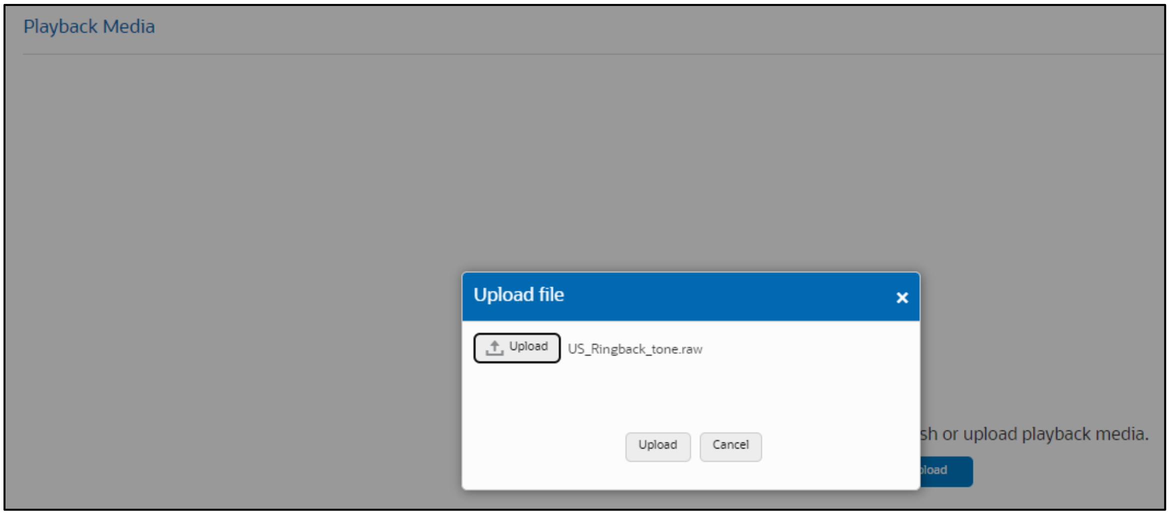
Media files of ringback tones are uploaded to /code/media to the Oracle SBC. This file differs based on your media generation method and must be raw media binary. For Transcoding based RBT, ensure that the files RAW PCM 16-bit MONO samples, sampled at 8-khz encapsulated with little-endian formatting and cannot exceed 4.8 MB.

Next, upload the file to the /code/media directory on the Oracle SBC.

GUI Path: System/Playback Media/Upload



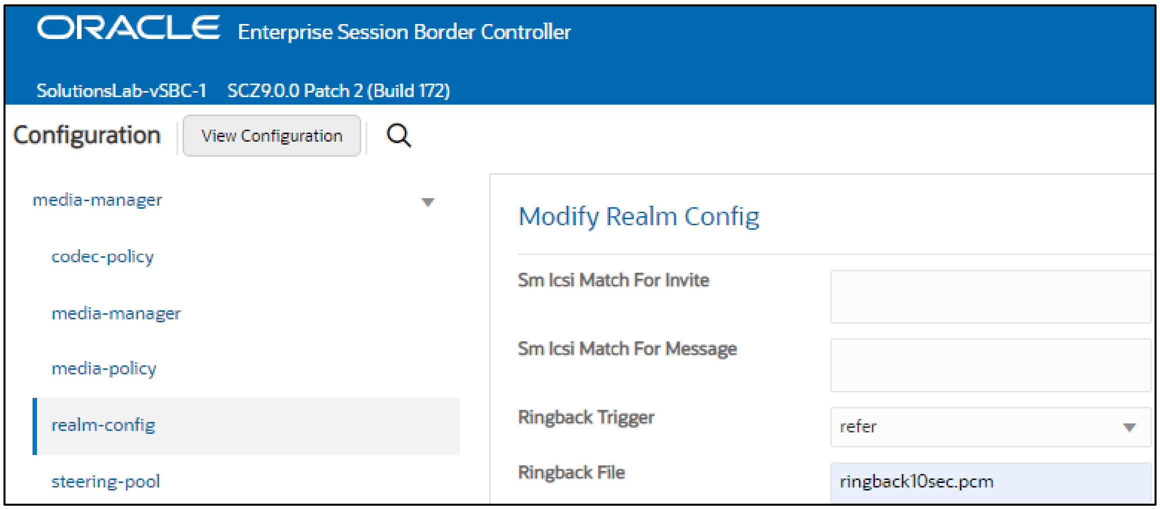
No playback media to display. Please refresh or upload playback media.



US_Ringback_tone.raw

Lastly, we'll assign this file to the realm facing PSTN, and set the trigger for the SBC to generate local ringback toward PSTN:

GUI Path: media manager/realm-config



Modify Realm Config

Sm Icsi Match For Invite

Sm Icsi Match For Message

Ringback Trigger: refer

Ringback File: ringback10sec.pcm

- Select OK at the bottom and save and activate your configuration.

To assign the ring back file on the realm through ACLI, navigate to below path and provide the name of the ringback file at the Ringback File config object.

ACLI Path: config t→media-manager→realm-config

in-manipulationid	Checkfor183

- Perform a save and activate configuration for changes to take effect.

11 ACLI Running Configuration

Below is a complete output of the running configuration used to create this application note. This output includes all of the configuration elements used in our examples, including some of the optional configuration features outlined throughout this document. Be aware that not all parameters may be applicable to every Oracle SBC setup, so please take this into consideration if planning to copy and paste this output into your SBC.

```
 certificate-record
        name                                Baltimore Root
        common-name                                Baltimore CyberTrust Root
certificate-record
        name                                DigiCertRoot
        common-name                                DigiCert Global Root CA
certificate-record
        name                                 DigiCertGlobalRootG2
        common-name                                  DigiCertGlobalRootG2
certificate-record
        name                                SBCCertificateforTeams
        state                              California
        locality                           Redwood City
        organization                           Oracle Corporation
        unit                              Oracle CGBU-LABS BOSTON
        common-name                                telechat.o-test06161977.com
certificate-record
        name                                WebServerInstance
        state                              California
        locality                           Redwood City
        organization                           Oracle Corporation
        unit                              Oracle CGBU-LABS BOSTON
        common-name                                managementcertificate
codec-policy
        name                                 SipTrunkCodecs
        allow-codecs                            PCMU G729 telephone-event
        add-codecs-on-egress                         PCMU
codec-policy
        name                                addCN
        allow-codecs                           *
        add-codecs-on-egress                     CN
http-server
        name                                webServerInstance
        http-state                          disabled
        https-state                          enabled
        tls-profile                        WebServerInstance

local-policy
        from-address                           *
        to-address                           *
        source-realm                           SipTrunk
        description                          Route calls from PSTN to Microsoft Teams Phone System Direct Routing
        policy-attribute
                next-hop                         sag:OperatorConnect
                realm                          Teams
                action                         replace-uri
local-policy
        from-address                           *
        to-address                           *
        source-realm                           Teams
        description                          Route Calls from Teams Phone System Direct Routing to PSTN
        policy-attribute
                next-hop                         10.1.2.30
                realm                          SipTrunk
```

```
local-policy
        from-address                        *
        to-address                        sip.gcs.pstnhub.microsoft.com
        source-realm                        Teams
        policy-attribute
                next-hop                        sag:OperatorConnect
                realm                         Teams
                action                        replace-uri
media-manager
        options                         audio-allow-asymmetric-pt
                                     xcode-gratuitous-rtcp-report-generation
media-profile
        name                            CN
        subname                            wideband
        payload-type                        118
media-profile
        name                            SILK
        subname                            narrowband
        payload-type                        103
        clock-rate                        8000
media-profile
        name                            SILK
        subname                            wideband
        payload-type                        104
        clock-rate                        16000
media-sec-policy
        name                            PSTNNonSecure
media-sec-policy
        name                            TeamsMediaSecurity
        inbound
                profile                        TeamsSRTP
                mode                            srtp
                protocol                        sdes
        outbound
                profile                        TeamsSRTP
                mode                            srtp
                protocol                        sdes

network-interface
        name                            s0p0
        ip-address                        10.1.2.4
        netmask                            255.255.255.0
        gateway                            10.1.2.1
network-interface
        name                            s1p0
        ip-address                        10.1.3.4
        netmask                            255.255.255.0
        gateway                            10.1.3.1
ntp-config
        server                        216.239.35.0
phy-interface
        name                            s0p0
        operation-type                      Media
phy-interface
```

```
            name                            s1p0
        operation-type                      Media
        slot                        1
realm-config
        identifier                          SipTrunk
        description                         Realm facing PSTN
        network-interfaces                  s0p0:0.4
        mm-in-realm                         enabled
media-sec-policy                    PSTNNonSecure
        access-control-trust-level          high
        codec-policy                        SipTrunkCodecs
        ringback-trigger                    refer
        ringback-file                       ringback10sec.pcm
realm-config
        identifier                          Teams
        description                         Realm facing Teams
        network-interfaces                  s1p0:0.4
        mm-in-realm                         enabled
        media-sec-policy                    TeamsMediaSecurity
        rtcp-mux                            enabled
        ice-profile                         ice
        teams-fqdn                          telechat.o-test06161977.com
        teams-fqdn-in-uri                   enabled
        sdp-inactive-only                   enabled
        access-control-trust-level          high
        codec-policy                        addCN
        rtcp-policy                         rtcpGen
rtcp-policy
        name                                rtcpGen
        rtcp-generate                       all-calls
sdes-profile
        name                                TeamsSRTP
        lifetime                            31
session-agent
        hostname                            10.1.2.30
        ip-address                          10.1.2.30
        realm-id                            SipTrunk
        ping-method                         OPTIONS
        ping-interval                       30
        ping-response                       enabled
session-agent
        hostname                            sip-as.gcs.pstnhub.microsoft.com
        port                        5061
        transport-method                    StaticTLS
        realm-id                            Teams
        ping-method                         OPTIONS
        ping-interval                       60
        ping-response                       enabled
        refer-call-transfer                 enabled
session-agent
        hostname                            sip-au.gcs.pstnhub.microsoft.com
        port                        5061
```

```
        transport-method                StaticTLS
        realm-id                        Teams
```

```
        ping-method                     OPTIONS
        ping-interval                   60
        ping-response                   enabled
        refer-call-transfer             enabled
session-agent
        hostname                        sip-eu.gcs.pstnhub.microsoft.com
        port                            5061
        transport-method                StaticTLS
realm-id                        Teams
        ping-method                     OPTIONS
        ping-interval                   60
        ping-response                   enabled
        refer-call-transfer             enabled
session-agent
        hostname                        sip-us.gcs.pstnhub.microsoft.com
        port                            5061
        transport-method                StaticTLS
        realm-id                        Teams
        ping-method                     OPTIONS
        ping-interval                   60
        ping-response                   enabled
        refer-call-transfer             enabled
session-group
        group-name                      OperatorConnect
        dest                            sip-us.gcs.pstnhub.microsoft.com
                                        sip-eu.gcs.pstnhub.microsoft.com
                                        sip-as.gcs.pstnhub.microsoft.com
                                        sip-au.gcs.pstnhub.microsoft.com
        sag-recursion                   enabled
        stop-sag-recurse                401,407,480
sip-config
        home-realm-id                   Teams
        options                         max-udp-length=0
        allow-pani-for-trusted-only     disabled
        add-ue-location-in-pani         disabled
        npli-upon-register              disabled
sip-feature
        name                            replaces
        realm                           Teams
        require-mode-inbound            Pass
       require-mode-outbound            Pass
sip-interface
        realm-id                        SipTrunk
        sip-port
                address                         10.1.2.4
                allow-anonymous                 agents-only
sip-interface
        realm-id                        Teams
        sip-port
                address                         10.1.3.4
                port                            5061
```

```
               transport-protocol        TLS
        tls-profile           TeamsTLSProfile
 allow-anonymous            all
    in-manipulationid         Checkfor183
    sip-profile            forreplaces
sip-manipulation
    name                   Checkfor183
    header-rule
        name                   check183
        header-name               @status-line
        action                manipulate
msg-type                reply
        methods                 Invite
        element-rule
            name                   is183
            type                  status-code
            action                store
            comparison-type            pattern-rule
            match-value              183
    mime-sdp-rule
        name                   if183
        msg-type                reply
        methods                 Invite
        action                manipulate
        comparison-type            boolean
        match-value              $check183.$is183
        sdp-session-rule
            name                   au
            action                manipulate
            sdp-line-rule
                name                   checkclineforsbcip
                type                  c
                action                 store
                comparison-type            pattern-rule
                match-value              ^(.(?!(10.1.3.4))).*$
    mime-sdp-rule
        name                   delete183SDP
        msg-type                reply
        methods                 Invite
        action                delete
        comparison-type            boolean
        match-value              $if183.$au.$checkclineforsbcip
    header-rule
        name                   change183to180
        header-name               @status-line
        action                manipulate
        comparison-type            boolean
        match-value              $if183.$au.$checkclineforsbcip
        element-rule
            name                   changestatus
            type                  status-code
            action                replace
            match-value              183
```

```
                new-value                       180
            element-rule
```

```
                name                            changereasonphrase
                type                            reason-phrase
                action                          replace
                match-value                     Session Progress
                new-value                       Ringing
sip-profile
        name                            forreplaces
        replace-dialogs                 enabled
steering-pool
        ip-address                      10.1.2.4
        start-port                      20001
        end-port                        40000
        realm-id                        SipTrunk
steering-pool
        ip-address                      10.1.4.4
        start-port                      10000
        end-port                        20000
        realm-id                        Teams
system-config
        hostname                        oraclesbc.com
        description                     SBC connecting PSTN Sip Trunk to Microsoft Operator Connect
        location                        Burlington, MA
        transcoding-cores               1
tls-global
        session-caching                 enabled
        diffie-hellman-key-size         DH_KeySize_2048
tls-profile
        name                            TeamsTLSProfile
        end-entity-certificate          SBCCertificateforTeams
trusted-ca-certificates                 BaltimoreRoot
        mutual-authenticate             enabled
tls-profile
        name                            WebServerInstance
        end-entity-certificate          WebServerInstance
        trusted-ca-certificates         BaltimoreRoot
                                        DigiCertRoot
```

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