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Configuring the Oracle SBC with Microsoft Teams Direct Routing Media Bypass - Enterprise Model

Technical Application Note

Disclaimer

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Revision History

Version	Description of Changes	Date Revision Completed
1.0	Added Web GUI	12-09-2019
2.0	Added bug fixes for ACMESOLU-106	21-10-2019

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Introduction

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

About Microsoft Teams Direct Routing

Microsoft Teams Direct Routing allows a customer provided SBC to connect to Microsoft Phone System. The customer provided SBC can be connected to almost any telephony trunk or interconnect 3rd party PSTN equipment. The scenario allows:

- Use virtually any PSTN trunk with Microsoft Phone System;
- Oracle Enterprise Session Border Controllers are Microsoft certified to work for Direct Routing. Additional information can be found at

https://docs.microsoft.com/en-us/microsoftteams/direct-routing-border-controllers

Planning Direct Routing

If you are planning to configure direct routing with Oracle SBC , you must ensure that the following prerequisites are completed before proceeding further

- Tenant requirements
- Licensing and other requirements
- SBC domain names
- Public trusted certificate for the SBC
- SIP Signaling: FQDNs

Tenant Requirements

Make sure that you have a custom domain on your O365 tenant. Likewise create an account, which is not the default domain created for your tenant. For more information https://docs.microsoft.com/en-us/microsoftteams/direct-routing-plan#sbc-domain-names

Licensing Requirements

Make sure that the following license requirements are met by the Direct routing users.(ie the users must be assigned the following licenses in Office 365)

- Microsoft Phone System
- Microsoft Teams + Skype for Business Plan 2 if included in Licensing Sku

DNS Requirements

Create DNS records for domains in your network that resolve to your SBC .
Before you begin, make sure that you have the following per every SBC you want to pair:

- Public IP address
- FQDN name resolving to the Public IP address

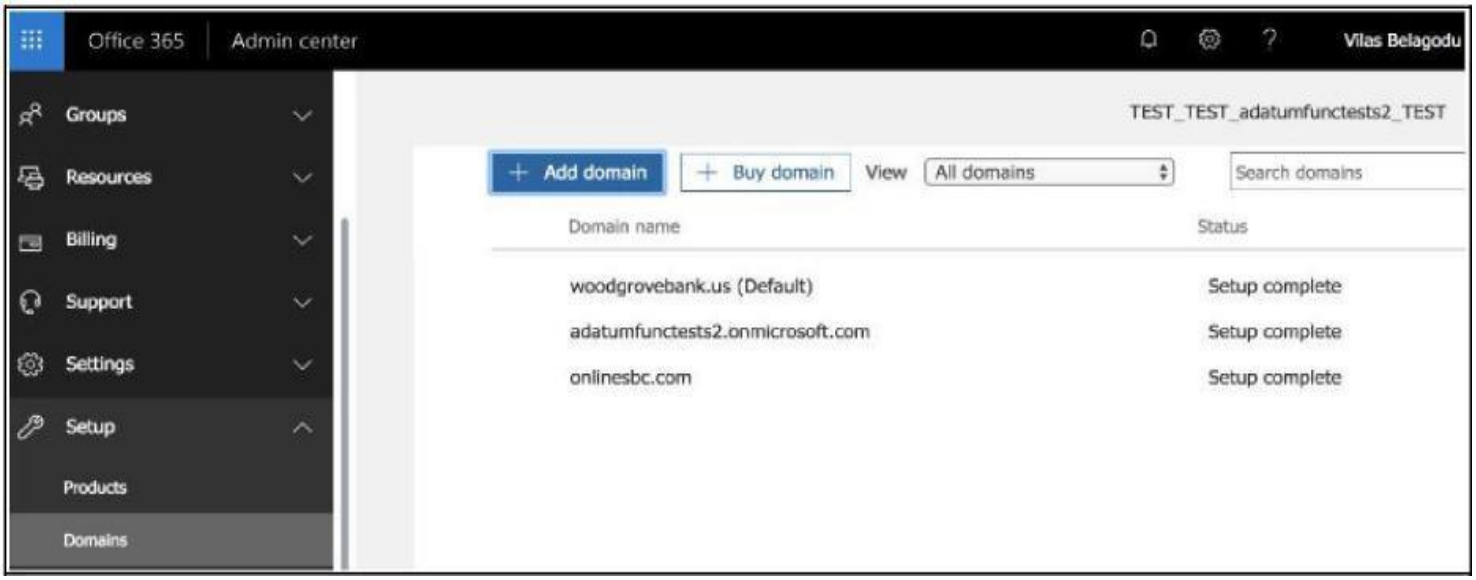
SBC Domain Names

The SBC domain name must be from one of the names registered in "Domains" of the tenant. You cannot use the *.onmicrosoft.com tenant for the domain name.

For example, on the picture below, the administrator registered the following DNS names for the tenant:

DNS Name	Can be used for SBC FQDN	Examples of FQDN names
woodgrovebank.us	Yes	Valid names: • sbc1.woodgrovebank.us; • ussbcs15.woodgrovebank.us • europe.woodgrovebank.us Non-Valid name: • sbc1.europe.woodgrovebank.us (requires registering domain name europe.atatum.biz in "Domains" first)
woodgrovebankus.onmicrosoft.com	No	Using *.onmicrosoft.com domains is not supported for SBC names
hybrdvoice.org	Yes	Valid names: • sbc1. hybridvoice.org • ussbcs15. hybridvoice.org • europe. hybridvoice.org Non-Valid name: • sbc1.europe.hybridvoice.org (requires registering domain name europe. hybridvoice.org in "Domains" first)

Please activate and register the domain of tenant.



In this document the following FQDN and IP is used as an example:

Public IP	FQDN Name
155.212.214.173	Oracleesbc.woodgrovebank.us

Public trusted certificate for the SBC

It is necessary to setup a public trusted certificate for direct routing. This certificate is used to establish TLS connection between Oracle SBC and MS Teams. The certificate needs to have the SBC FQDN in the subject, common name, or subject alternate name fields. For root certificate authorities used to generate SBC certificate ,refer Microsoft documentation. https://docs.microsoft.com/en-us/microsoftteams/direct-routing-plan#public-trusted-certificate-for-the-sbc

Configure Direct Routing

The SBC has to be paired with the Direct routing interface for direct routing to work. To achieve this follow the below steps

Establish a remote PowerShell session to Skype for Business Online

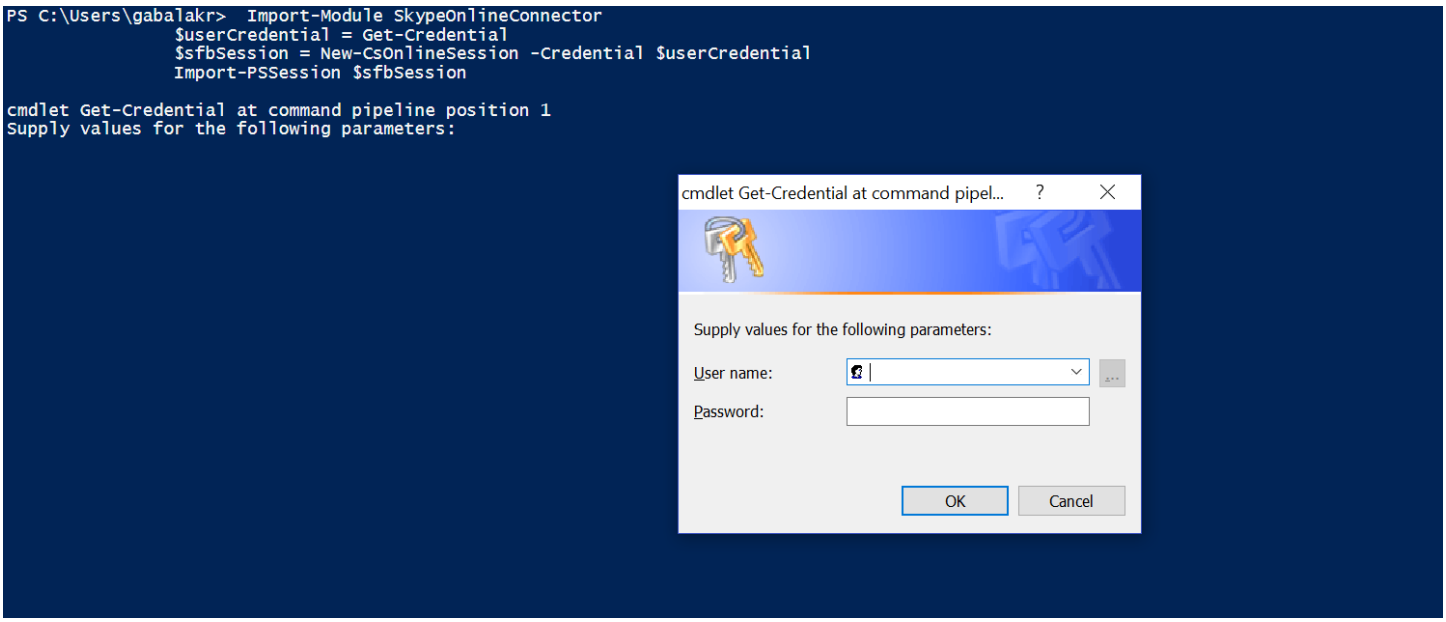
The first step is to download Microsoft PowerShell .For more information and downloading the client, visit Microsoft's website https://docs.microsoft.com/en-us/SkypeForBusiness/set-up-your-computer-for-windows-powershell/set-up-your-computer-for-windows-powershell.

To establish a remote connection ,follow the below steps

- Open PowerShell and type in the below commands
- Import-Module SkypeOnlineConnector
- $userCredential = Get-Credential
- $sfbSession = New-CsOnlineSession -Credential $userCredential
- Import-PSSession $sfbSession

```
PS C:\Users\gabalakr> Import-Module SkypeOnlineConnector
                      $userCredential = Get-Credential
                      $sfbSession = New-CsOnlineSession -Credential $userCredential
                      Import-PSSession $sfbSession
```

- PowerShell prompts for a username and password. Enter the tenant username and password .Tenants are used in pairing the SBC with the direct routing interface.



```
PS C:\Users\gabalakr>  Import-Module SkypeOnlineConnector
               $userCredential = Get-Credential
               $sfbSession = New-CsOnlineSession -Credential $userCredential
               Import-PSSession $sfbSession
cmdlet Get-Credential at command pipeline position 1
Supply values for the following parameters:

ModuleType Version    Name                          ExportedCommands
---------- -------    ----                          ----------------
Script     1.0        tmp_fcnyz43x.w0h              {Clear-CsOnlineTelephoneNumberReservation, ConvertTo-JsonForPSWS, Disable-CsMeetingRoom, Disable-CsOnlineDia...
```

- Now the remote connection is established. Check whether the remote connection is proper by using the below command
  "Get-Command *onlinePSTNGateway*"
  The command will return the four functions shown here that will let you manage the SBC.

```
PS C:\Users\gabalakr> Get-Command *onlinePSTNGateway*

CommandType     Name                                               Version    Source
-----------     ----                                               -------    ------
Function        Get-CsOnlinePSTNGateway                            1.0        tmp_fcnyz43x.w0h
Function        New-CsOnlinePSTNGateway                            1.0        tmp_fcnyz43x.w0h
Function        Remove-CsOnlinePSTNGateway                         1.0        tmp_fcnyz43x.w0h
Function        Set-CsOnlinePSTNGateway                            1.0        tmp_fcnyz43x.w0h
```

Pair the SBC to tenant

To pair SBC to the tenant, type the command as shown below. Here the FQDN used is oraclesbc.woodgrovebank.us

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

For more information ,please visit the Microsoft documentation here:

https://docs.microsoft.com/en-us/microsoftteams/direct-routing-configure#connect-to-skype-for-business-online-by-using-powershell

```
PS C:\WINDOWS\system32> New-CsOnlinePSTNGateway -Fqdn oracleesbc2.woodgrovebank.us -SipSignallingPort 5061 -MaxConcurrentSessions 500 -MediaBypass $true
```

After pairing, we can check whether the SBC is present in the list of paired SBC's by typing in the command:

Get-CsOnlinePSTNGateway -Identity oracleesbc2.woodgrovebank.us

The details of the gateway are listed when the above command is entered.
Verify whether the enabled parameter is set to true.
The OPTIONS ping from the SBC is now responded with 200OK.Once there are incoming options to the direct routing interface, it starts sending OPTIONS to the SBC.

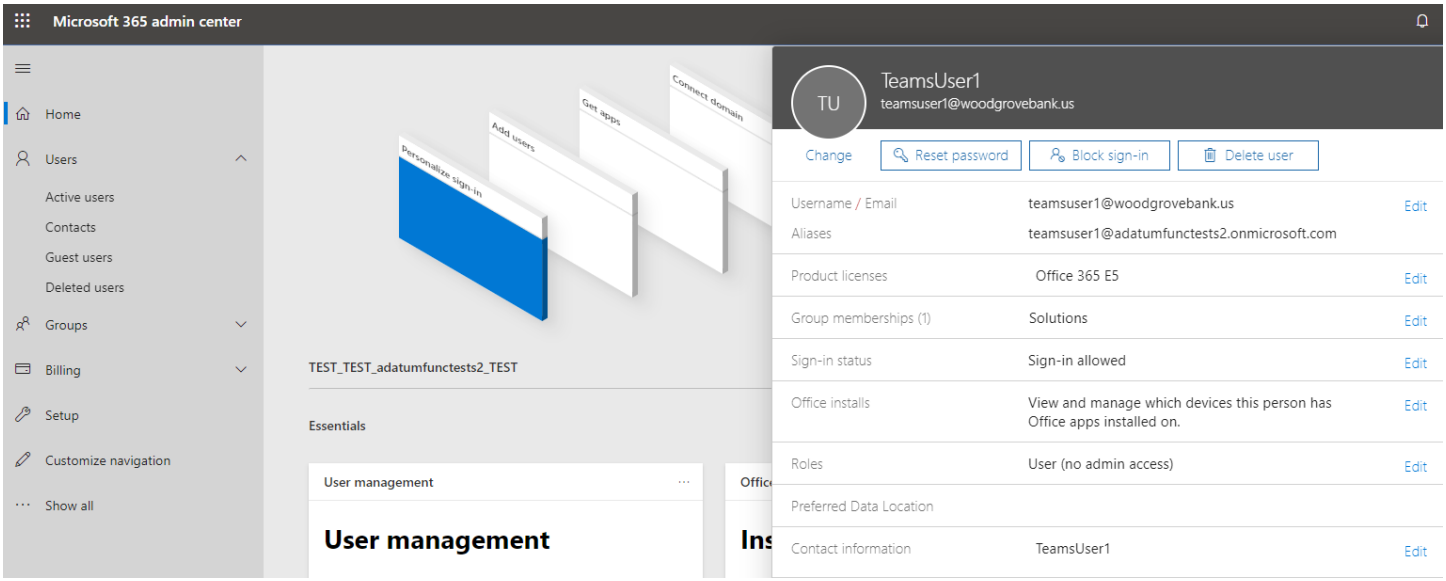
```
Identity                          : oracleesbc2.woodgrovebank.us
Fqdn                              : oracleesbc2.woodgrovebank.us
SipSignallingPort                 : 5061
FailoverTimeSeconds               : 10
ForwardCallHistory                : True
ForwardPai                        : True
SendSipOptions                    : True
MaxConcurrentSessions             :
Enabled                           : True
MediaBypass                       : True
GatewaySiteId                     :
GatewaySiteLbrEnabled             : False
FailoverResponseCodes             : 408,503,504
GenerateRingingWhileLocatingUser  : True
PidfLoSupported                   : False
MediaRelayRoutingLocationOverride :
ProxySbc                          :
BypassMode                        : None
```

Enable users for Direct Routing

To add users, create a user in Office 365 and assign a license. Here the following user is created: teamsuser1@woodgrovebank.us

Here the following license is added

- Office 365 Enterprise E5 (including SfB Plan2, Exchange Plan2, Teams, and Phone System)



Verify whether the user is homed in Skype for business Online by issuing the below command in PowerShell

“Get-CsOnlineUser -Identity "<User name>" | fl RegistrarPool”

Here the “infra.lync.com” verifies that the user is homed.

```
PS C:\WINDOWS\system32> Get-CsOnlineUser -Identity teamsuser1 | fl RegistrarPool

RegistrarPool : sippoolsn23a15.infra.lync.com
```

Assign a phone number to the user

After creating a user, a phone number and voice mail has to be assigned through Powershell. Enter the below command for assigning a phone number.

Set-CsUser -Identity "<User name>" -EnterpriseVoiceEnabled $true -HostedVoiceMail $true -OnPremLineURI tel:<E.164 phone number>

```
PS C:\WINDOWS\system32> set-CSuser -Identity teamsuser1 -EnterpriseVoiceEnabled $true -HostedVoiceMail $true -OnPremLineURI tel:+17814437383
```

The phone number used has to be configured as a full E.164 phone number with country code.

Configure Voice Routing

Voice Routing is performed by the direct routing Interface based on the following elements

- Voice Routing Policy
- PSTN Usages
- Voice Routes
- Online PSTN Gateway

Here is an example to configure routes ,PSTN usage, voice routing policy and assigning the policy to user.

1. Create the PSTN Usage "US and Canada".

```
PS C:\Users\gabalakr> Set-CsOnlinePstnUsage -Identity Global -Usage @{Add="US and Canada"}
```

2. Verify this by executing the command below

```
PS C:\Users\gabalakr> Get-CSOnlinePSTNUsage


Identity : Global
Usage    : {US and Canada}



PS C:\Users\gabalakr>
```

3. Configure voice route as shown below. Here all calls are routed to the same SBC.This is achieved by using -NumberPattern ".*"

Set-CsOnlineVoiceRoute -id "Bedford 1" -NumberPattern ".*" -OnlinePstnGatewayList oracleesbc2.woodgrovebank.us–Priority 1

```
PS C:\WINDOWS\system32> Set-CSOnlineVoiceRoute -id "Oracle_US" -NumberPattern ^(\+1[0-9]{10})$ -OnlinePstnGatewayList oracleesbc2.woodgrovebank.us -Priority 1
```

4.Verify the configuration by typing in the following command Get-CsOnlineVoiceRoute

```
Identity              : Oracle_US
Priority              : 3
Description           :
NumberPattern         : ^(\+1[0-9]{10})$
OnlinePstnUsages      : {Oracle_US}
OnlinePstnGatewayList : {sbc2.customers.telechat.o-test06161977.com, oracleesbc2.woodgrovebank.us}
Name                  : Oracle_US
```

5. Create a Voice Routing Policy "US Only" and add to the policy the PSTN Usage "US and Canada.".Use the following command

New-CsOnlineVoiceRoutingPolicy "US Only" -OnlinePstnUsages "US and Canada"

This can be verified through the following command.

```
PS C:\Users\gabalakr> Get-CsOnlineVoiceRoutingPolicy


Identity          : Global
OnlinePstnUsages  : {}
Description       :
RouteType         :

Identity          : Tag:US Only
OnlinePstnUsages  : {US and Canada}
Description       :
RouteType         : BYOT
```

6. Grant to user teamsuser1 a voice routing policy by using PowerShell

```
PS C:\WINDOWS\system32> Grant-CsOnlineVoiceRoutingPolicy -Identity "teamsuser1" -PolicyName "US Only"
```

7. Validate the same using the PowerShell command as shown below

```
PS C:\Users\gabalakr> Get-CsOnlineVoiceRoutingPolicy


Identity          : Global
OnlinePstnUsages  : {}
Description       :
RouteType         :

Identity          : Tag:US Only
OnlinePstnUsages  : {US and Canada}
Description       :
RouteType         : BYOT
```

Microsoft Teams Direct Routing Interface characteristics

Table 1 contains the technical characteristics of the Direct Routing Interface. Microsoft, in most cases, uses RFC standards as a guide during the development. However, Microsoft does not guarantee interoperability with SBCs even if they support all the parameters in table 1 due to specifics of implementation of the standards by SBC vendors. Microsoft has a partnership with some SBC vendors and guarantees their device's interoperability with the interface. All validated devices are listed on Microsoft's site. Microsoft only supports the validated devices to connect to Direct Routing Interface. Oracle is one of the vendors who have a partnership with Microsoft.

Ports and IP	SIP Interface FQDN Name	Refer to Microsoft documentation	
	IP Addresses range for SIP interfaces	Refer to Microsoft documentation	
	SIP Port	5061	
	IP Address range for Media	Refer to Microsoft documentation	
	Media port range on Media Processors	Refer to Microsoft documentation	
	Media Port range on the client	Refer to Microsoft documentation	
Transport and Security	SIP transport	TLS	
	Media Transport	SRTP	
	SRTP Crypto Suite	AES_CM_128_HMAC_SHA1_80, non-MKI	DTLS-SRTP is not supported
	Control protocol for media transport	SRTCP (SRTCP-Mux recommended)	Using RTCP mux helps reduce number of required ports
	Supported Certification Authorities	Refer to Microsoft documentation	
	Transport for Media Bypass	ICE-lite (RFC5245) – recommended, • Client also has Transport Relays	
Codecs	Audio codecs	• G711 • G722 • Silk (Teams clients) • Opus (WebRTC clients) - Only if Media Bypass is used; • G729	
	Other codecs	• DTMF – Required • Events 0-16 • CN o Required narrowband and wideband • RED – Not required • Silence Suppression – Not required	

Requirements to SIP messages “Invite” and “Options”

Microsoft Teams Hybrid Voice Connectivity interface has requirements for the syntax of SIP messages.

The 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.

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

Requirements for “INVITE” messages syntax

Picture 1 Example of INVITE message

```
INVITE sip:+17814437382@sip.pstnhub.microsoft.com:5061;user=phone;transport=tls SIP/2.0
Via: SIP/2.0/TLS 155.212.214.172:5061;branch=z9hG4bKndcs1720d08dhhs5s8g0.1
Max-Forwards: 45
From:<sip:+17657601680@oracleesbc2.woodgrovebank.us:5060;user=phone>;tag=af50c97a0a020200
To: <sip:+17814437382@sip.pstnhub.microsoft.com:5060;user=phone>
Call-ID: 1-af50c97a0a020200.2e95886d@68.68.117.67
CSeq: 2 INVITE
Contact:<sip:7657601680@oracleesbc2.woodgrovebank.us:5061;user=phone;transport=tls>;sip.ice
Allow: ACK, BYE, CANCEL, INVITE, OPTIONS, PRACK, REFER
User-Agent: Oracle ESBC
Supported: 100rel,replaces
Content-Type: application/sdp
```

1. **Request-URI**
   The recommendation is to set the Global FQDN name of the direct routing, in URI hostname when sending calls to Hybrid Voice Connectivity interface.
   Syntax: INVITE sip: <phone number>@<Global FQDN > SIP/2.0
2. **From and To headers**
   Must: When placing calls to Teams Hybrid Voice Connectivity Interface “FROM” header MUST have SBC FQDN in URI hostname:
   Syntax: From:sip: <phone number>@<FQDN of the SBC>;tag=....
   If the parameter is not set correctly, the calls are rejected with “403 Forbidden” message.

Recommended: When placing calls to Teams Hybrid Voice Connectivity Interface "To" header have SBC FQDN in URI hostname of the Syntax: To: INVITE sip: <phone number>@<FQDN of the SBC>

3. **Contact**

   Must have the SBC FQDN for media negotiation. Syntax: Contact: <phone number>@<FQDN of the SBC>:<SBC Port>;<transport type>

   The above requirements are automatically fulfilled in the referenced build of the software.

Requirements for "OPTIONS" messages syntax

Picture 2 Example of OPTIONS message

```
OPTIONS sip:sip.pstnhub.microsoft.com:5061;transport=tls SIP/2.0
Via: SIP/2.0/TLS 155.212.214.172:5061;branch=z9hG4bKk5ilpo00cobbgo9614h0
Call-ID: 98980084af15b946c779c9873165808f020000khp2@155.212.214.172
To: sip:ping@sip.pstnhub.microsoft.com
From: <sip:ping@oracleSBC2.woodgrovebank.us>;tag=db4ec94e7d8227d305c068e7a408a6a0000khp2
Max-Forwards: 70
CSeq: 6835 OPTIONS
Route: <sip:52.114.132.46:5061;lr>
Content-Length: 0
Contact: <sip:ping@oracleSBC2.woodgrovebank.us:5061;transport=tls>
Record-Route: <sip:oracleSBC2.woodgrovebank.us>
```

1. **From header**

   When sending OPTIONS to Teams Hybrid Voice Connectivity Interface "FROM" header MUST have SBC FQDN in URI hostname:

   Syntax: From: sip: <phone number>@<FQDN of the SBC>;tag=....

   If the parameter is not set correctly, the OPTIONS are rejected with "403 Forbidden" message.

2. **Contact.**

   When sending OPTIONS to Teams Hybrid Voice Connectivity Interface "Contact" header should have SBC FQDN in URI hostname along with Port & transport parameter set to TLS.

   Syntax: Contact: sip: <FQDN of the SBC:port;transport=tls> If the parameter is not set correctly, outbound OPTIONS won't be sent by Teams

The above requirements are automatically fulfilled in the referenced build of the software.

Validated Oracle version

Oracle conducted tests with Oracle SBC SCZ8.3 software – this software with the configuration listed below can run on any of the following products:

- AP 1100
- AP 3900
- AP 4600
- AP 6350
- AP 6300
- VME

Here Release SCZ830p7 is the software version used.Please upgrade to SCZ830p7 before configuring Oracle SBC for MS Teams.

Configuring the SBC

This chapter provides step-by-step guidance on how to configure Oracle SBC for interworking with Microsoft Teams Direct Routing Interface with Media Bypass.

What is Media Bypass

Media bypass shortens the path of media traffic and reduces the number of hops in transit for better performance. With media bypass, media is kept between the Session Border Controller (SBC) and the client instead of sending it via the Microsoft Phone System. For more information on media bypass ,please read Microsoft's documentation here. https://docs.microsoft.com/en-us/microsoftteams/direct-routing-plan-media-bypass

The Figure 1 below shows the connection topology example.

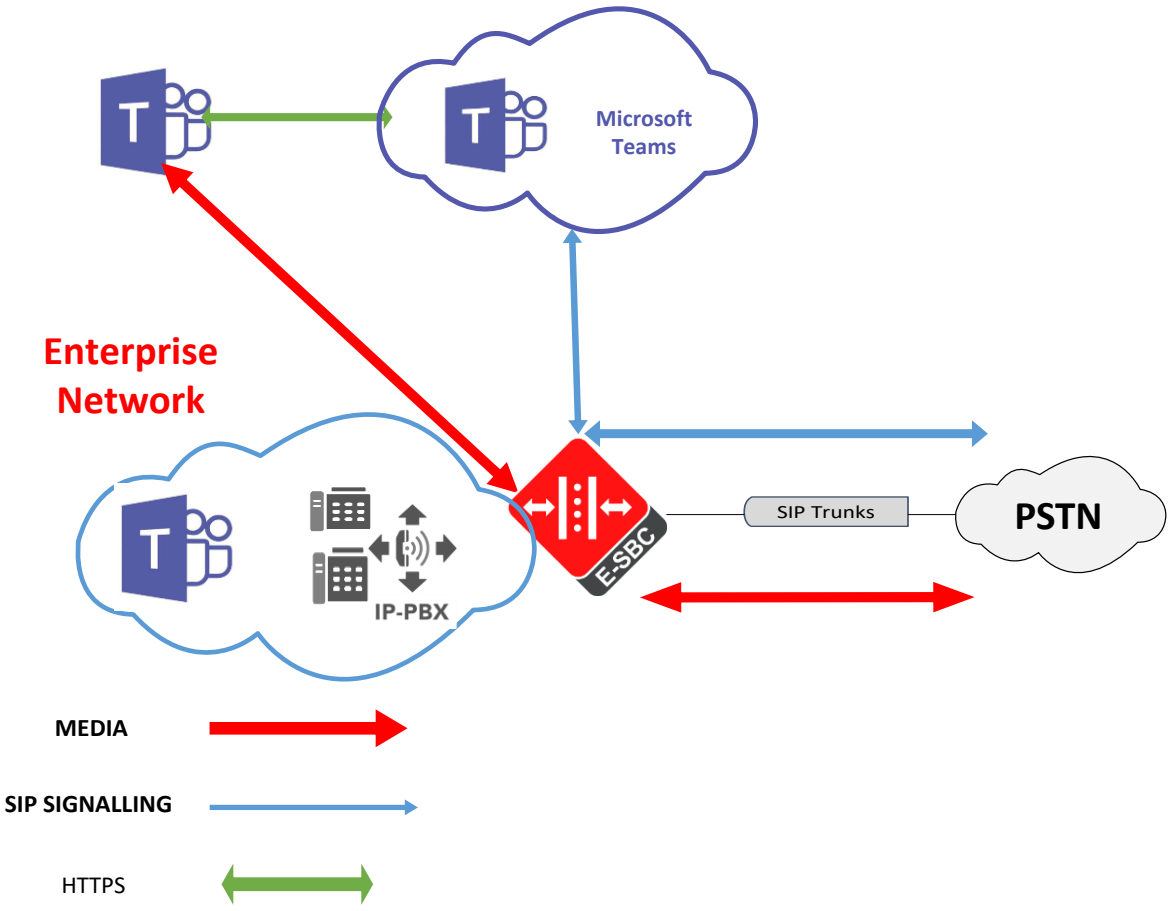


Figure :1: Signaling & media flow with media-bypass enabled

There are several connection entities on the picture:

- Enterprise network consisting of an IP-PBX and Teams client
- Microsoft Teams Direct Routing Interface on the WAN
- SIP trunk from a 3rd party provider on the WAN

These instructions cover configuration steps between the Oracle SBC and Microsoft Teams Direct Routing Interface. The interconnection of other entities, such as connection of the SIP trunk, 3rd Party PBX and/or analog devices are not covered in this instruction. The details of such connection are available in other instructions produced by the vendors of retrospective components.

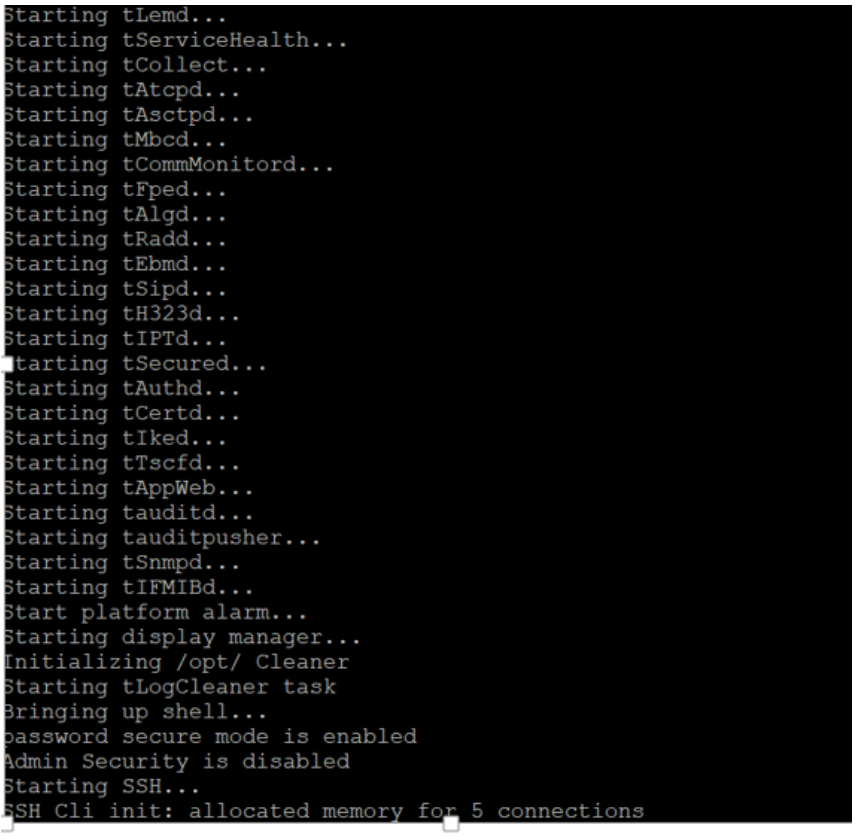
New SBC configuration

If the customer is looking to setup a new SBC from scratch with Microsoft teams, please follow the section below.

Establishing a serial connection to the SBC

Connect one end of a straight-through Ethernet cable to the front console port (which is active by default) on the SBC and the other end to console adapter that ships with the SBC, connect the console adapter (a DB-9 adapter) to the DB-9 port on a workstation, running a terminal emulator application such as PuTTY. Start the terminal emulation application using the following settings:

- Baud Rate=115200
- Data Bits=8
- Parity=None
- Stop Bits=1
- Flow Control=None



Power on the SBC and confirm that you see the following output from the boot-up sequence

Enter the default password to log in to the SBC. Note that the default SBC password is “acme” and the default super user password is “packet”.

Both passwords have to be changed according to the rules shown below.

```
Password:
%
% Only alphabetic (upper or lower case), numeric and punctuation
% characters are allowed in the password.
% Password must be 8 - 64 characters,
% and have 3 of the 4 following character classes :
%      - lower case alpha
%      - upper case alpha
%      - numerals
%      - punctuation
%
Enter New Password:
Confirm New Password:

Password is acceptable.
```

Now set the management IP of the SBC by setting the IP address in bootparam.to access bootparam. Go to Configure terminal->bootparam.

Note: There is no management IP configured by default.

```
PE-6300-1(configure)# bootparam

'.' = clear field;  '-' = go to previous field;  q = quit

Boot File               : /boot/nnSCZ830p7.bz
IP Address              : 172.18.255.115
VLAN                    :
Netmask                 : 255.255.0.0
Gateway                 : 172.18.0.1
IPv6 Address            :
IPv6 Gateway            :
Host IP                 :
FTP username            : vxftp
FTP password            : vxftp
Flags                   :
Target Name             : PE-6300-1
Console Device          : COM1
Console Baudrate        : 115200
Other                   :

NOTE: These changed parameters will not go into effect until reboot.
Also, be aware that some boot parameters may also be changed through
PHY and Network Interface Configurations.

PE-6300-1(configure)#
```

Setup product type to Enterprise Session Border Controller as shown. To configure product type, type in setup product in the termianl

```
PE-6300-1# setup product

---------------------------------------------------------------
WARNING:
Alteration of product alone or in conjunction with entitlement
changes will not be complete until system reboot

Last Modified 2019-09-11 13:57:32
---------------------------------------------------------------
 1 : Product         : Enterprise Session Border Controller
```

Enable the features for the ESBC using the setup entitlements command as shown

```
Entitlements for Enterprise Session Border Controller
Last Modified: Never
-------------------------------------------------------------
 1 : Session Capacity                    : 0
 2 :   Advanced                          :
 3 : Admin Security                      :
 4 : Data Integrity (FIPS 140-2)         :
 5 : Transcode Codec AMR Capacity        : 0
 6 : Transcode Codec AMRWB Capacity      : 0
 7 : Transcode Codec EVRC Capacity       : 0
 8 : Transcode Codec EVRCB Capacity      : 0
 9 : Transcode Codec EVS Capacity        : 0
 10: Transcode Codec OPUS Capacity       : 0
 11: Transcode Codec SILK Capacity       : 0

Enter 1 - 11 to modify, d' to display, 's' to save, 'q' to exit. [s]: 1

  Session Capacity (0-128000)            : 500

Enter 1 - 11 to modify, d' to display, 's' to save, 'q' to exit. [s]: 3

*************************************************************
CAUTION: Enabling this feature activates enhanced security
functions. Once saved, security cannot be reverted without
resetting the system back to factory default state.
*************************************************************
  Admin Security (enabled/disabled)      :

Enter 1 - 11 to modify, d' to display, 's' to save, 'q' to exit. [s]: 5

  Transcode Codec AMR Capacity (0-102375)       : 50

Enter 1 - 11 to modify, d' to display, 's' to save, 'q' to exit. [s]: 2

    Advanced (enabled/disabled)          : enabled

Enter 1 - 11 to modify, d' to display, 's' to save, 'q' to exit. [s]: 10

  Transcode Codec OPUS Capacity (0-102375)      : 50

Enter 1 - 11 to modify, d' to display, 's' to save, 'q' to exit. [s]: 11

  Transcode Codec SILK Capacity (0-102375)      : 50
```

Save the changes and reboot the SBC.

```
  Transcode Codec SILK Capacity (0-102375)      : 50

Enter 1 - 11 to modify, d' to display, 's' to save, 'q' to exit. [s]: s
SAVE SUCCEEDED
PE-6300-1#
PE-6300-1#
PE-6300-1#
PE-6300-1# reboot

------------------------------------------------------------
WARNING: you are about to reboot this ESBC!
------------------------------------------------------------
```

The SBC comes up after reboot and is now ready for configuration.

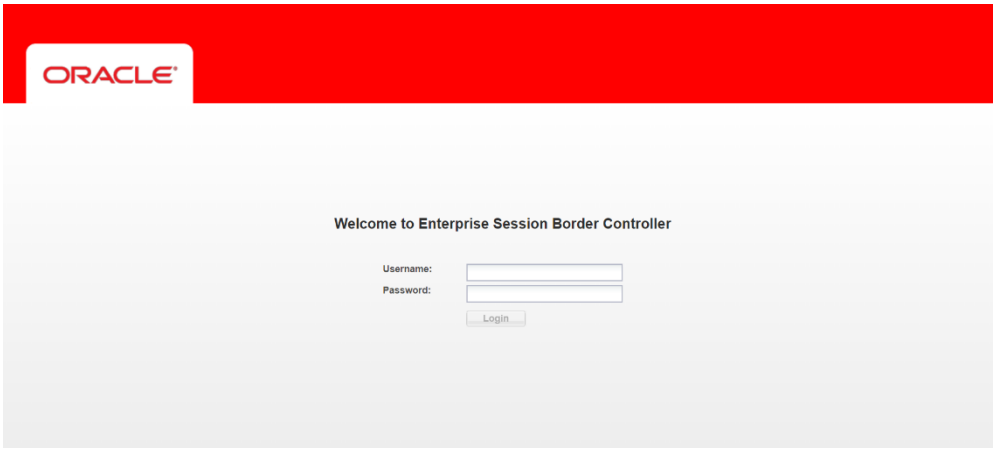
Go to configure terminal->system->web-server-config. Enable the web-server-config to access the SBC using WebGUI. Save and activate the config.

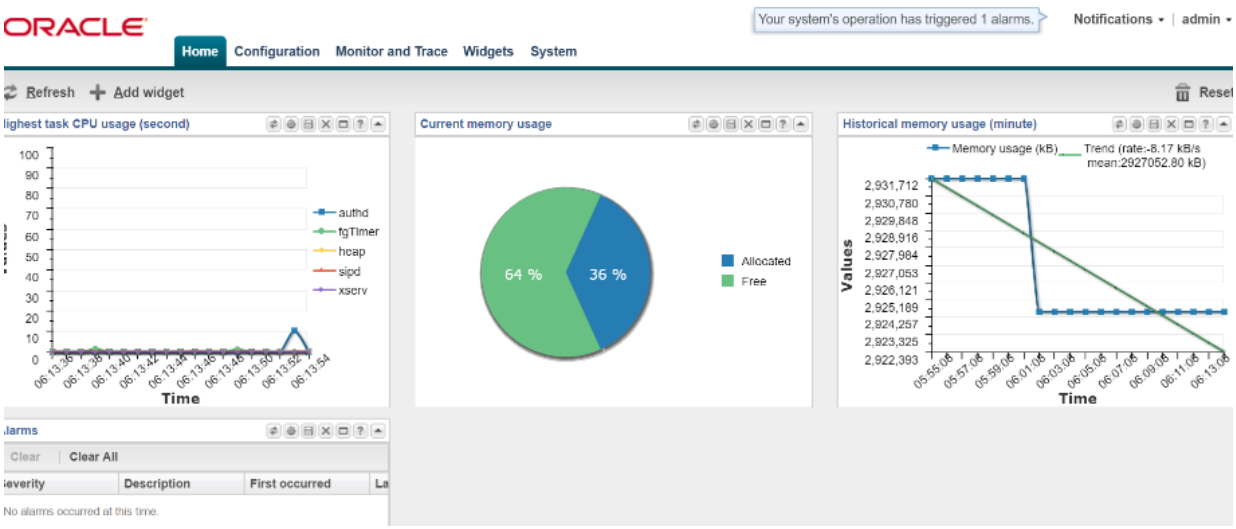
```
PE-6300-1(web-server-config)#
PE-6300-1(web-server-config)# state enabled
PE-6300-1(web-server-config)# done
web-server-config
        state                                   enabled
        inactivity-timeout                      5
        http-state                              enabled
        http-port                               80
        https-state                             disabled
        https-port                              443
        tls-profile
        last-modified-by                        admin@172.18.0.176
        last-modified-date                      2019-09-12 05:31:51

PE-6300-1(web-server-config)# exit
PE-6300-1(system)# exit
PE-6300-1(configure)# exit
PE-6300-1# save-config
checking configuration
-------------------------------------------------------------------------------
Results of config verification:
   1 configuration error
Run 'verify-config' for more details
-------------------------------------------------------------------------------
Save-Config received, processing.
waiting for request to finish
Request to 'SAVE-CONFIG' has Finished,
Save complete
Currently active and saved configurations do not match!
To sync & activate, run 'activate-config' or 'reboot activate'.
PE-6300-1# activate-config
Activate-Config received, processing.
waiting for request to finish
Request to 'ACTIVATE-CONFIG' has Finished,
Activate Complete
```

Configure SBC using Web GUI

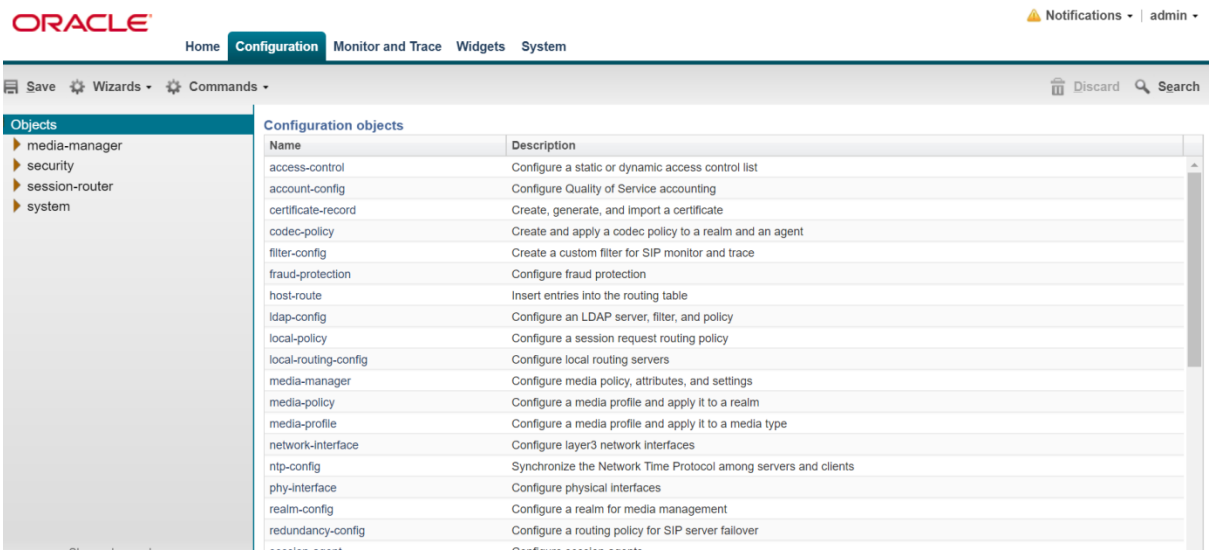
In this app note , we configure SBC using the WebGUI.

The WebGUI can be accessed through the url https://<SBC_MGMT_IP>. The username and password is the same as that of CLI.





Go to Configuration as shown below, to configure the SBC.



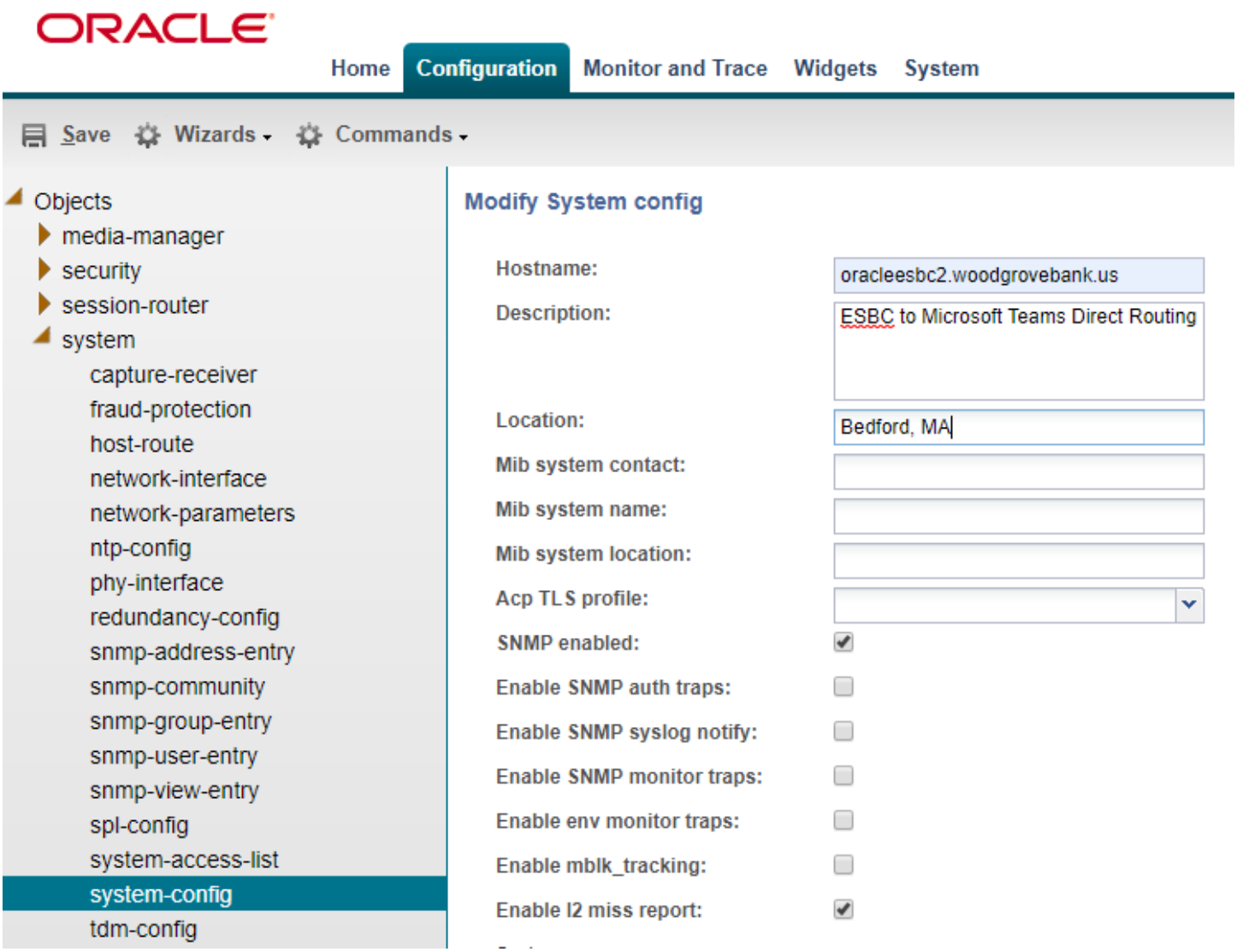
Kindly refer to the GUI User Guide https://docs.oracle.com/cd/E92503_01/doc/esbc_ecz800_webgui.pdf for more information.

The expert mode is used for configuration.

Tip:To make this configuration simpler, one can directly search the element to be configured ,from the Objects tab available.

Configure system-config

Go to system->system-config



For VME, transcoding cores are required to be set. Please refer the documentation here for more information

https://docs.oracle.com/cd/E85213_01/doc/sbc_scz739_essentials.pdf

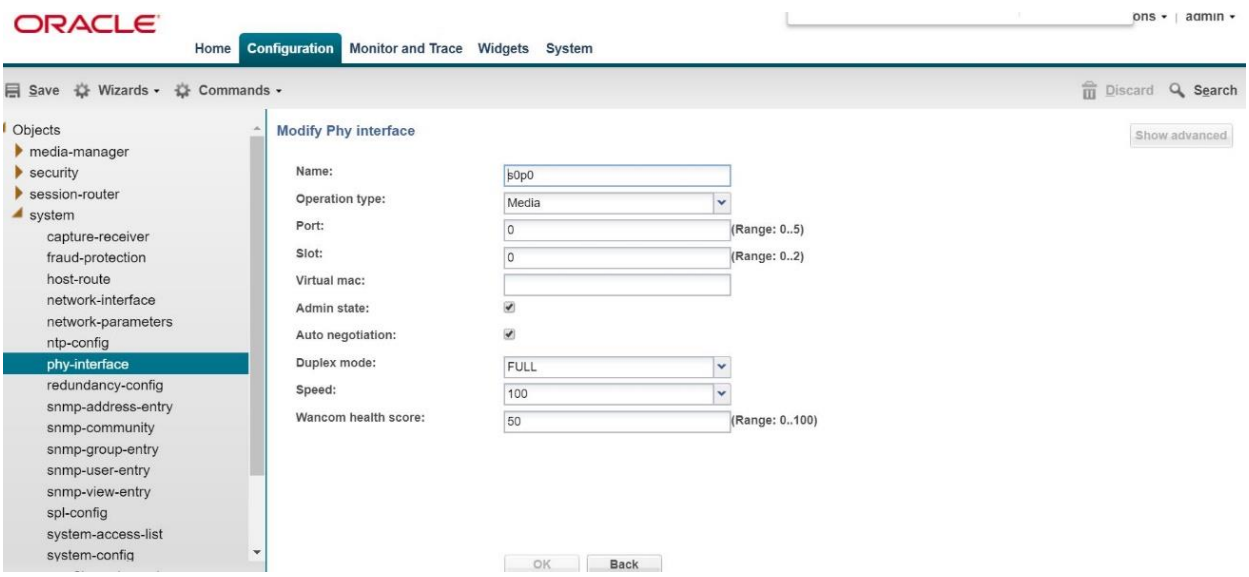
Configure Physical Interface values

To configure physical Interface values, go to System->phy-interface.

You will first configure the slot 0, port 0 interface designated with the name s0p0. This will be the port plugged into your inside (connection to the PSTN gateway) interface. Teams is configured on the slot 0 port 1. Below is the screenshot for creating a phy-interface on s0p0

Create a similar interface for Teams as well from the WebGUI.The table below specifies the values for both teams and Trunk.

Parameter Name	Trunk(s0p0)	MSTeams(s0p1)
Slot	0	0
Port	0	1
Operation Mode	Media	Media

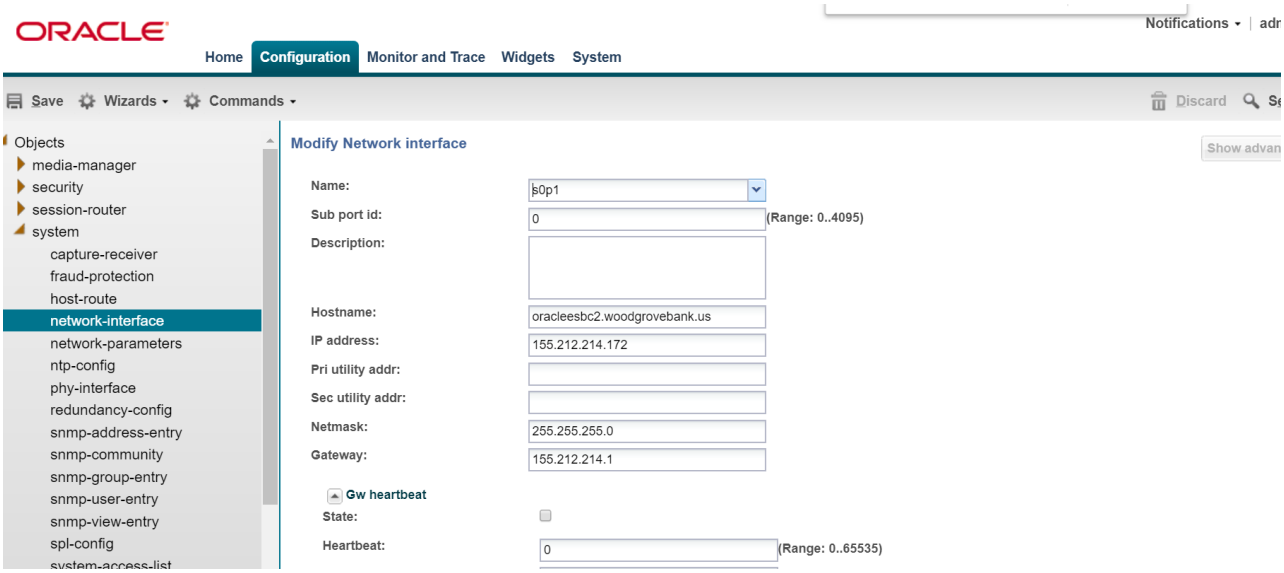


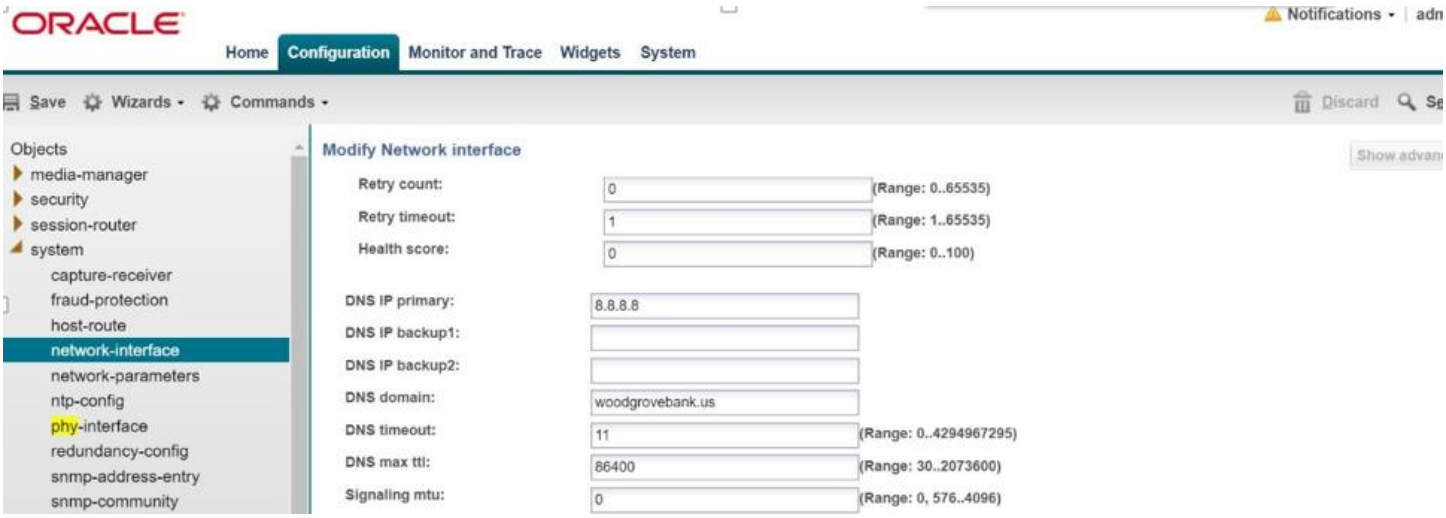
Configure Network Interface values

To configure network-interface, go to system->Network-Interface. Configure two interfaces, one for teams and one for PSTN trunk. Here,in the example the Teams network interface is shown. Configure the PSTN interface in the same manner.

The table below lists the parameters ,to be configured for both the interfaces. The same is modified as per customer environment.

Parameter Name	Teams Network Interface	PSTN trunk Network interface
Name	s0p1	s0p0
Host Name	oracleesbc2.woodgrovebank.us	
IP address	155.212.214.172	192.65.72.196
Netmask	255.255.255.0	255.255.255.0
Gateway	155.212.214.1	192.65.72.1
DNS-IP Primary	8.8.8.8	
DNS-domain	woodgrovebank.us	

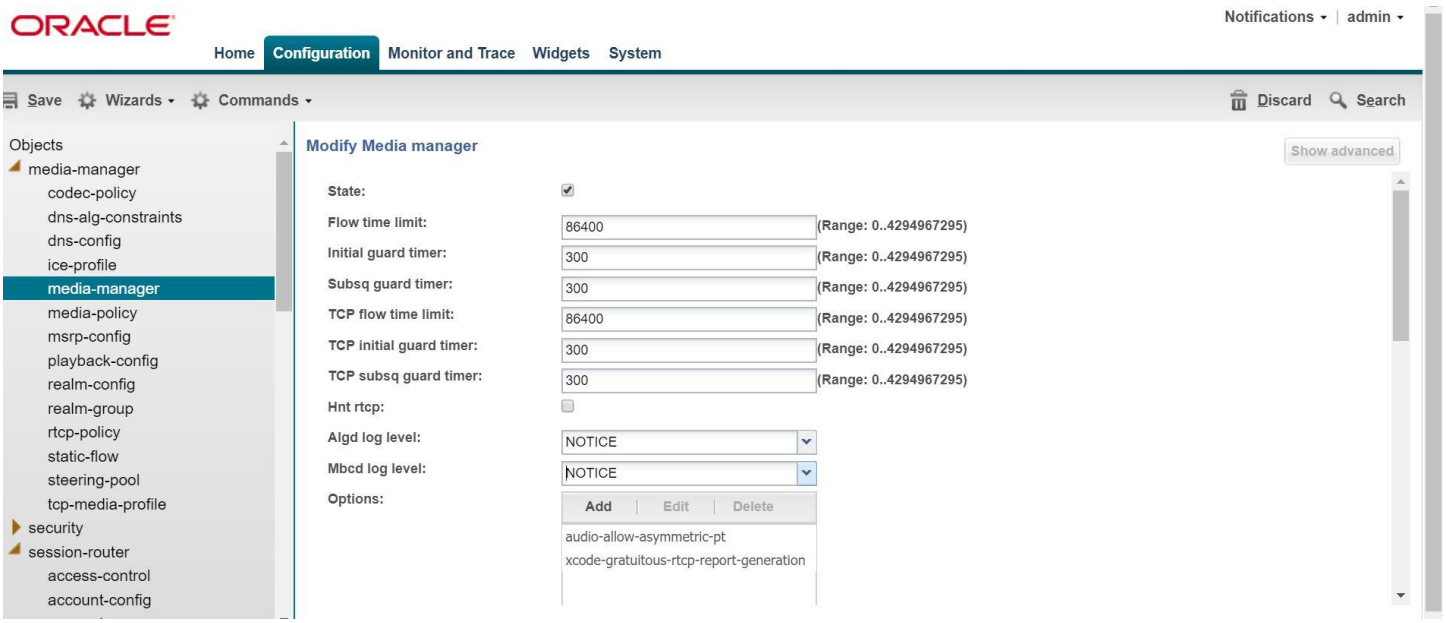




Tip:Configure ICMP IP and HIP IP only on the PSTN side.It is not advisable to configure the ICMP ip and HIP ip on the teams facing side because of inherint risks.

Enable media manager

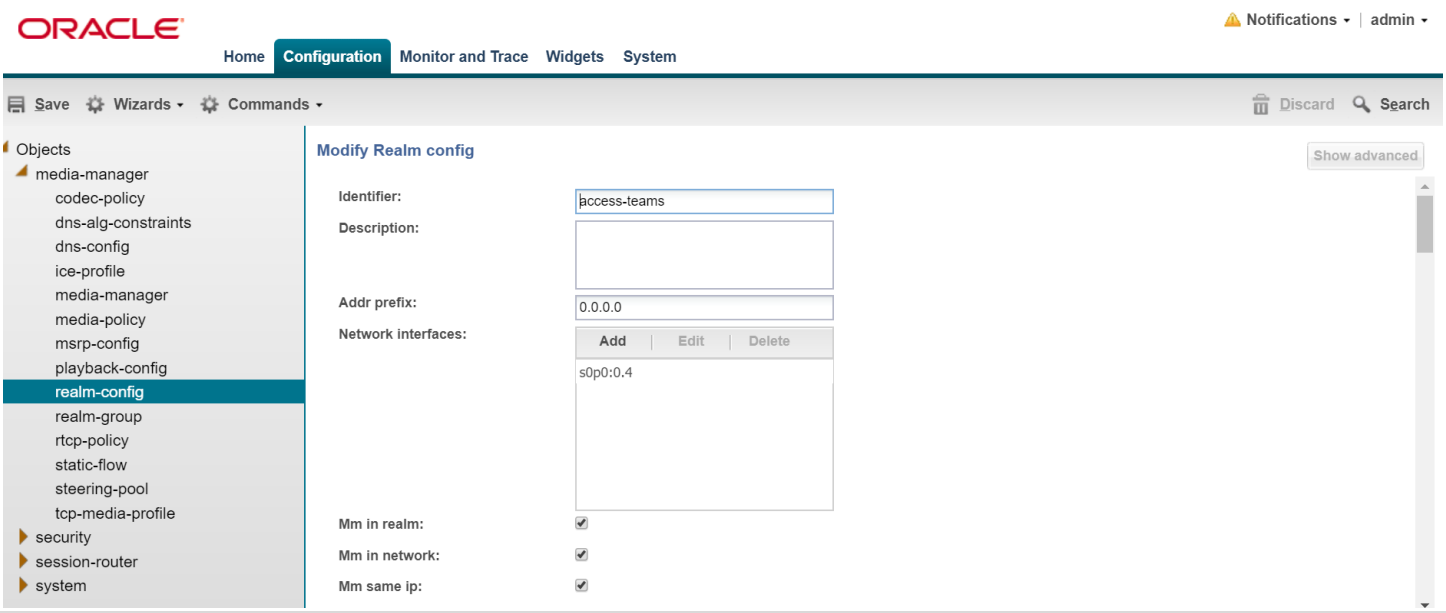
Media-manager handles the media stack required for SIP sessions on the SBC. Enable the media manager and configure the below option for generating rtcp reports.
audio-allow-assymetric-pt
xcode-gratutious-rtcp-report-generation
Go to Media-Manager->Media-Manager



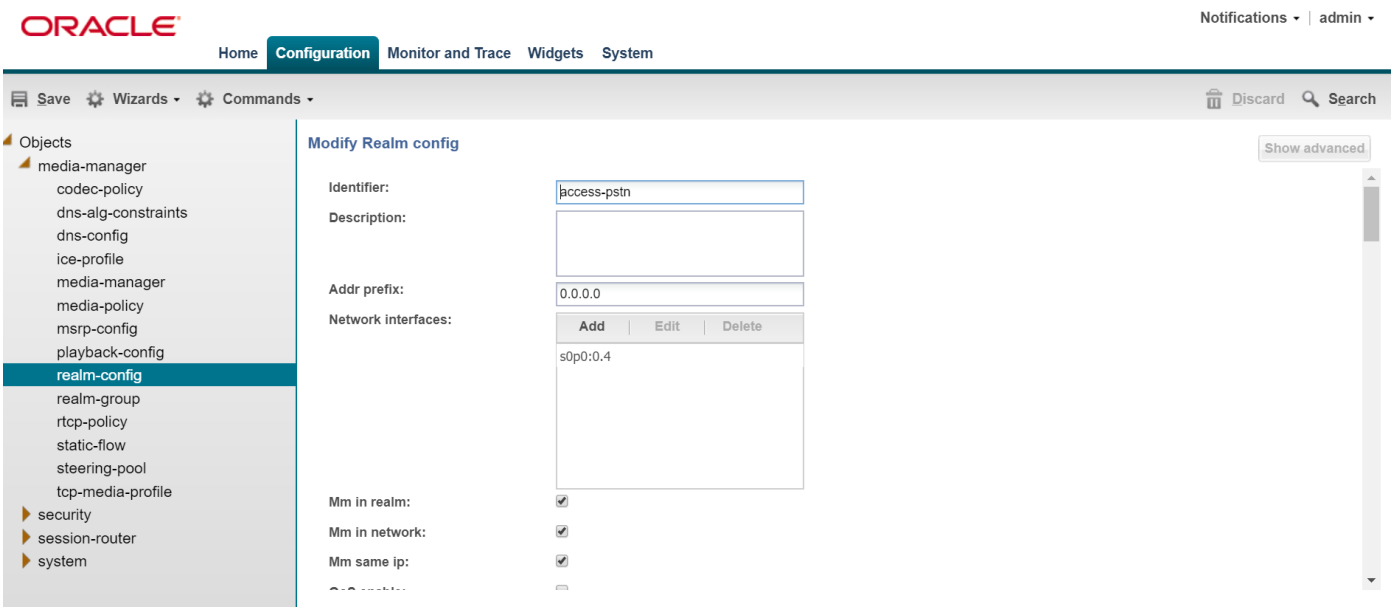
Configure Realms

Navigate to realm-config under media-manager and configure a realm as shown below

Configure realm for teams as shown below

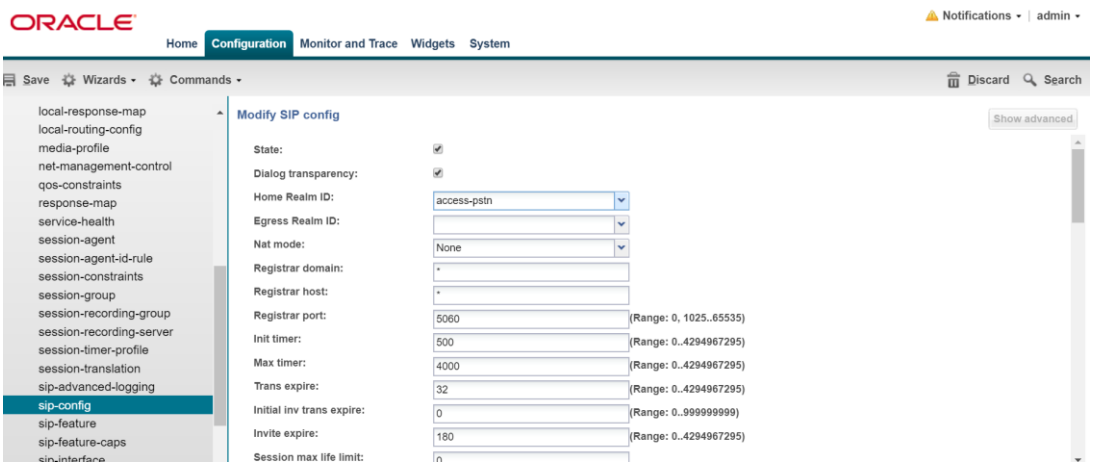


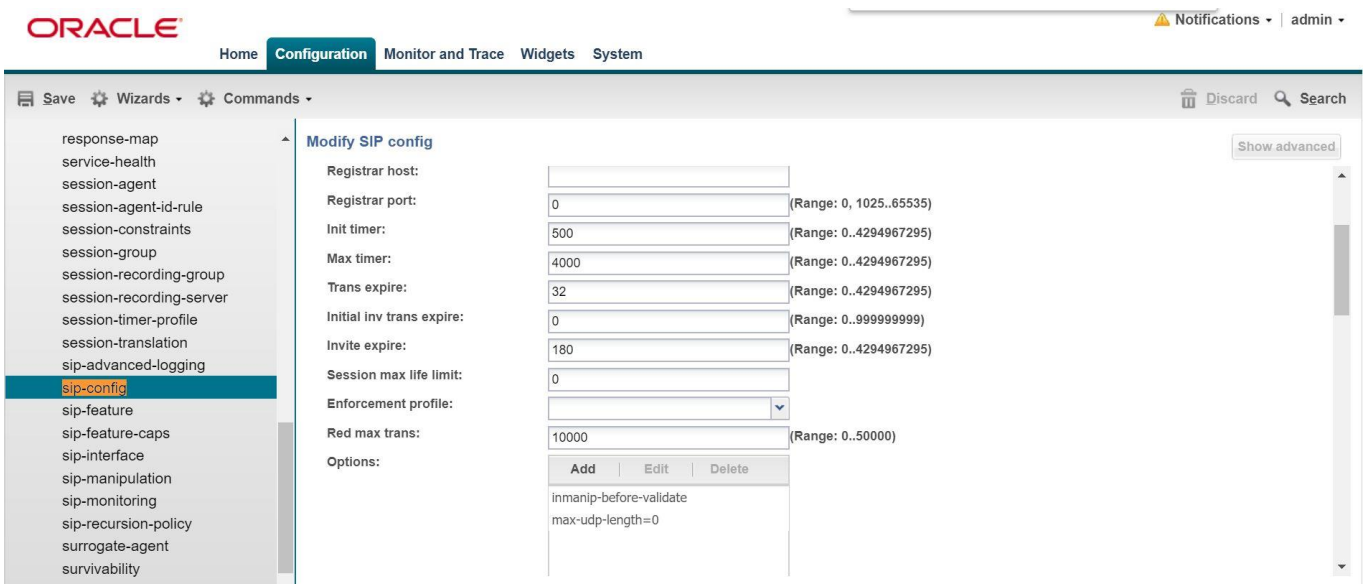
Configure the realm , similarly for SIP Trunk



Enable sip-config

SIP config enables SIP handling in the SBC. Make sure the home realm-id , registrar-domain and registrar-host are configured. Also add the options to the sip-config as shown below.To configure sip-config,Go to Session-Router->sip-config. In options add max-udp-length =0.

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session-agent-id-rule
session-constraints
session-group
session-recording-group
session-recording-server
session-timer-profile
session-translation
sip-advanced-logging
sip-config
sip-feature
sip-feature-caps
sip-interface
sip-manipulation
sip-monitoring
sip-recursion-policy
surrogate-agent
survivability
Modify SIP config
Show advanced
Registrar host:
Registrar port:
0
(Range: 0, 1025..65535)
Init timer:
500
(Range: 0..4294967295)
Max timer:
4000
(Range: 0..4294967295)
Trans expire:
32
(Range: 0..4294967295)
Initial inv trans expire:
0
(Range: 0..999999999)
Invite expire:
180
(Range: 0..4294967295)
Session max life limit:
0
Enforcement profile:
Red max trans:
10000
(Range: 0..50000)
Options:
Add
Edit
Delete
inmanip-before-validate
max-udp-length=0

Configuring a certificate for SBC Interface

Microsoft Teams Direct Routing Interface only allows TLS connections from SBCs for SIP traffic with a certificate signed by one of the trusted certification authorities.
The step below describes how to request a certificate for SBC External interface and configure it based on the example of DigiCert. The process includes the following steps:

1. Create a certificate-record – "Certificate-record" are configuration elements on Oracle SBC which captures information for a TLS certificate – such as common-name, key-size, key-usage etc.

The following certificate-records are required on the Oracle SBC in order for the SBC to connect with Microsoft Teams

   - SBC – a certificate-record assigned to SBC
   - Root – a certificate-record for root cert
   - Intermediate – a certificate-record for intermediate (this is optional – only required if your server certificate is signed by an intermediate)

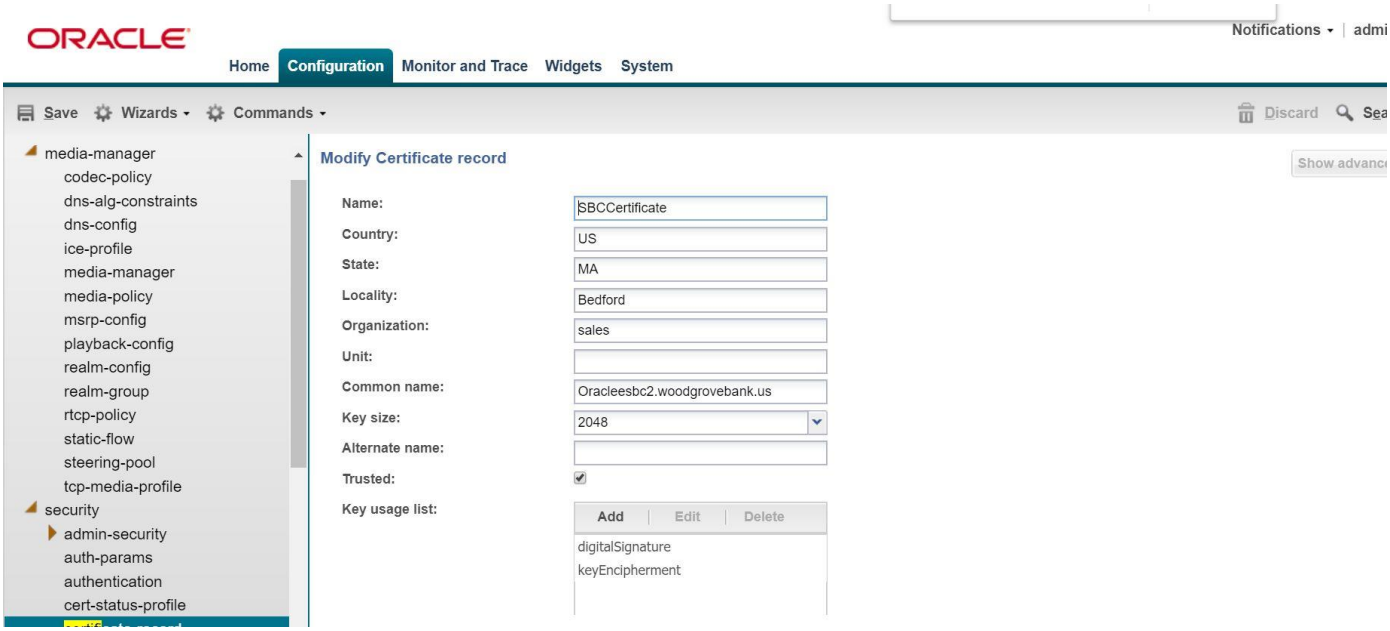
2. Generate a Certificate Signing Request (CSR) and obtain the certificate from a supported Certification Authority

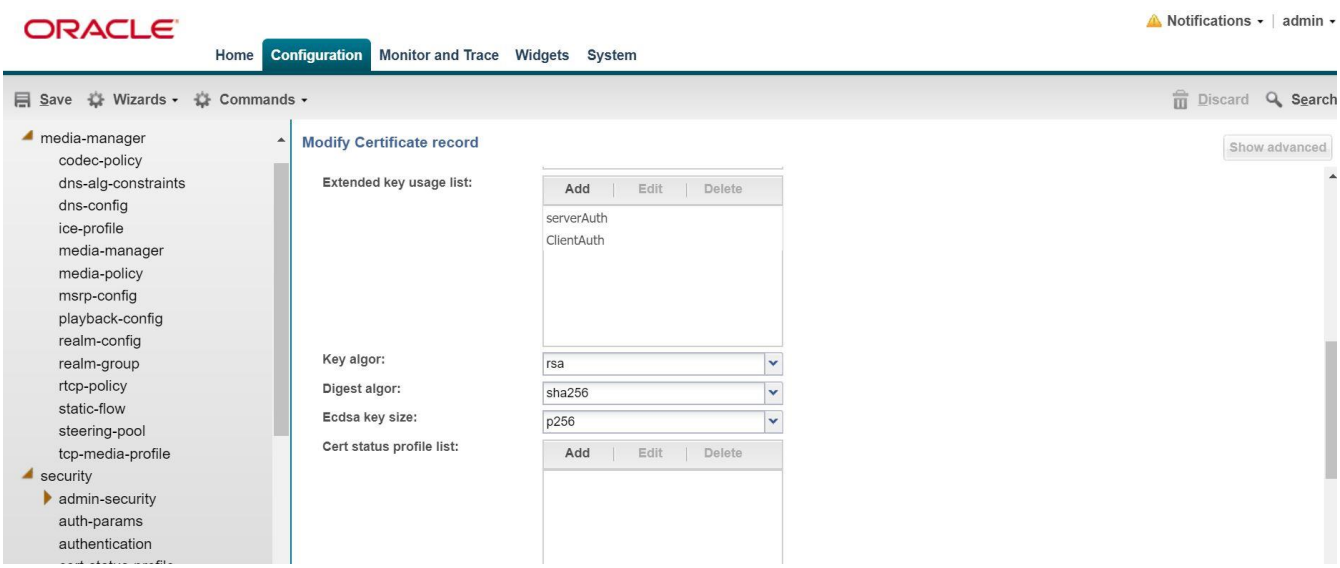
3. Deploy the SBC and Root/Intermediary certificates on the SBC

SBC Certificate Creation

Step 1 – Creating the SBC certificate record

Go to security->Certificate Record and configure a certificate for SBC as shown below.





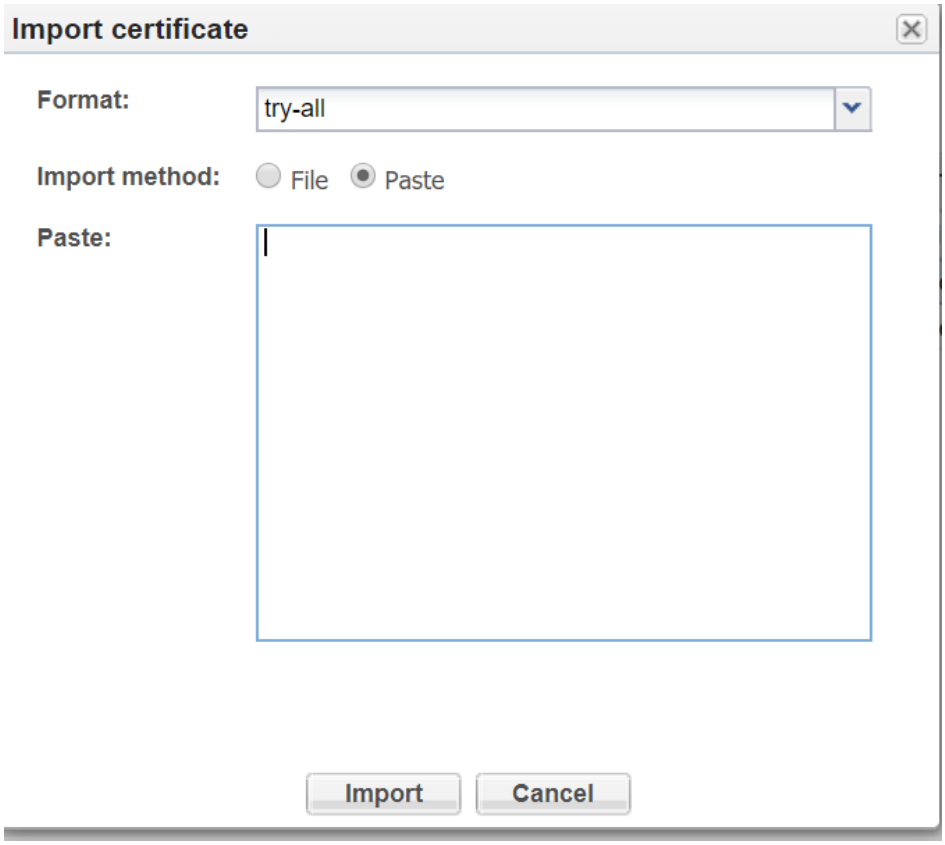
Step 2 – Generating a certificate signing request for SBC certificate

- Select the certificate and generate certificate on clicking the “Generate” command.
- Please copy/paste the text that gets printed on the screen as shown below and upload to your CA server for signature.

- Also, note that a save/activate is required

Step 3 – Deploy the SBC certificate

Once certificate signing requests have been completed – import the signed certificate to the SBC.
Copy paste the certificate.
Once done, issue save/activate from the WebGUI



Root and Intermediate Certificates Creation

There are 3 more certificates that are required for direct routing.

-BaltimoreRoot: This certificate is always required for MS Teams.
This certificate can be downloaded from https://cacert.omniroot.com/bc2025.pem
The serial number of this certificate is 0x20000b9.
Note :The certificate should be in .pem format.

-DigiCertRoot

-DigiCertInter

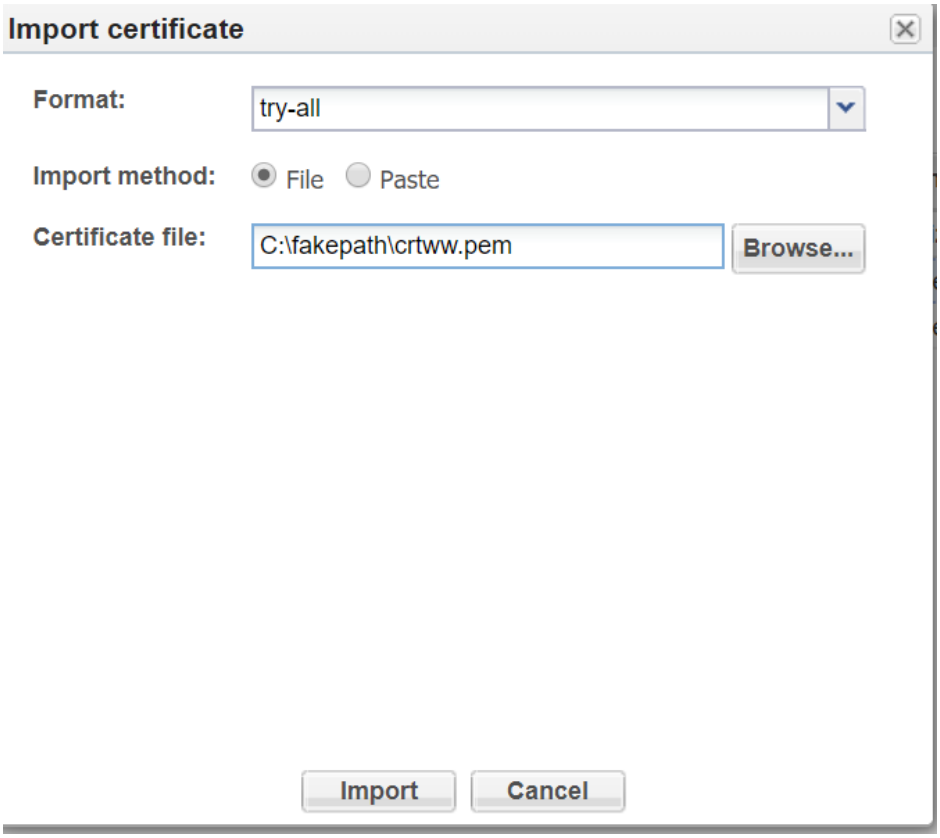
Step1-Creating the root and intermediate certificates on SBC

Go to security->Certificate Record and create the certificate with parameters as shown. . Modify the configuration according to the certificates in your environment.

Parameter	DigicertInter	BaltimoreRoot	DigiCertRoot
Common-name	DigiCert SHA2 Secure Server CA	Baltimore CyberTrust Root	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

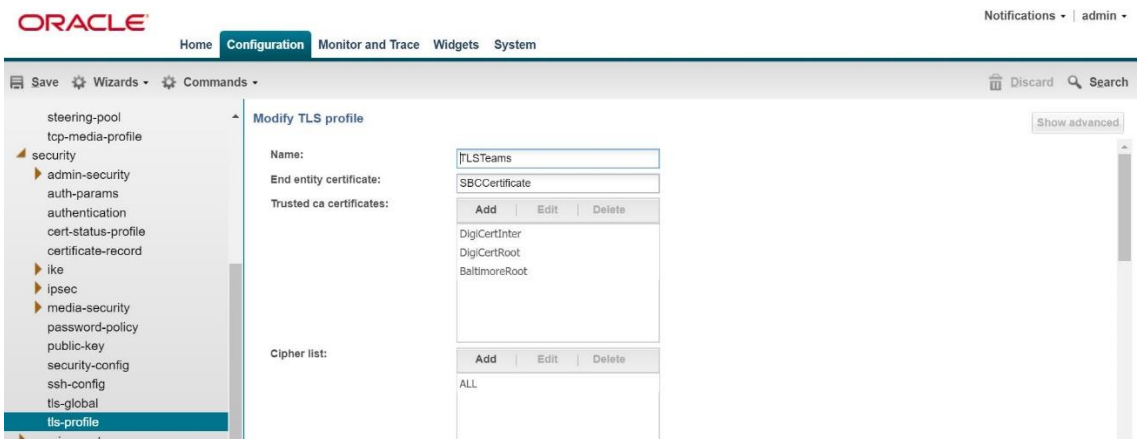
Step2:Deploying the Root and Intermediate certificates on SBC

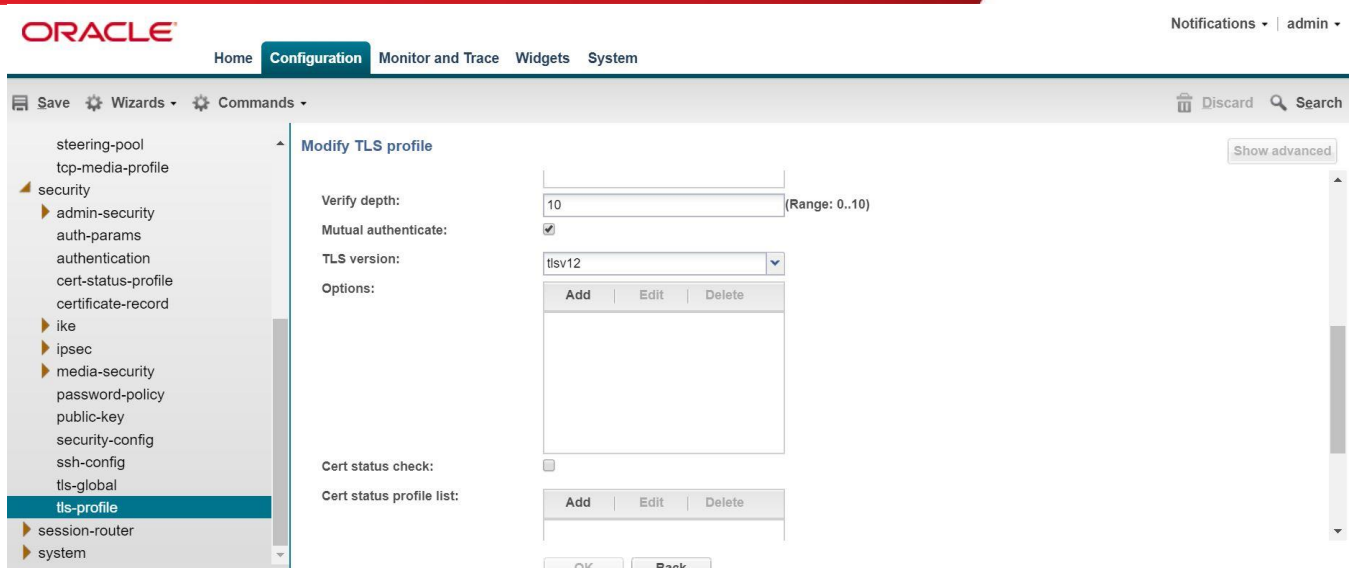
All the root and intermediate certificates have to imported to SBC.
The root and intermediate certificates can be imported into the SBC only in the .pem format.
Note: The BaltimoreRoot certificate downloaded in Step1 can be directly imported as shown.
Click on the certificate and select Import.
The below screen appears.Make sure your file is in .pem format and upload.



TLS-Profile

A TLS profile configuration on the SBC allows for specific certificates to be assigned. Go to security-> TLS-profile config element and configure the tls-profile as shown below

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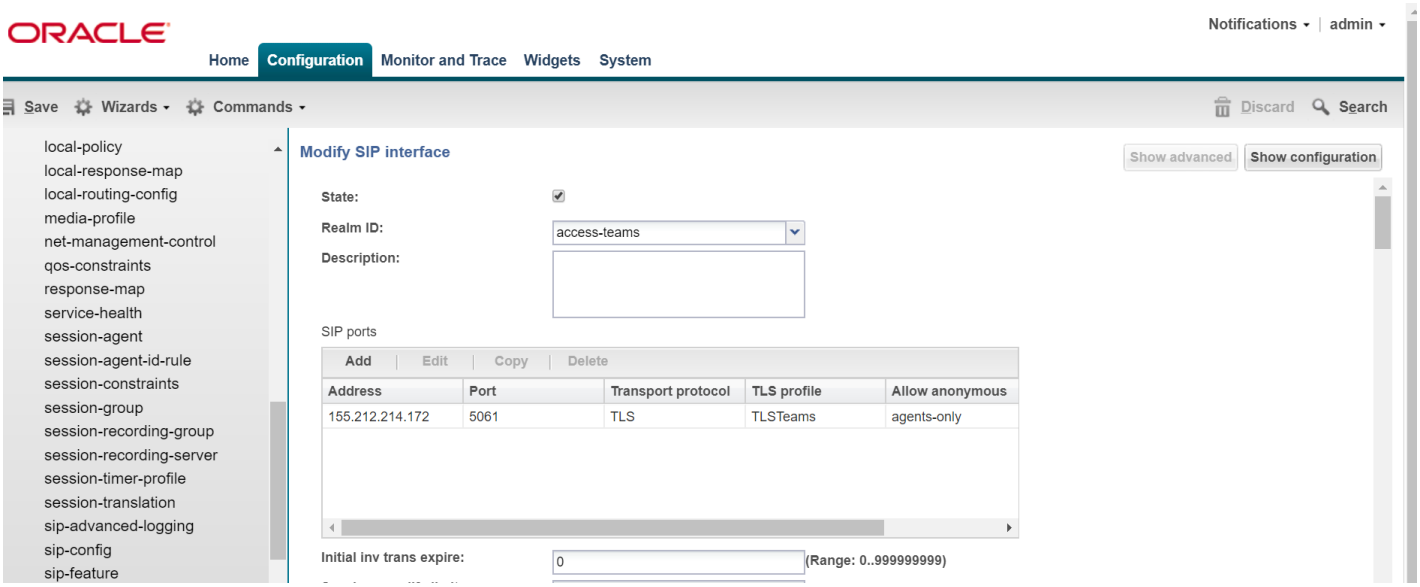
ipsec
media-security
password-policy
public-key
security-config
ssh-config
tls-global
tls-profile
session-router
system
Modify TLS profile
Show advanced
Verify depth:
10
(Range: 0..10)
Mutual authenticate:
TLS version:
tlsv12
Options:
Add
Edit
Delete
Cert status check:
Cert status profile list:
Add
Edit
Delete

Creating a sip-interface to communicate with Microsoft Teams

Set the following configuration elements – ensure that the IP address allocated to the SIP interface is the FQDN resolvable address. i.e. if you issue command nslookup from another computer , “oracleesbc2.woodgrovebank.us” – it should resolve to 155.212.214.172.

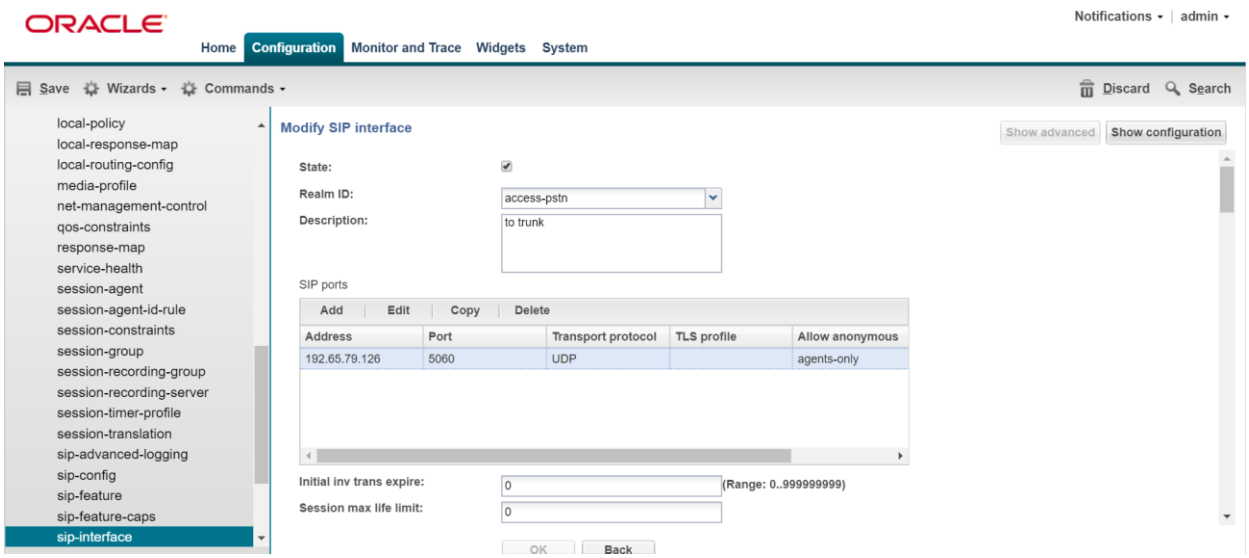
Note that the IP should be publicly routable IP address.To configure sip-interface,Go to Session-Router->Sip-Interface.

Note:
-Tls-profile needs to match the name of the tls-profile previously created
-Set allow-anonymous to agents-only to ensure traffic to this sip-interface only comes from Teams server.



Configure sip-interface to communicate with SIP Trunk

Similarly configure the sip-interface for sip-trunk, according to your environment.

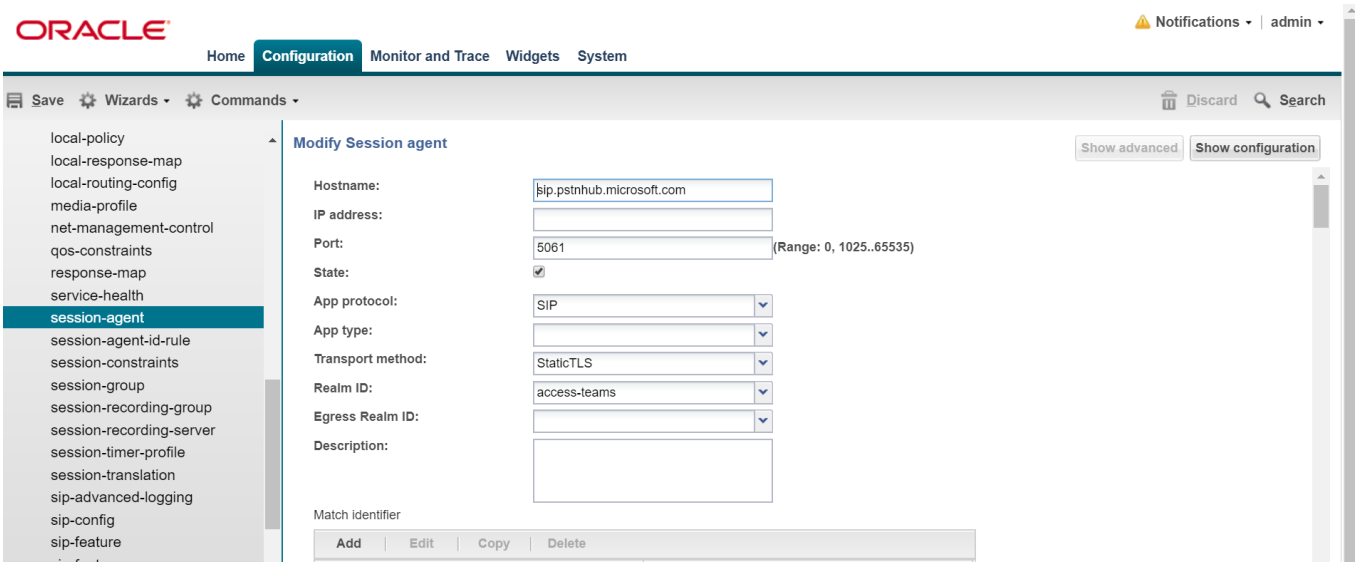


Once sip-interface is configured – the SBC is ready to accept traffic on the allocated IP address. Now configure where the SBC sends the outbound traffic.

Configure session-agent

Session-agents are config elements which are trusted agents who can send/receive traffic from the SBC with direct access to trusted data path. Configure the session-agent for Teams with the following parameters. Go to session-router->Session-Agent.

- hostname to “sip.pstnhub.microsoft.com”
- port 5061
- realm-id – needs to match the realm created for teams – in this case – “Access-teams”
- transport set to “StaticTLS”
- refer-call-transfer set to enabled
- ping-method – send OPTIONS message to Microsoft to check health
- ping-interval to 30 secs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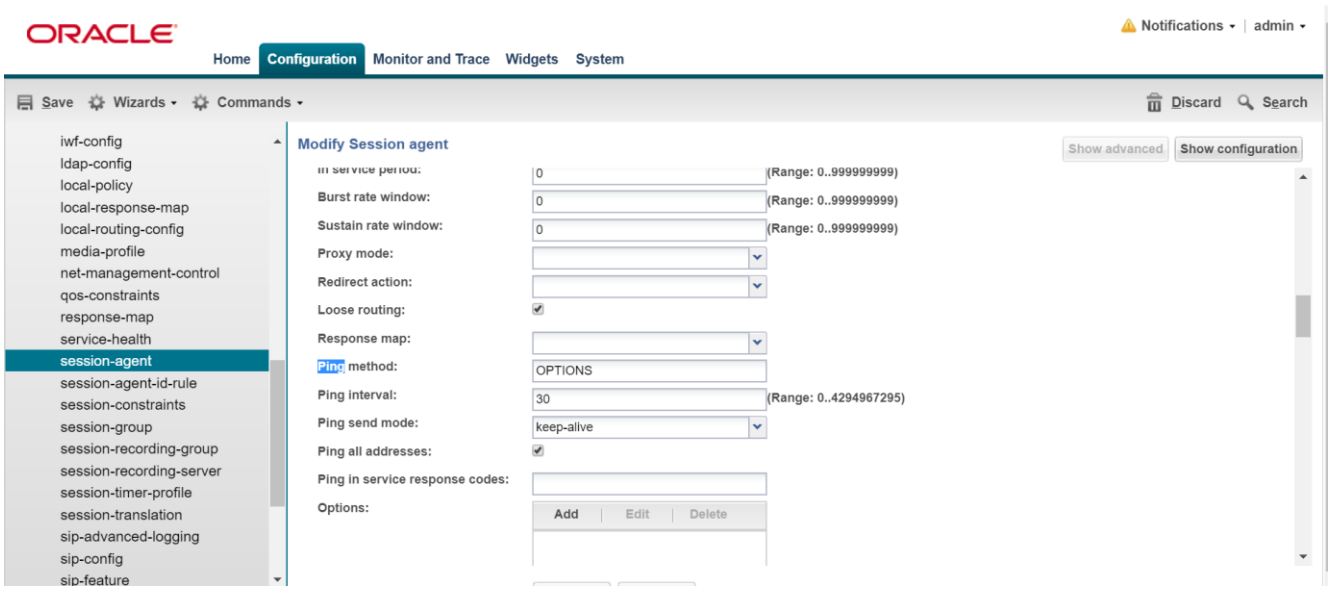
net-management-control
qos-constraints
response-map
service-health
session-agent
session-agent-id-rule
session-constraints
session-group
session-recording-group
session-recording-server
session-timer-profile
session-translation
sip-advanced-logging
sip-config
sip-feature
Modify Session agent
Show advanced
Show configuration
Hostname:
sip.pstnhub.microsoft.com
IP address:
Port:
5061
(Range: 0, 1025..65535)
State:
App protocol:
SIP
App type:
Transport method:
StaticTLS
Realm ID:
access-teams
Egress Realm ID:
Description:
Match identifier
Add
Edit
Copy
Delete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local-response-map
local-routing-config
media-profile
net-management-control
qos-constraints
response-map
service-health
session-agent
session-agent-id-rule
session-constraints
session-group
session-recording-group
session-recording-server
session-timer-profile
session-translation
sip-advanced-logging
sip-config
sip-feature
Modify Session agent
Show advanced
Show configuration
(Range: 0..999999999)
Burst rate window:
0
(Range: 0..999999999)
Sustain rate window:
0
(Range: 0..999999999)
Proxy mode:
Redirect action:
Loose routing:
Response map:
Ping method:
OPTIONS
Ping interval:
30
(Range: 0..4294967295)
Ping send mode:
keep-alive
Ping all addresses:
Ping in service response codes:
Options:
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Edit
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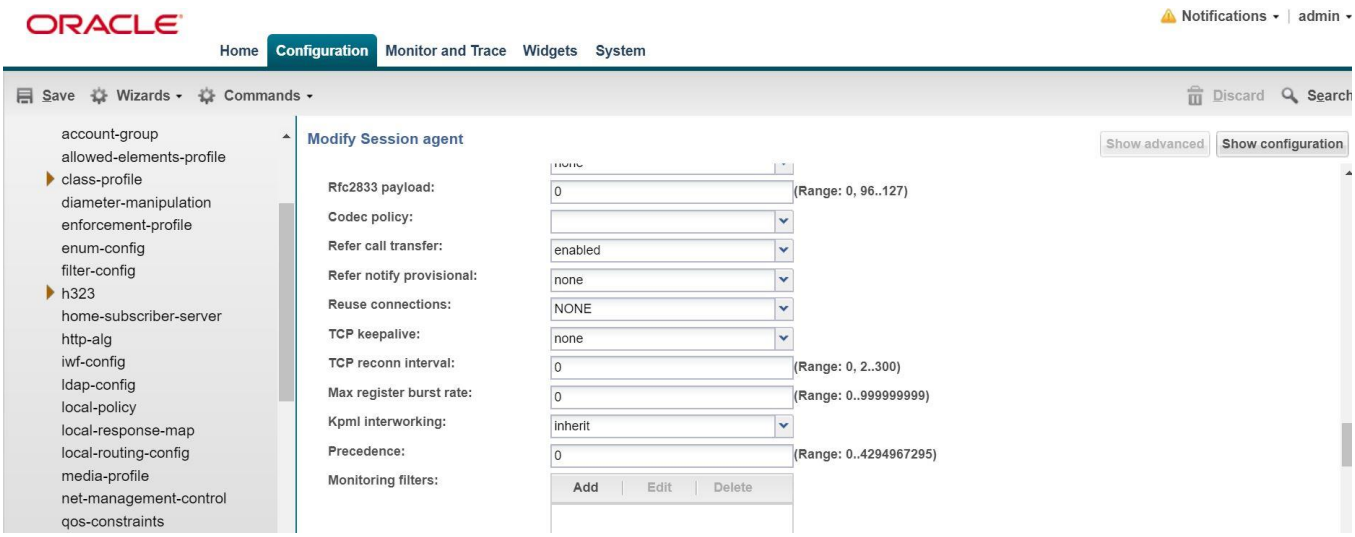
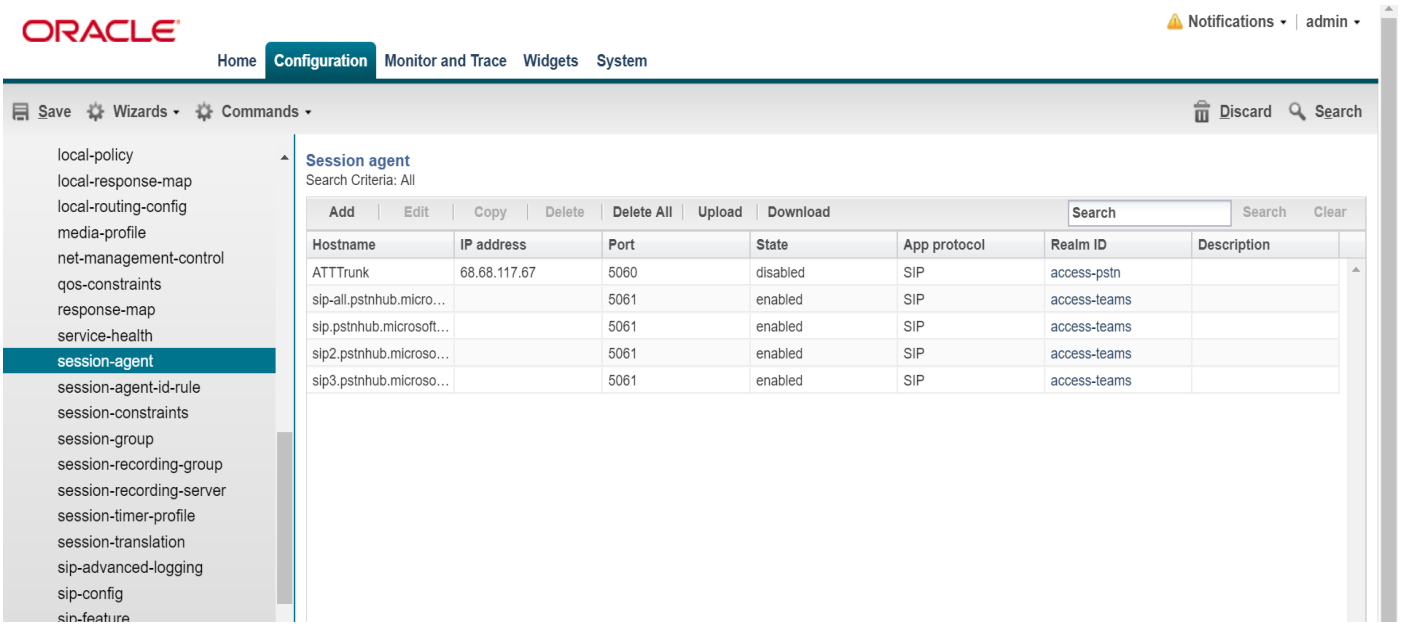


Follow above steps to create 2 more sessions for:

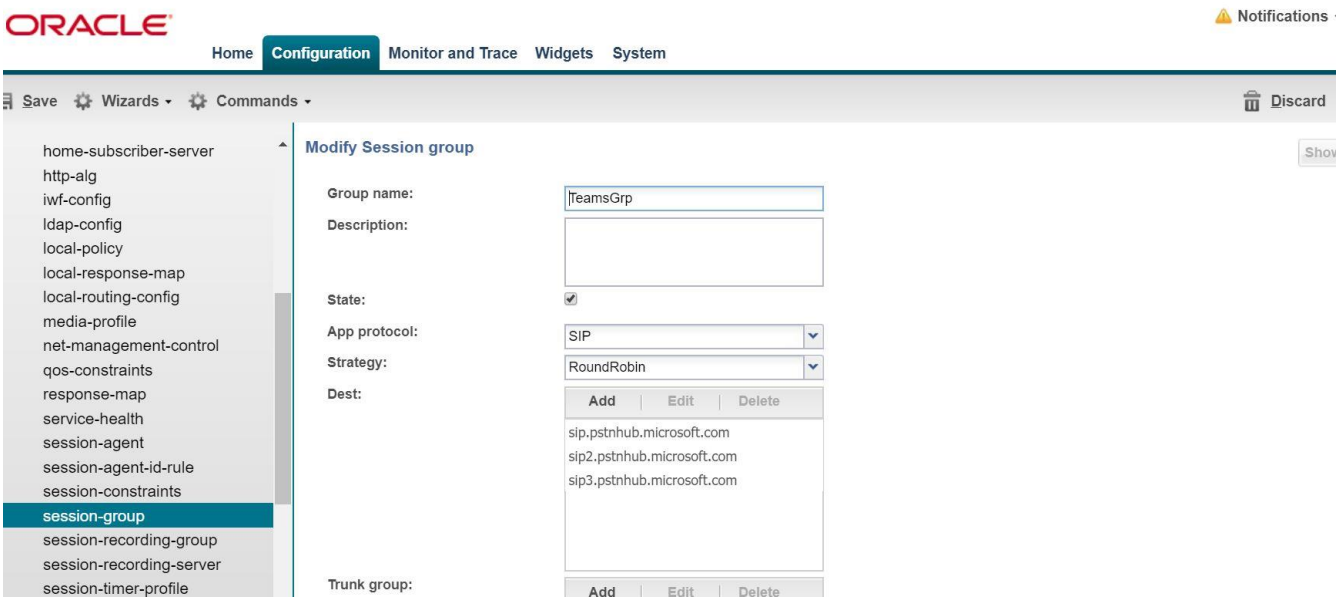
- sip2.pstnhub.microsoft.com
- sip3.pstnhub.microsoft.com
- sip-all.pstnhub.microsoft.com

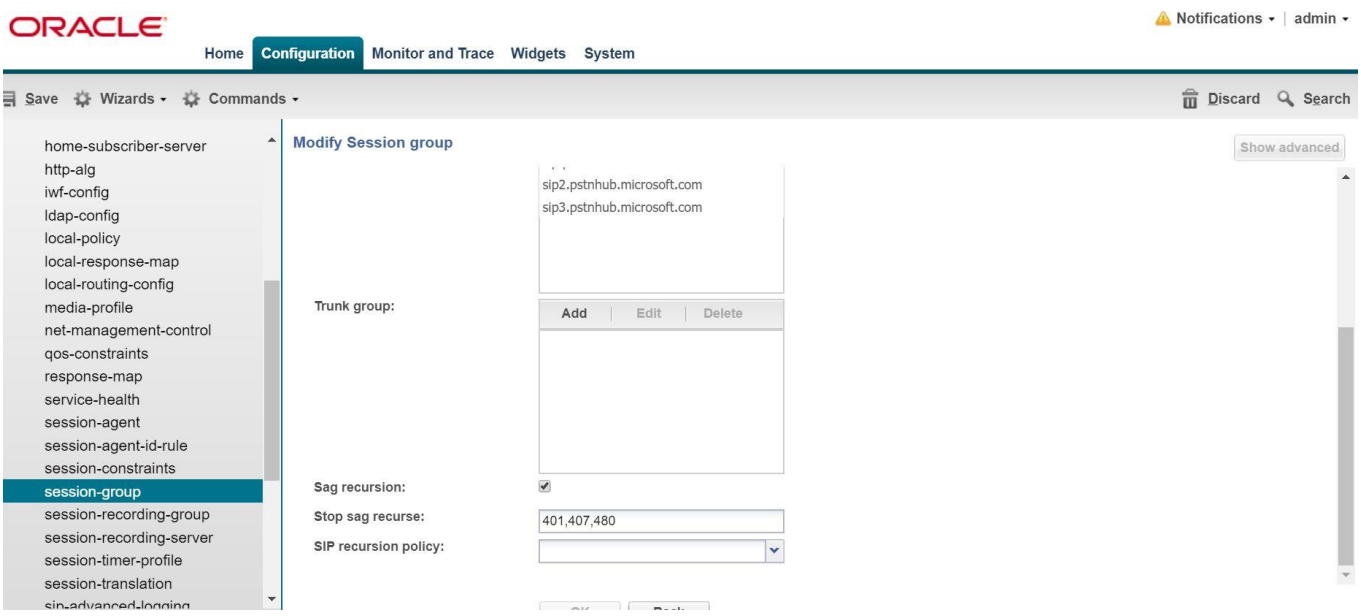
- *Note: Please note that all signaling SHOULD only point to sip/sip2/sip3.pstnhub.microsoft.com – no signaling shoulbe sent to sip-all.pstnhub.microsoft.com FQDN. The sip-all.pstnhub.microsoft.com FQDN is only used for longer DNS TTL value*



Create a Session Agent Group

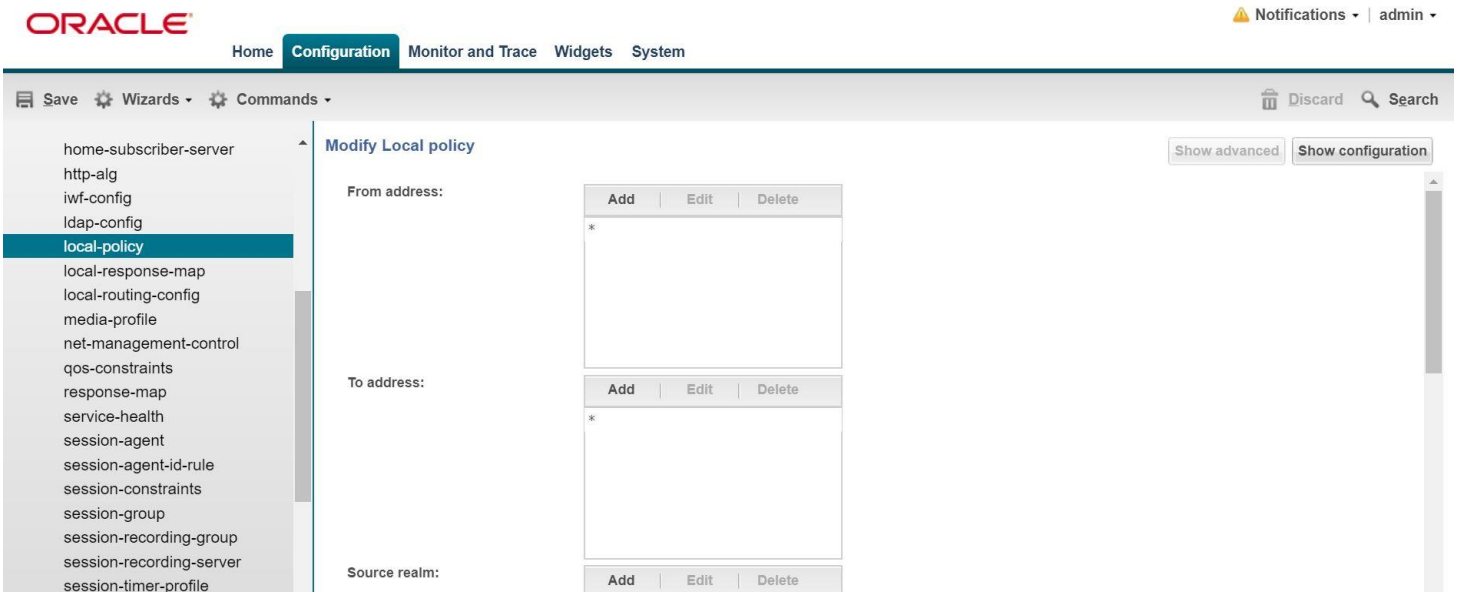
A session agent group allows the SBC to create a load balancing model.Go to Session-Router->Session-Group.

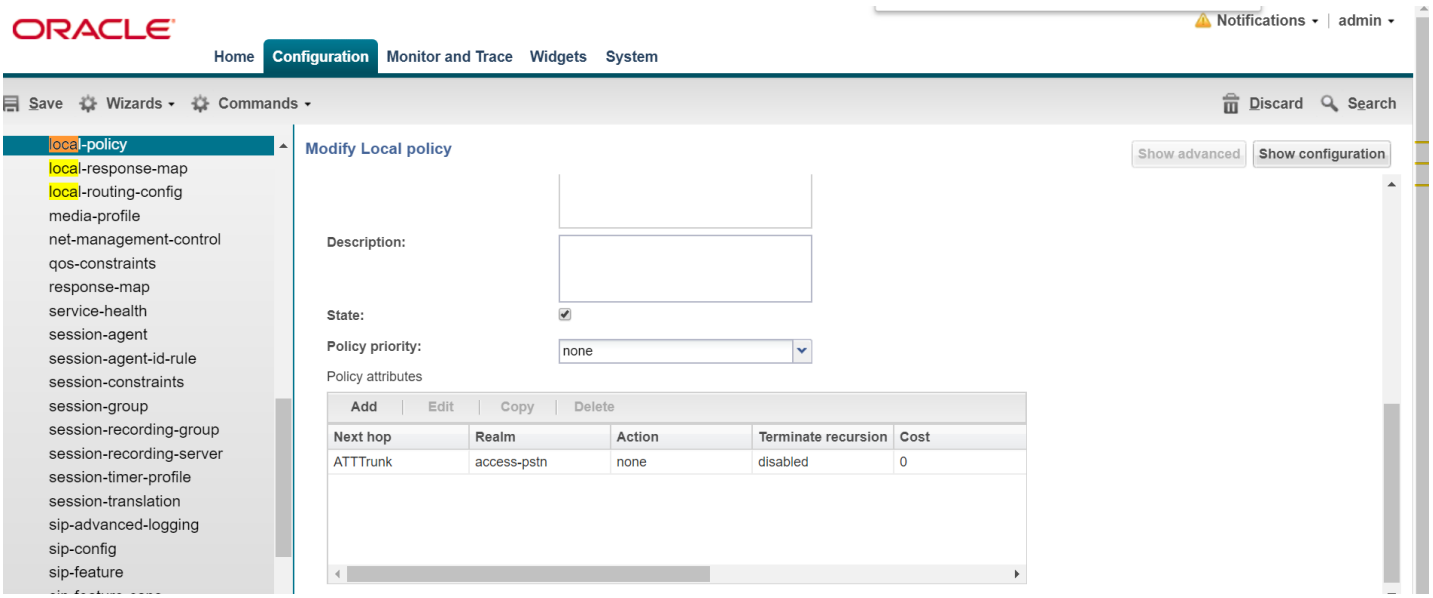


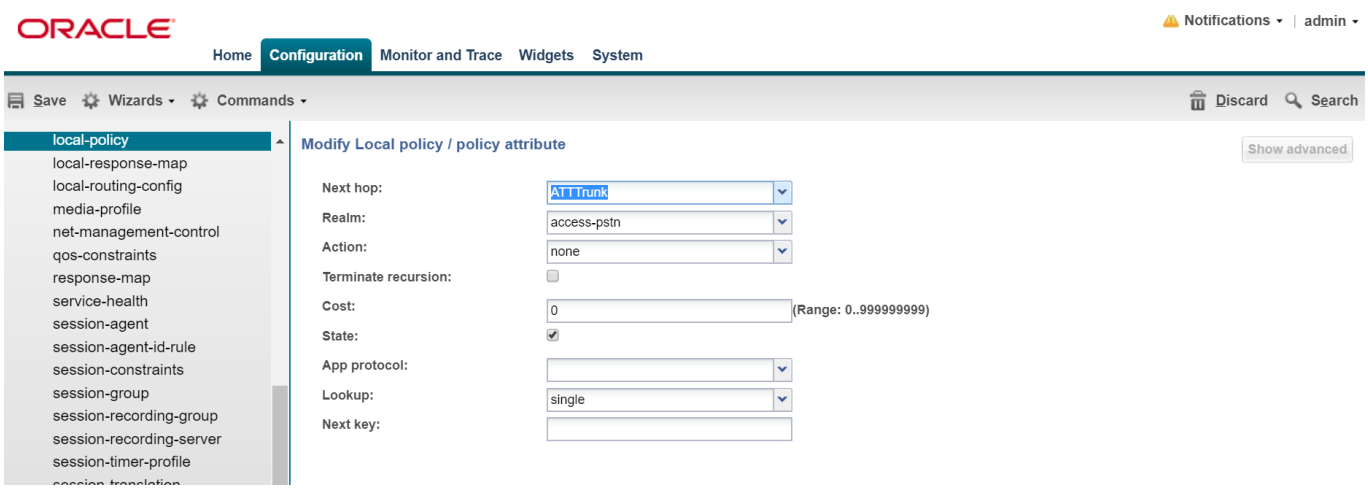


Configure local-policy

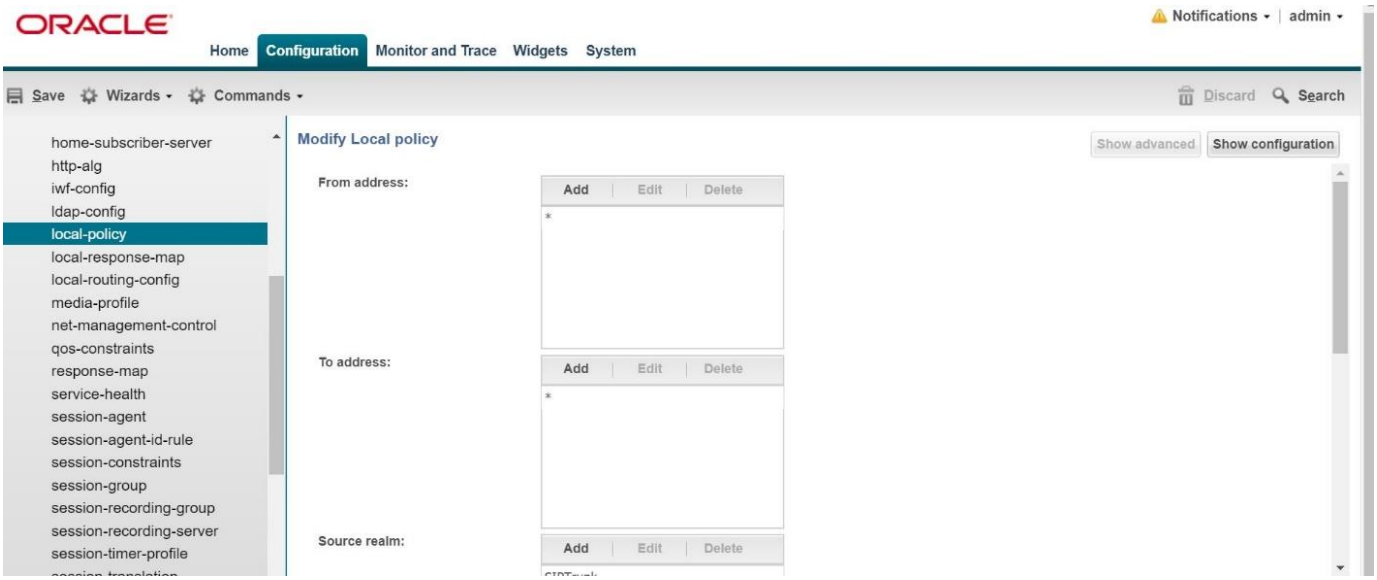
Local policy config allows for the SBC to route calls from one end of the network to the other based on routing criteria.to configure local-policy,go to Session-Router->local-policy. In order for inbound calls from Teams to be routed to a SIP Trunk following config is required:

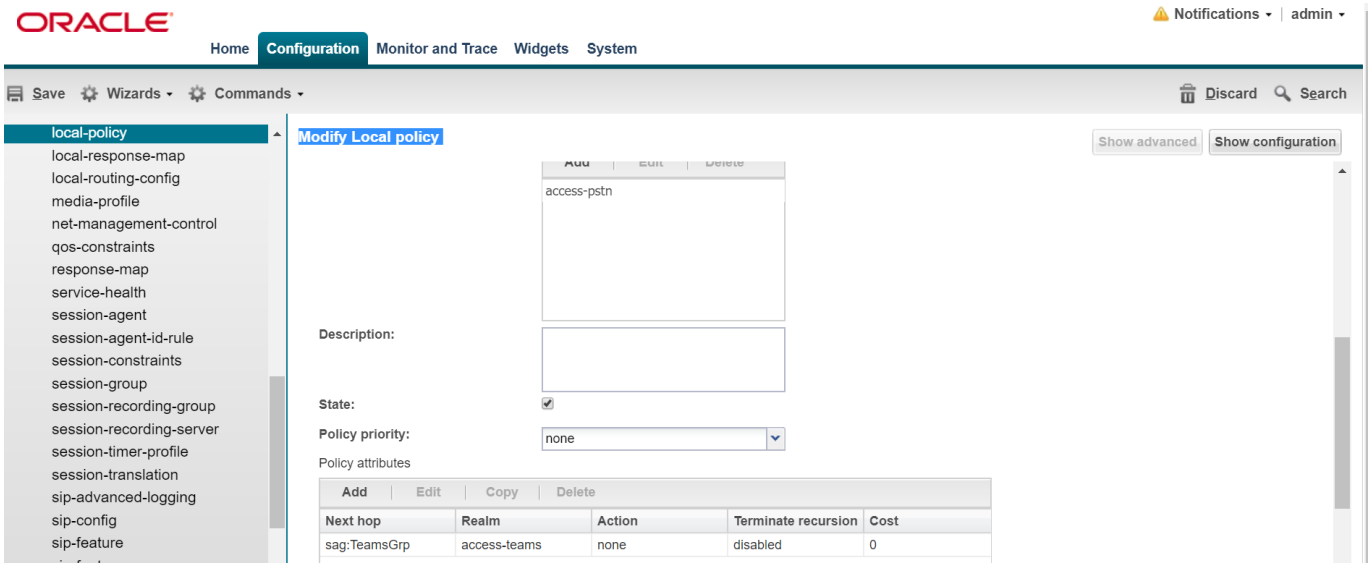


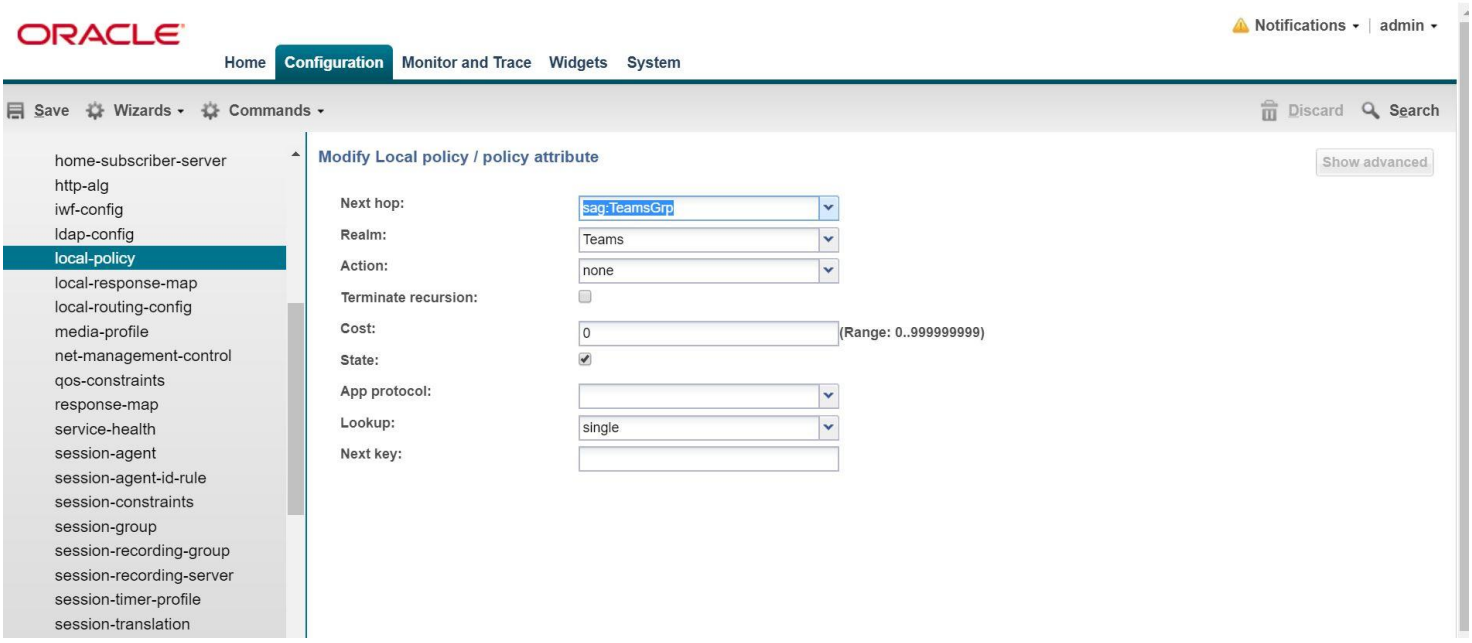




The above local policy config is allowing any DID from teams that lands on the SBC to be routed to ATT Trunk via realm access-pstn, where the next hop is the IP address of the ATT Trunk.
A second local policy is required to be configured to route outbound calls to Teams from access-pstn, configure it as follows





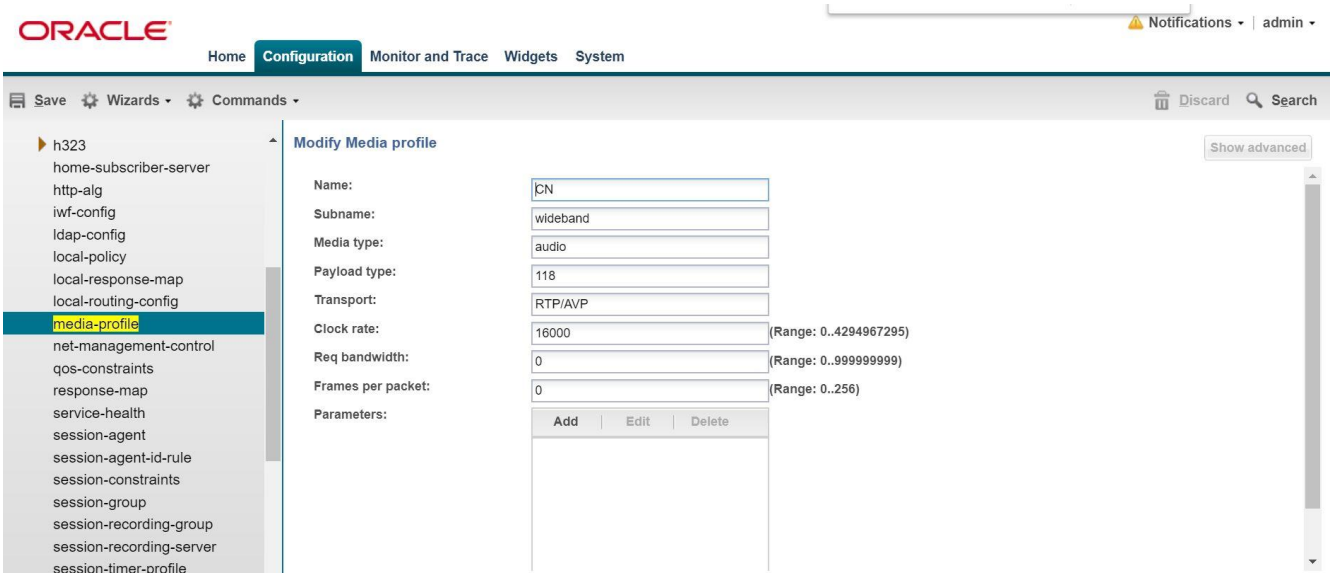


The above local policy will route calls from Access-pstn to access-teams if they match the routing criteria.

Configure Media Profile & Codec Policy

The Oracle® Session Border Controller (SBC) uses codec policies to describe how to manipulate SDP messages as they cross the SBC. The SBC bases its decision to transcode a call on codec policy configuration and the SDP. Each codec policy specifies a set of rules to be used for determining what codecs are retained, removed, and how they are ordered within SDP.

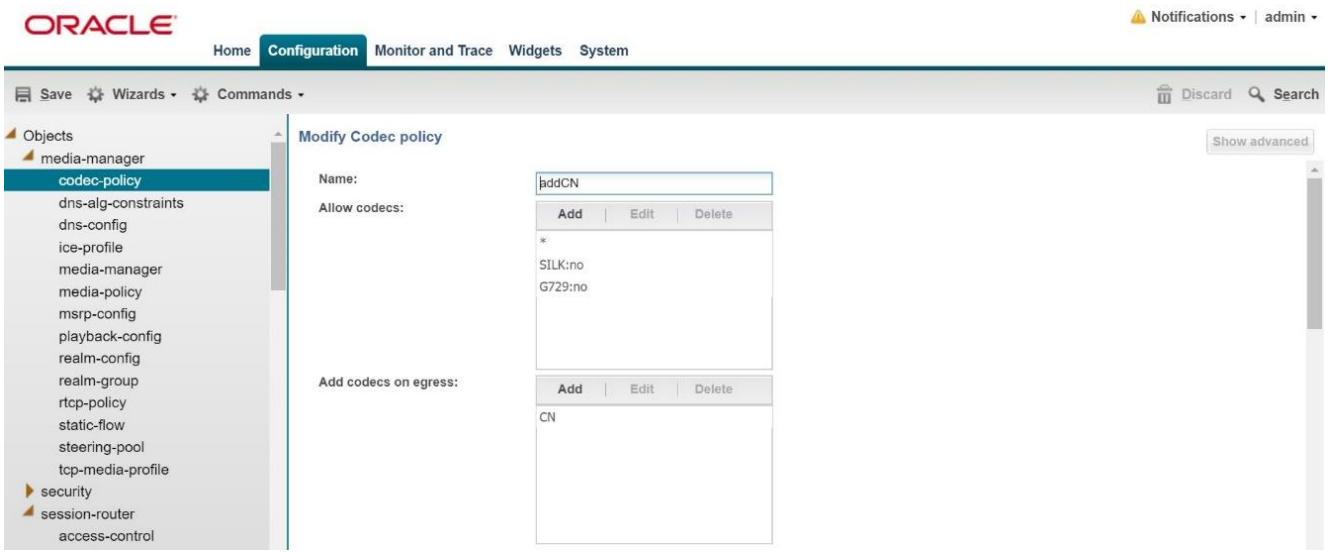
Note: this is an optional config – configure codec policy only if deemed required
Some SIP trunks may have issues with the codecs being offered by Microsoft teams, so following codec policy may be required in order for the calls to work flawlessly.
SILK & CN offered by Microsoft teams are using a payload type which is different than usual. Configure the media-profile as shown below,go to Session-Router->Media-profile

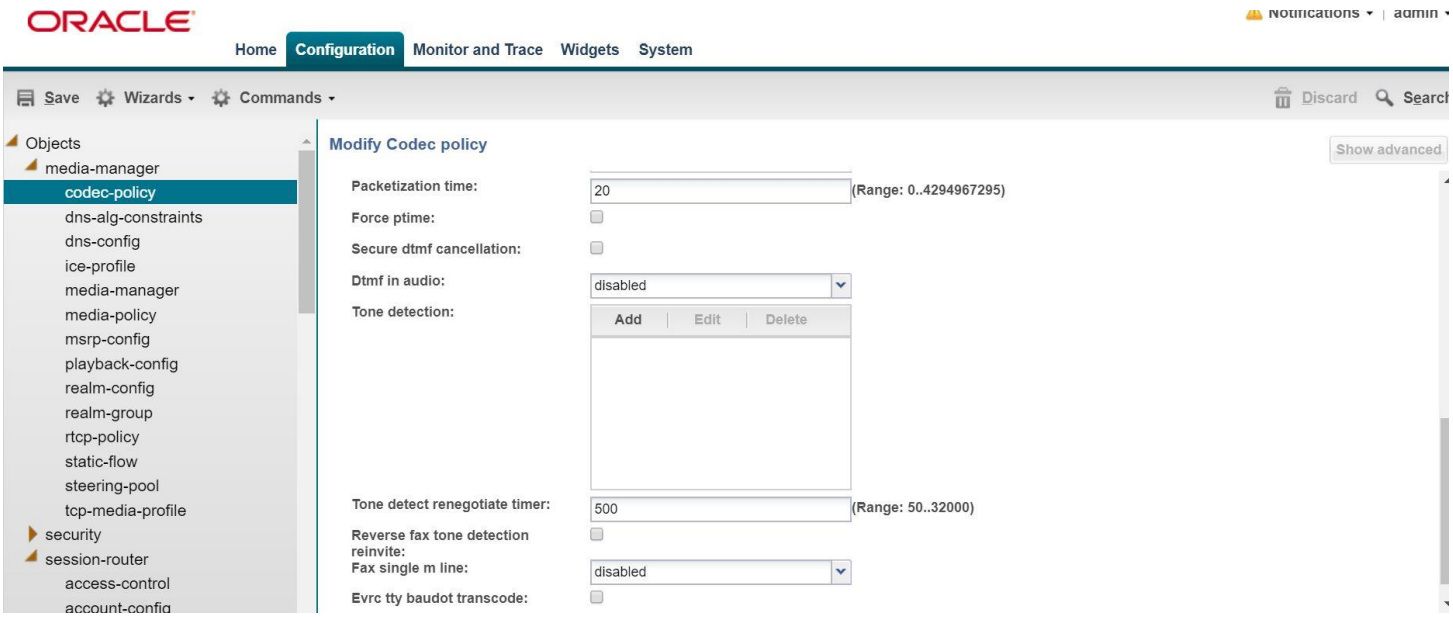


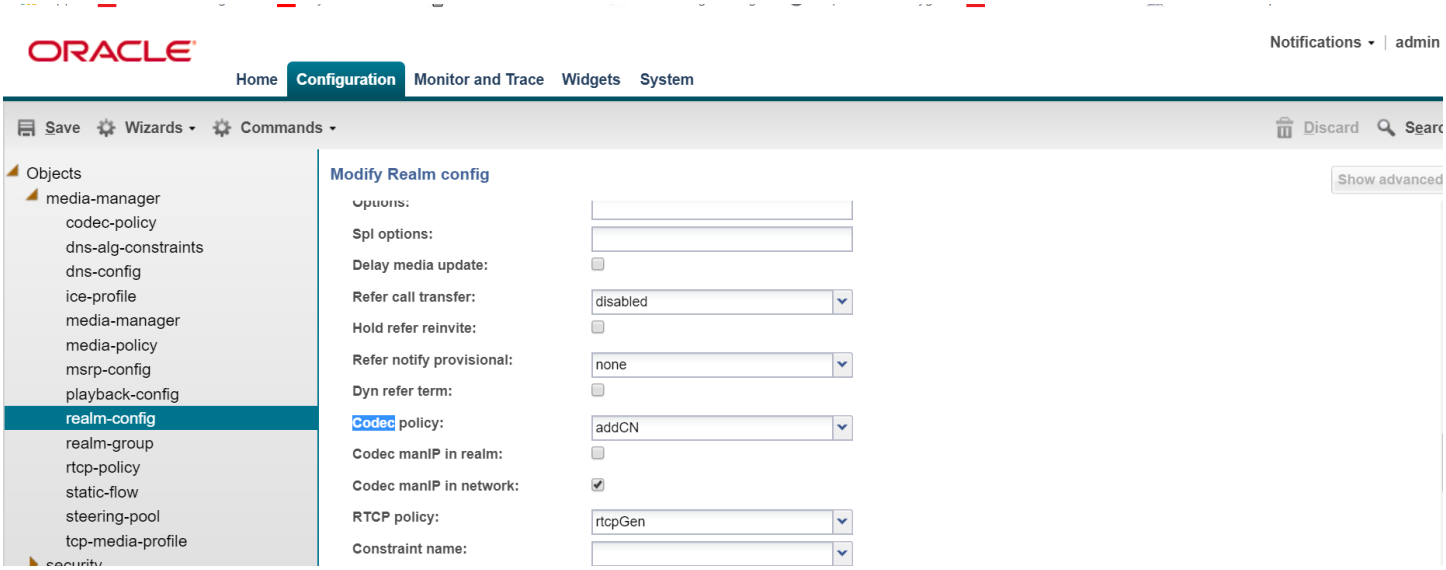
Configure media profiles similarly, for silk codec also.

Parameters	SILK-1	SILK-2
Subname	narrowband	wideband
Payload-Type	103	104
Clock-rate	8000	16000

Create another codec-policy, addCN, to add comfort noise towards Teams and apply it on the realm for Teams, Access-teams.







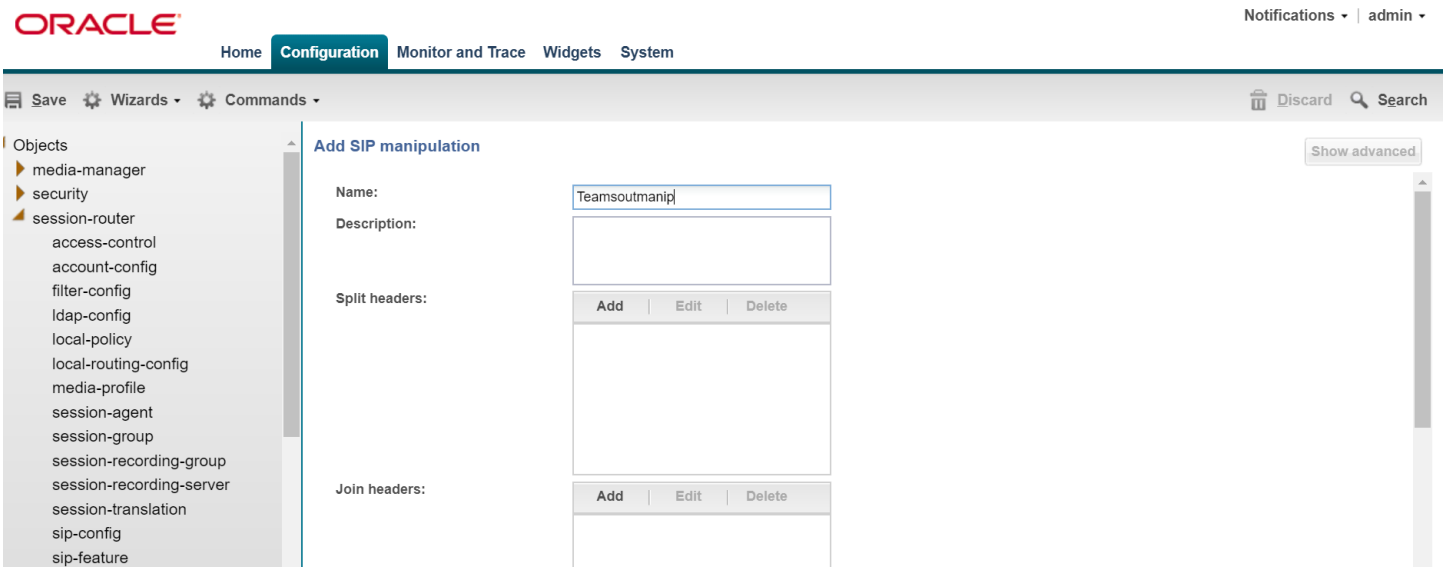
Configure sip-manipulations

Teamsoutmanip

In order for calls to be presented to Microsoft teams or SIP trunk from the SBC – the SBC would require alterations to the SIP signaling natively created. Following are manipulations required on the SBC in order for to present signaling to Microsoft Teams:

- Countrycode– formats the Request-URI as per MS Teams standards
- Change_fromip_fqdn , Change_to_userandhost – changes the From and To header according to MS requirements
- Addcontactheaderinoptions – Add a new Contact header to OPTIONS message
- Recordroute – Add a new Record-Route header to OPTIONS message
- Alter_contact-changes the contact header as per MS Teams requirements
- Adduseragent – adds the SBC information in the User-Agent header,if the User-agent is not present already.
- Modifyuser – Modifies the SBC information in the User-Agent header,if the User-agent is present already.
- Reqsendonlytoinactive - Modifies the send only attribute of SDP to inactive in the request
- Replyrecvonlytoinactive - Modifies the recv only attribute of SDP to inactive in the reply

The following sip-manipulation called Teamsoutmanip is configured as out-manipulationid to make the changes mentioned above.To configure sip-manipulations, go to session-router->sip-manipulation


ORACLE
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Save Wizards Commands
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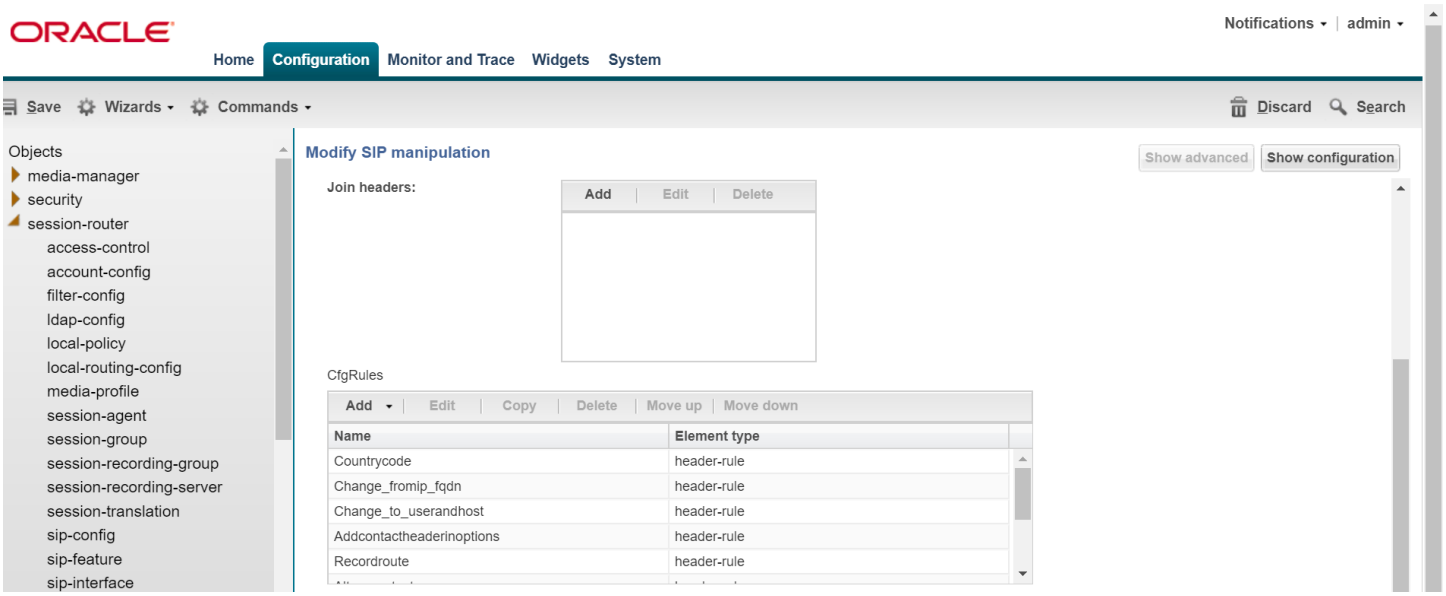
Objects
media-manager
security
session-router
access-control
account-config
filter-config
ldap-config
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
Add SIP manipulation
Show advanced
Name:
Teamsoutmanip
Description:
Split headers:
Add Edit Delete
Join headers:
Add Edit Delete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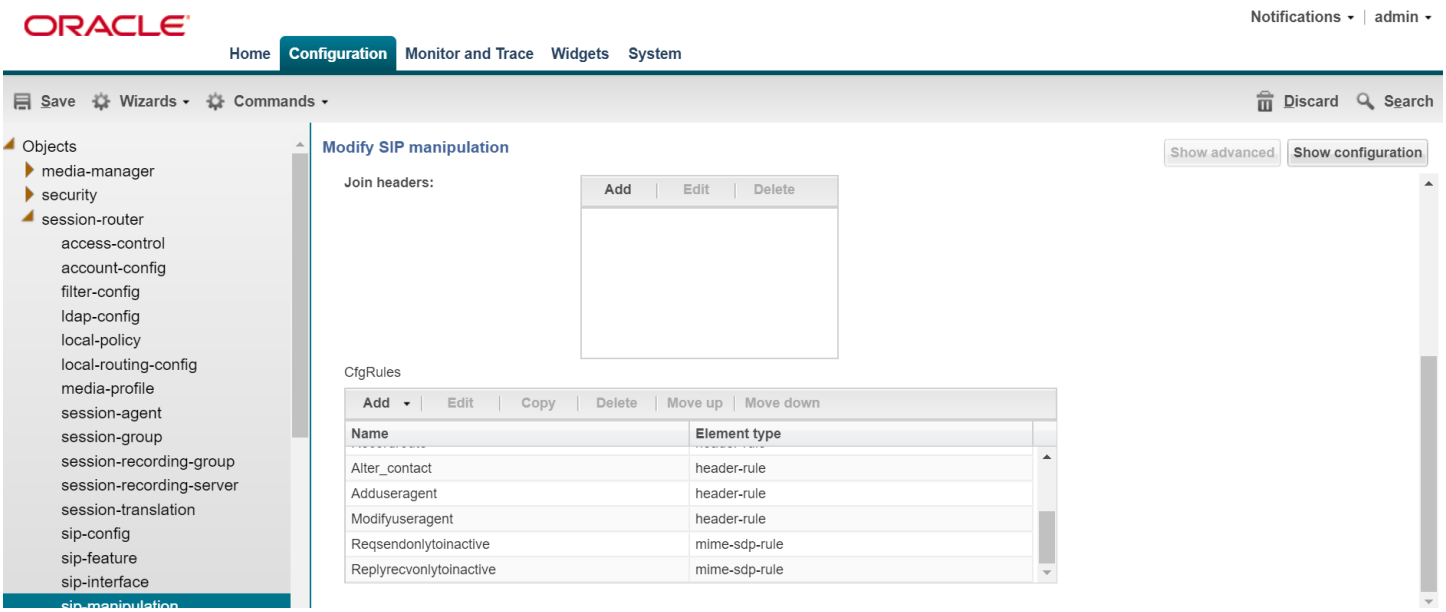
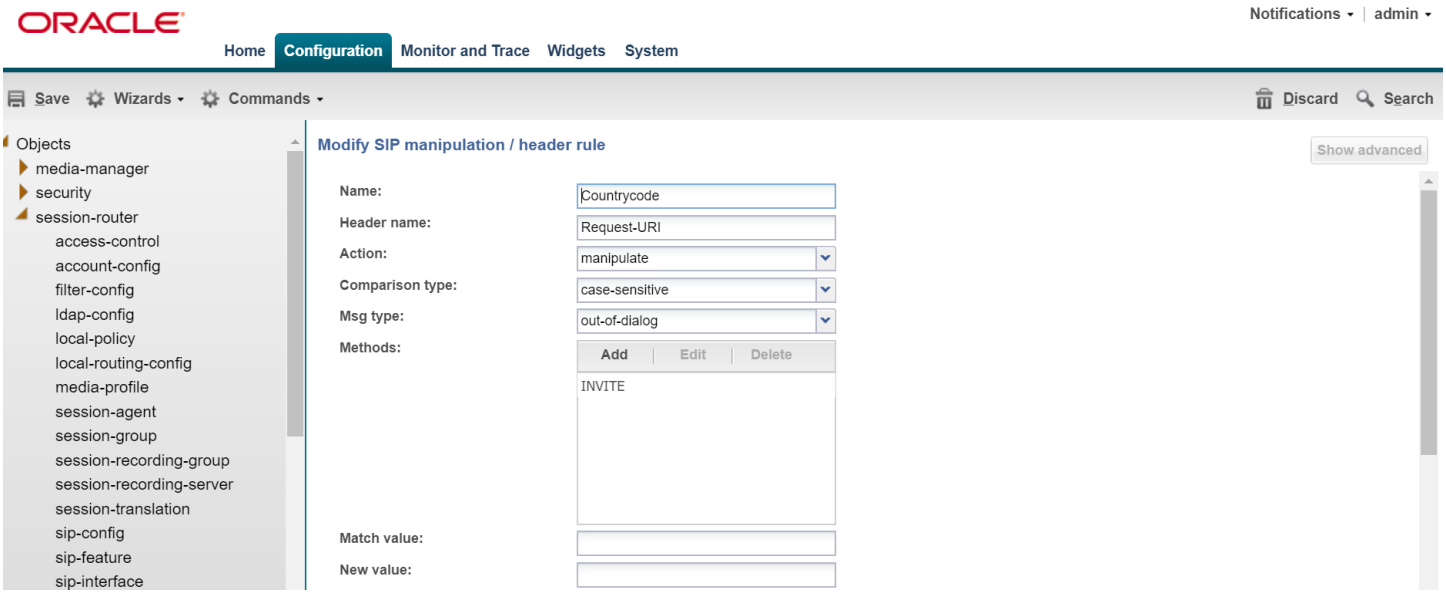
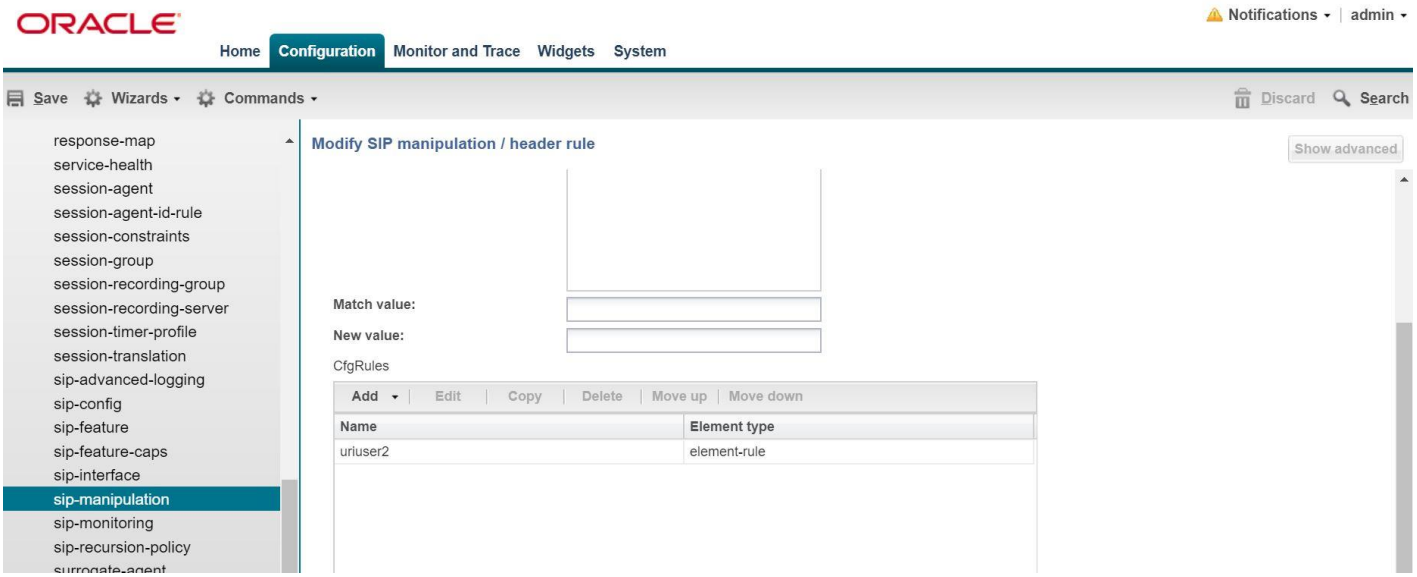
filter-config
ldap-config
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
sip-interface
Modify SIP manipulation
Show advanced
Show configuration
Join headers:
Add Edit Delete
CfgRules
Add Edit Copy Delete Move up Move down
Name
Element type
Countrycode
header-rule
Change_fromip_fqdn
header-rule
Change_to_userandhost
header-rule
Addcontactheaderinoptions
header-rule
Recordroute
header-rule

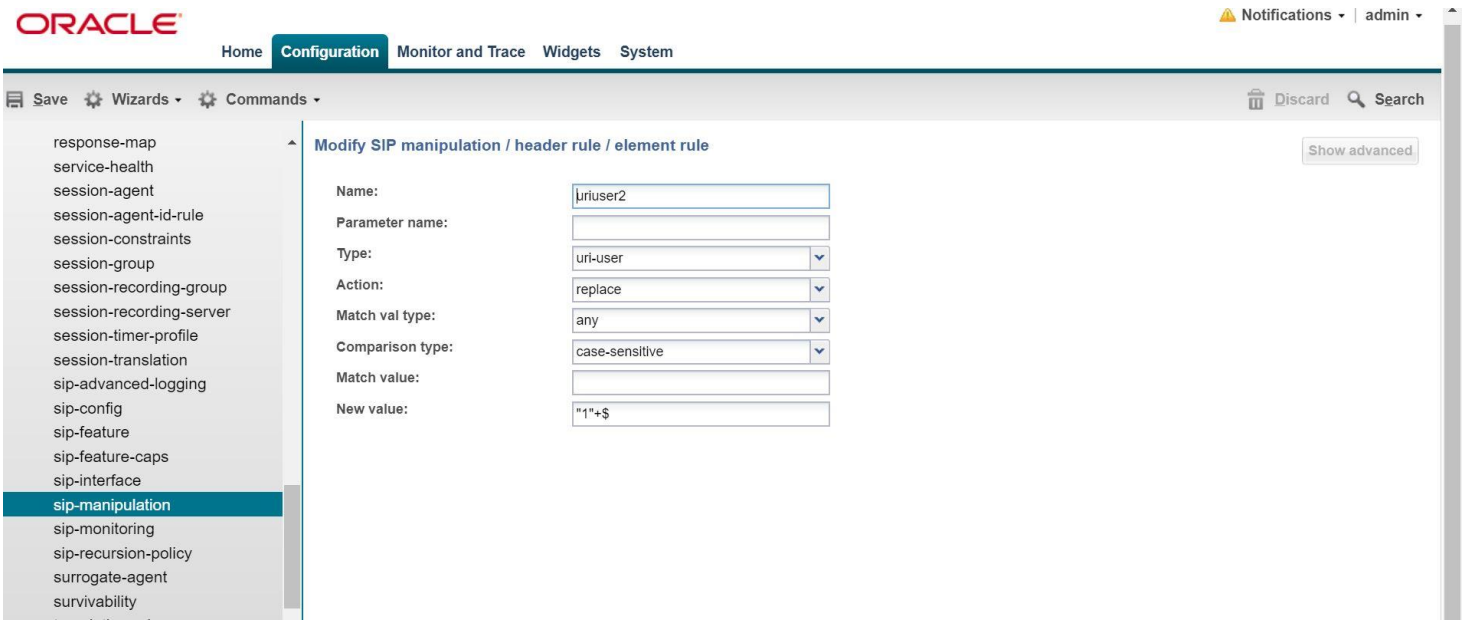


Countrycode Manipulation:

It is configured as a header rule in the sip-manipulation Teamsoutmanip shown above.



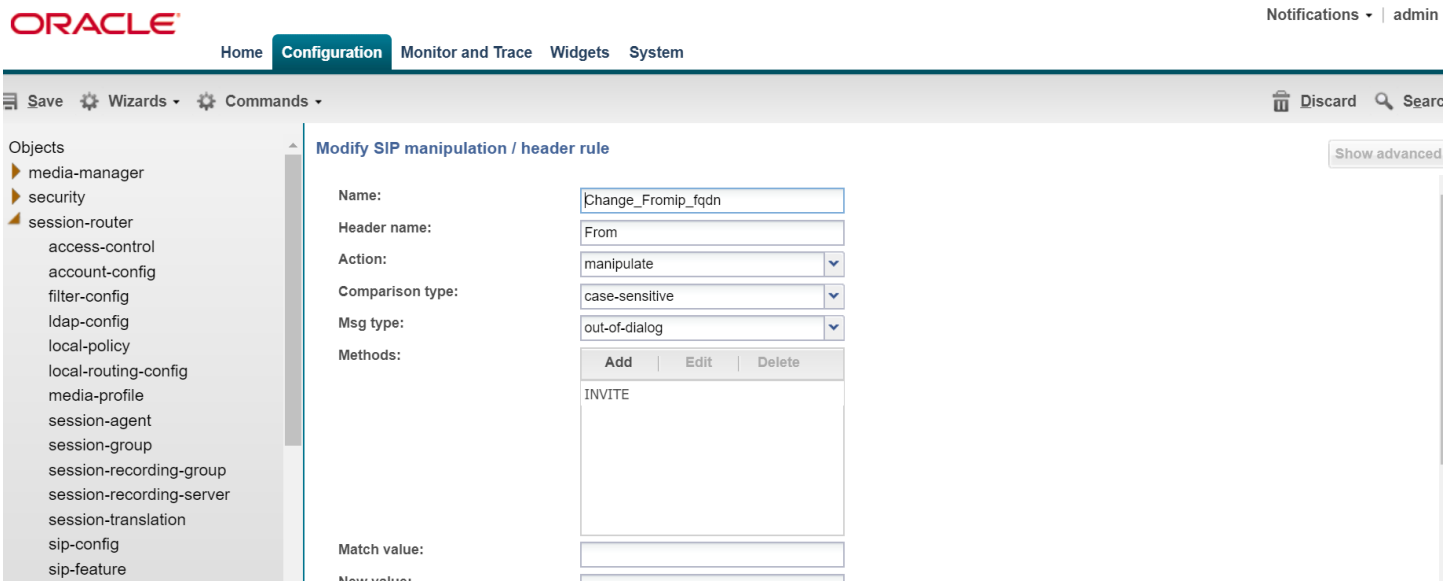


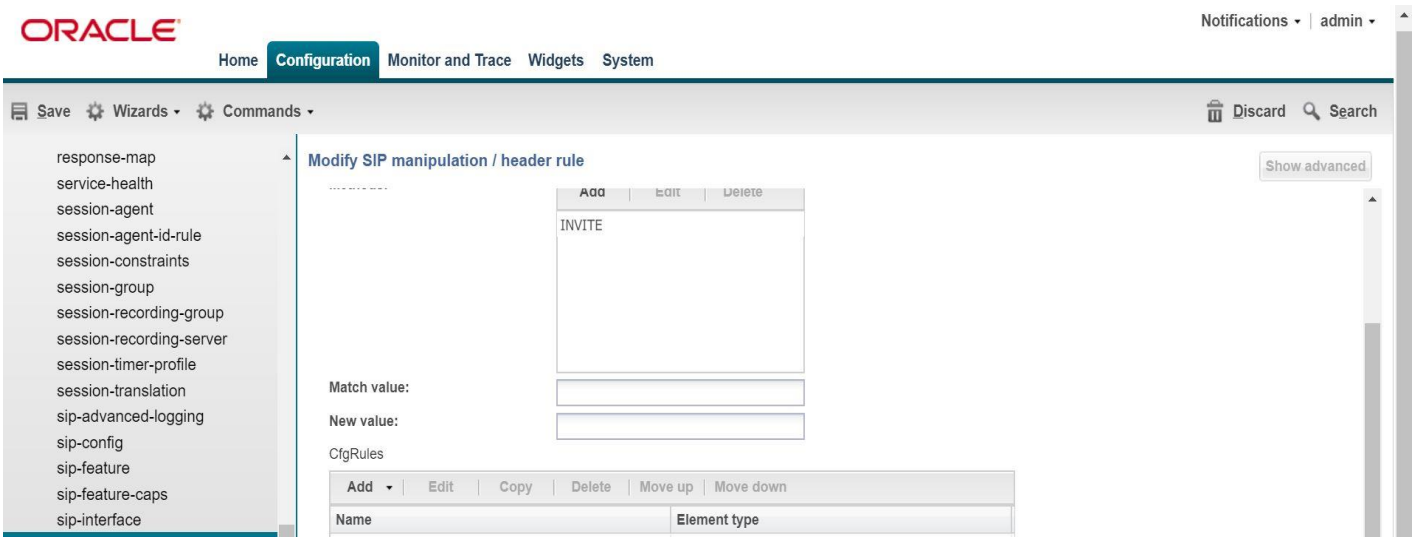


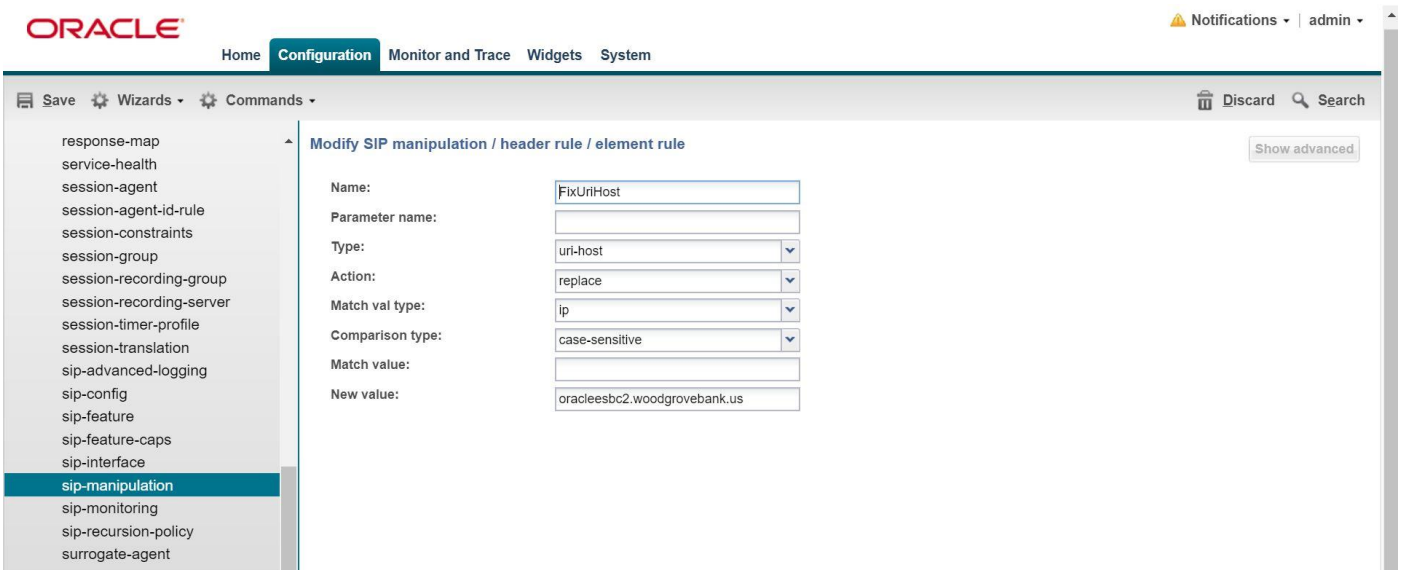
Here, the “1”added is the country code of United States. Similarly, country code can be added if necessary, for other countries.

Change_fromip_fqdn Manipulation:

It is configured as a header rule in the sip-manipulation Teamsoutmanip. Here the host uri is changed to oracleesbc2.woodgroovebank.us as shown below



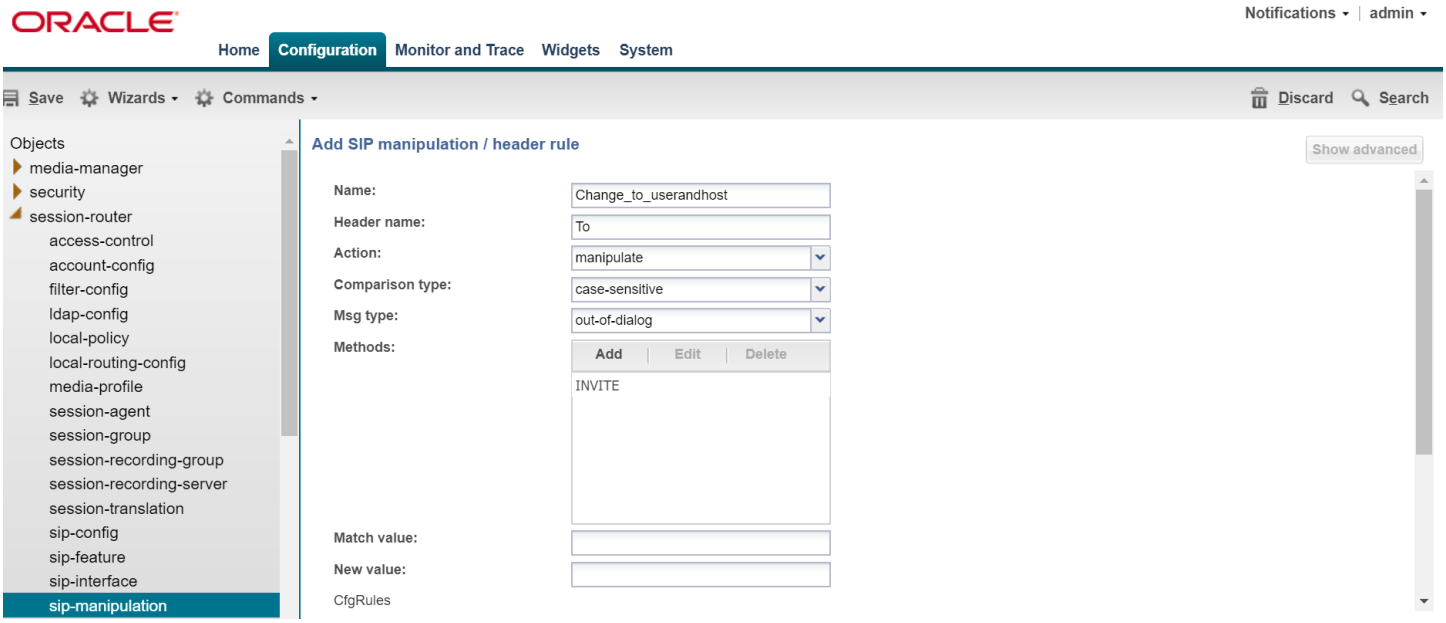


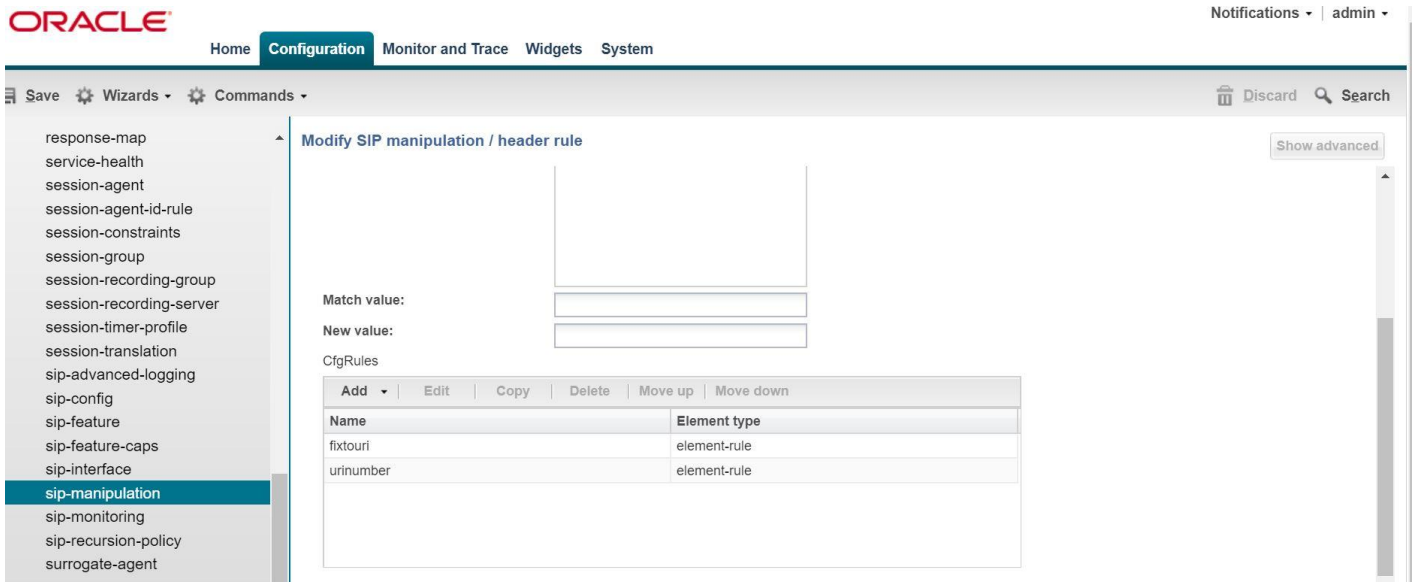


Change_to_userandhost Manipulation:

It is configured as a header rule in the sip-manipulation Teamsoutmanip. Here,two element rules are added.

- The host uri is changed according to MS Teams requirements.
- The phone number here is also changed, here "1" added is the country code of United States. Similarly, country code can be added if necessary, for other countries.

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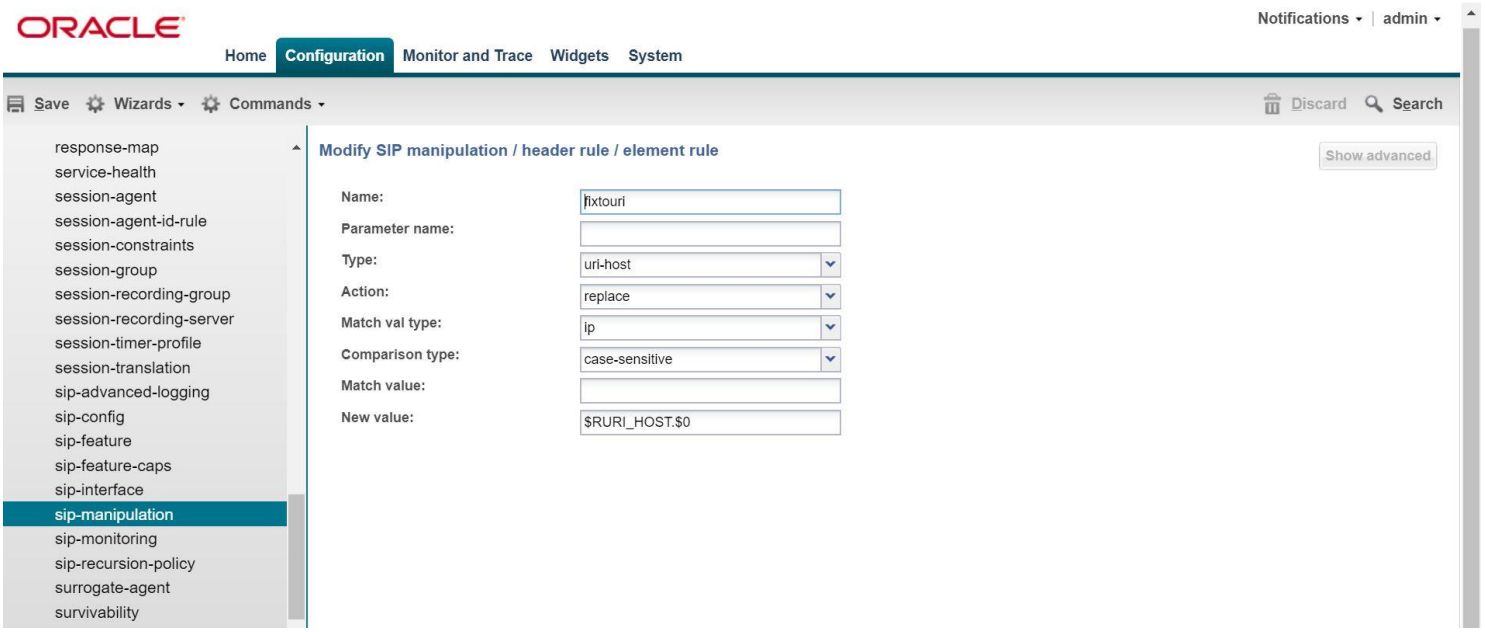
response-map
service-health
session-agent
session-agent-id-rule
session-constraints
session-group
session-recording-group
session-recording-server
session-timer-profile
session-translation
sip-advanced-logging
sip-config
sip-feature
sip-feature-caps
sip-interface
sip-manipulation
sip-monitoring
sip-recursion-policy
surrogate-agent
Modify SIP manipulation / header rule
Show advanced
Match value:
New value:
CfgRules
Add
Edit
Copy
Delete
Move up
Move down
Name
Element type
fixtouri
element-rule
urinumber
element-rule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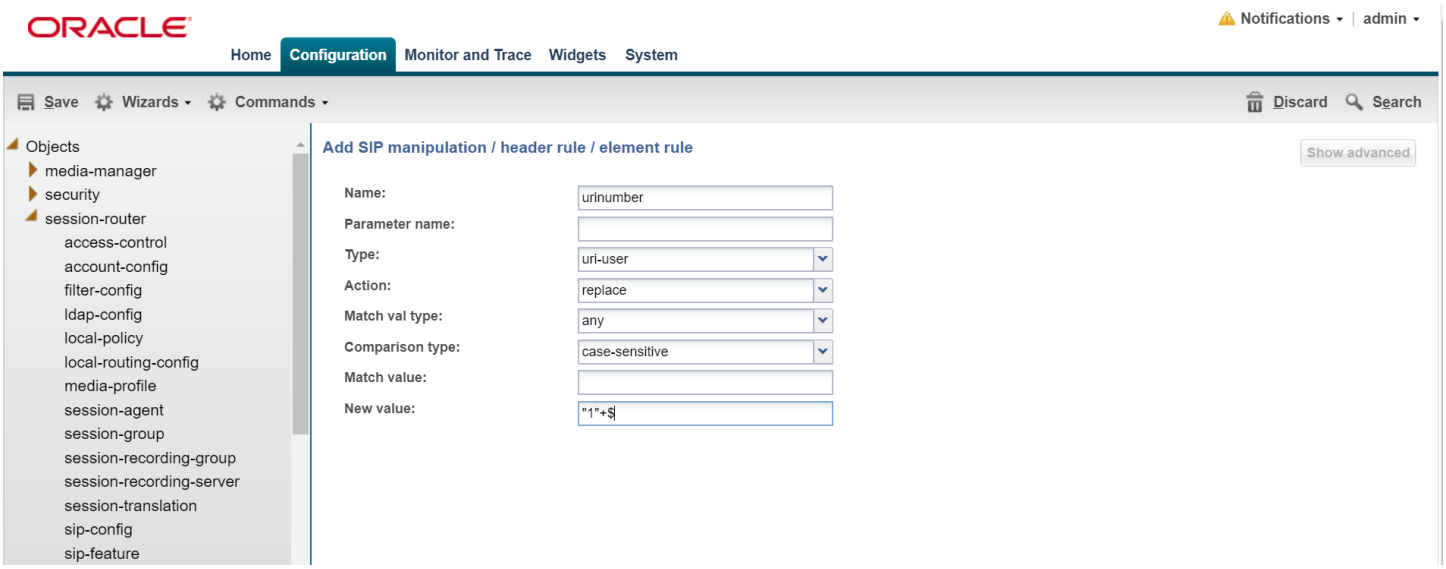
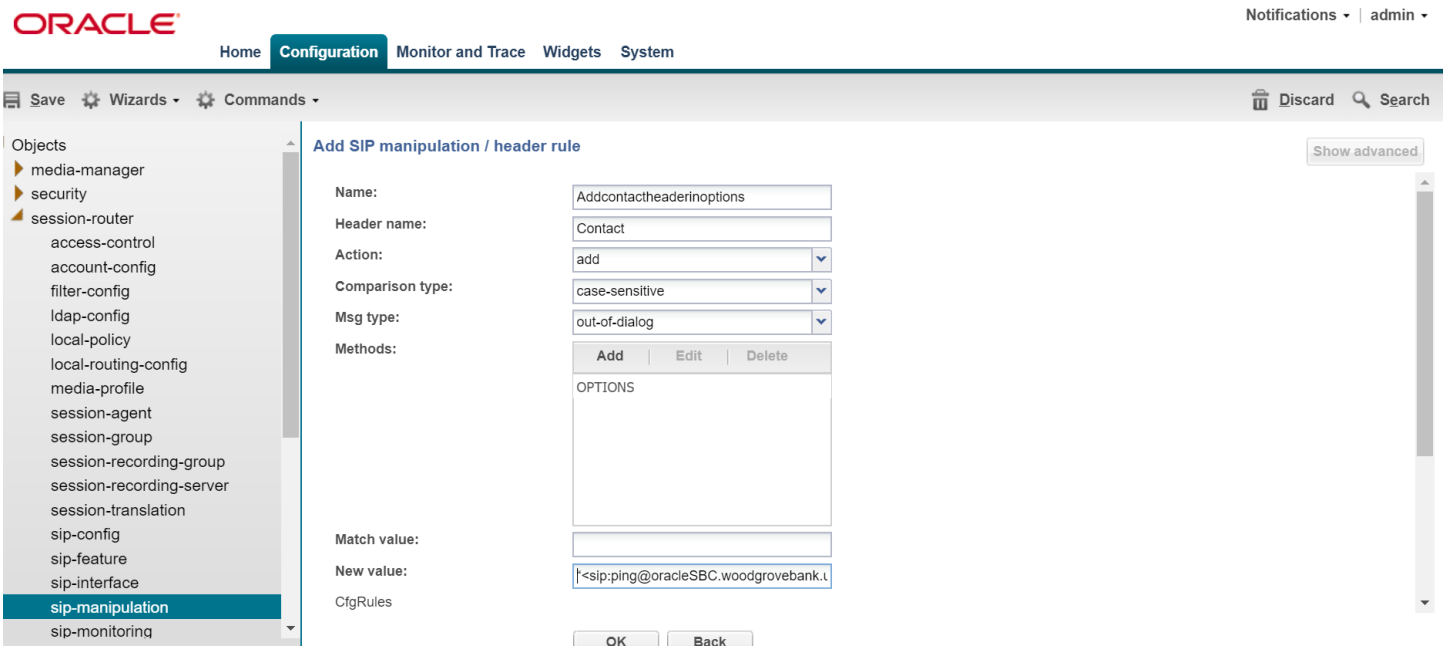
service-health
session-agent
session-agent-id-rule
session-constraints
session-group
session-recording-group
session-recording-server
session-timer-profile
session-translation
sip-advanced-logging
sip-config
sip-feature
sip-feature-caps
sip-interface
sip-manipulation
sip-monitoring
sip-recursion-policy
surrogate-agent
survivability
Modify SIP manipulation / header rule / element rule
Show advanced
Name:
fixtouri
Parameter name:
Type:
uri-host
Action:
replace
Match val type:
ip
Comparison type:
case-sensitive
Match value:
New value:
$RURI_HOST.$0



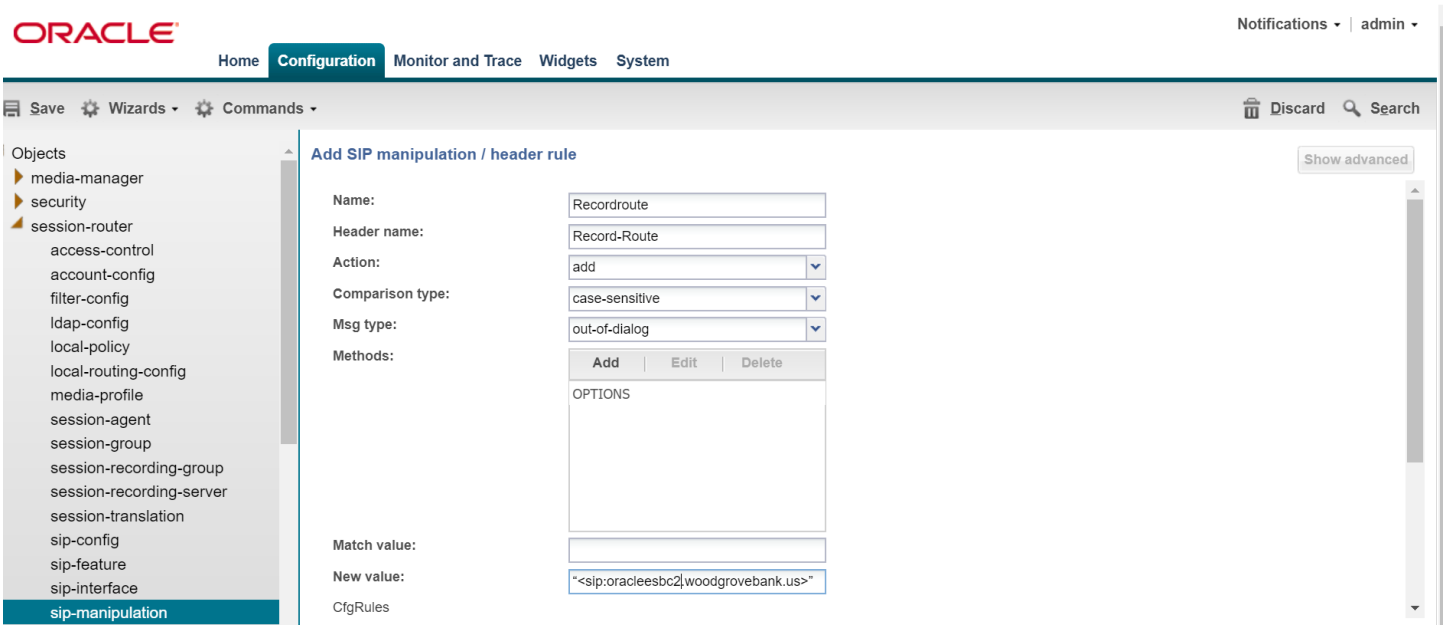
Addcontactheaderinoptions

It is configured as a header rule in the sip-manipulation Teamsoutmanip. Here the contact is changed to "<sip:ping@oracleSBC.woodgrovebank.us:5061;transport=tls>",according to MS Team requirements.



Recordroute

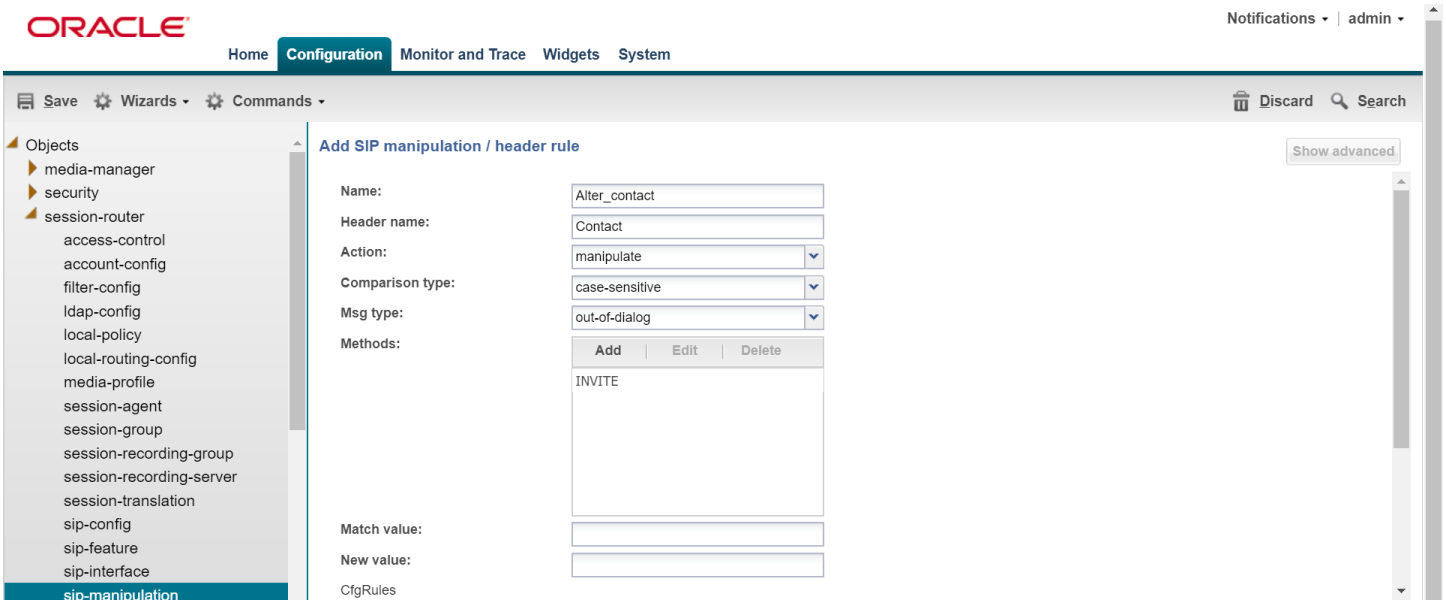
It is configured as a header rule in the sip-manipulation Teamsoutmanip .Here Record-route is added to the OPTIONS message “<sip:oracleesbc2.woodgrovebank.us>”

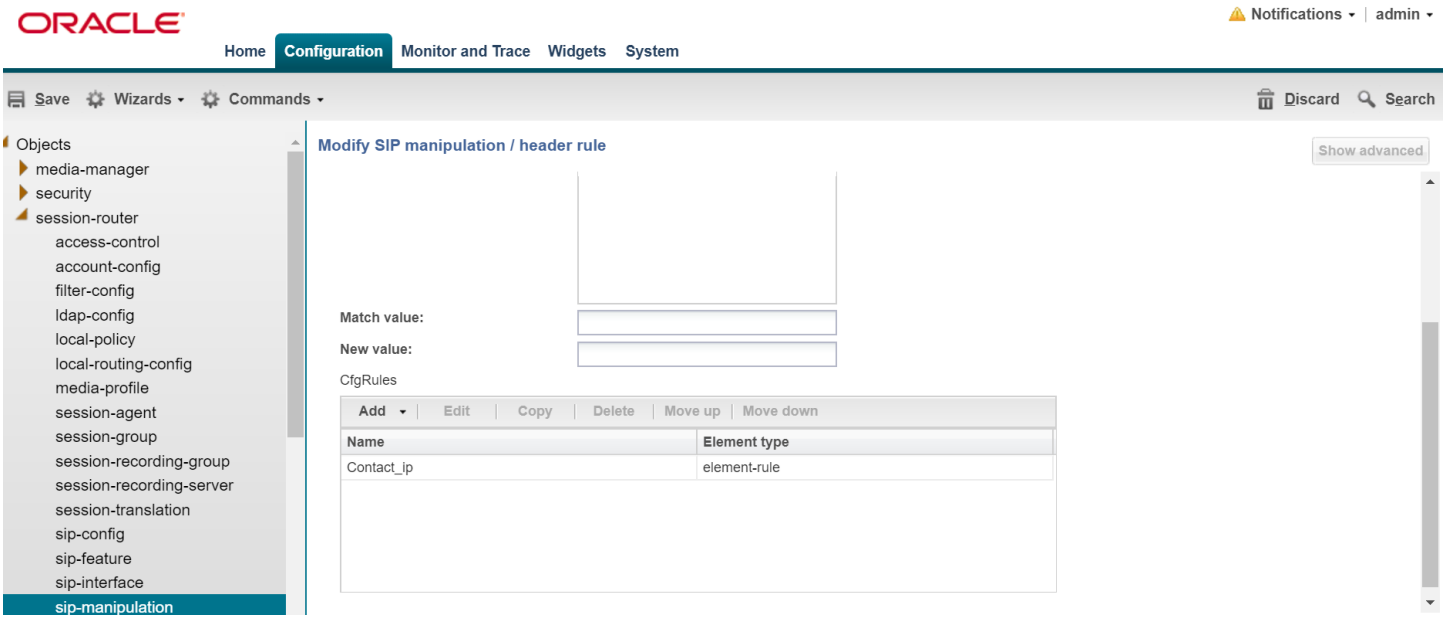


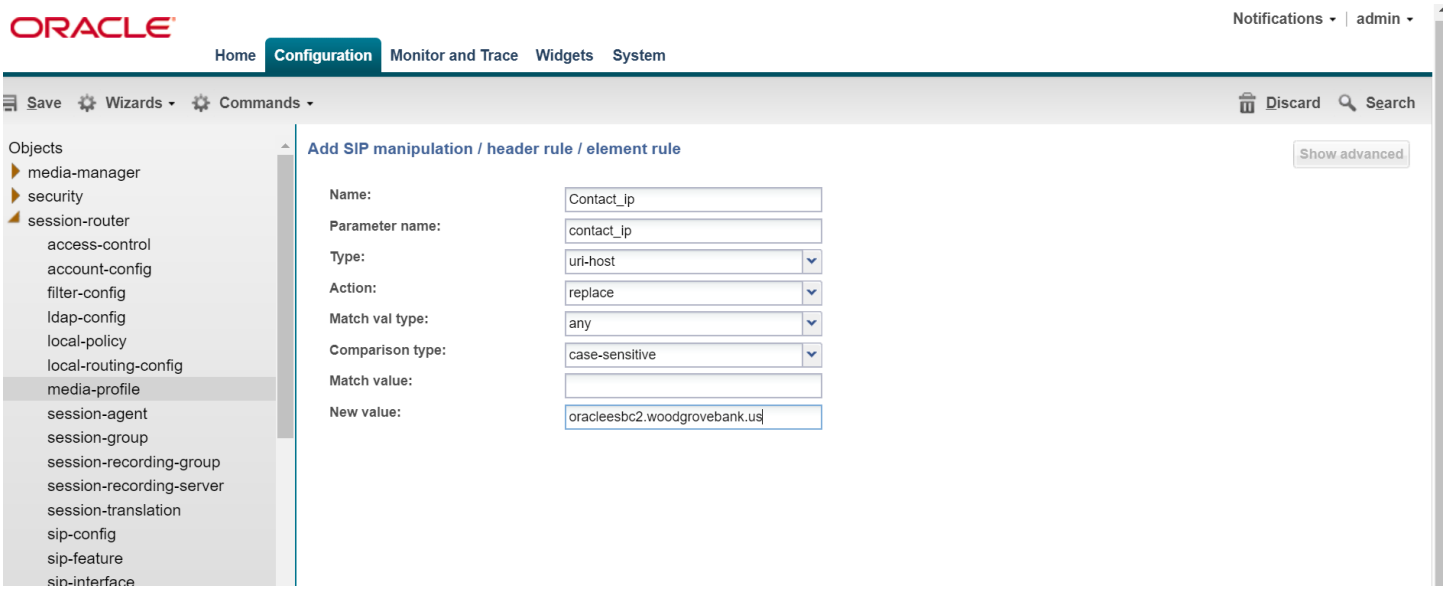
Alter_contact

It is configured as a header rule in the sip-manipulation Teamsoutmanip.The contact header is changed according to MS Team requirements. The following element rule is added

- Changing the uri according to include the SBC uri (oracleesbc2.woodgrovebank.us)

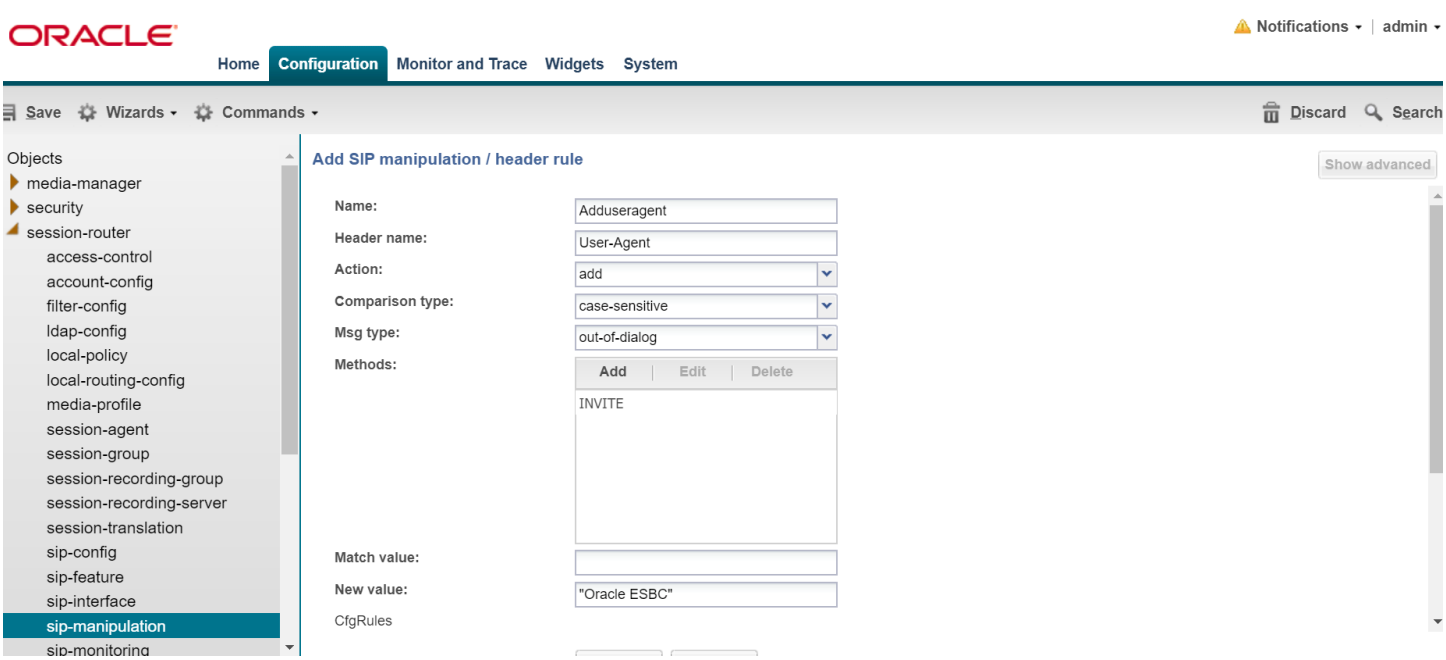






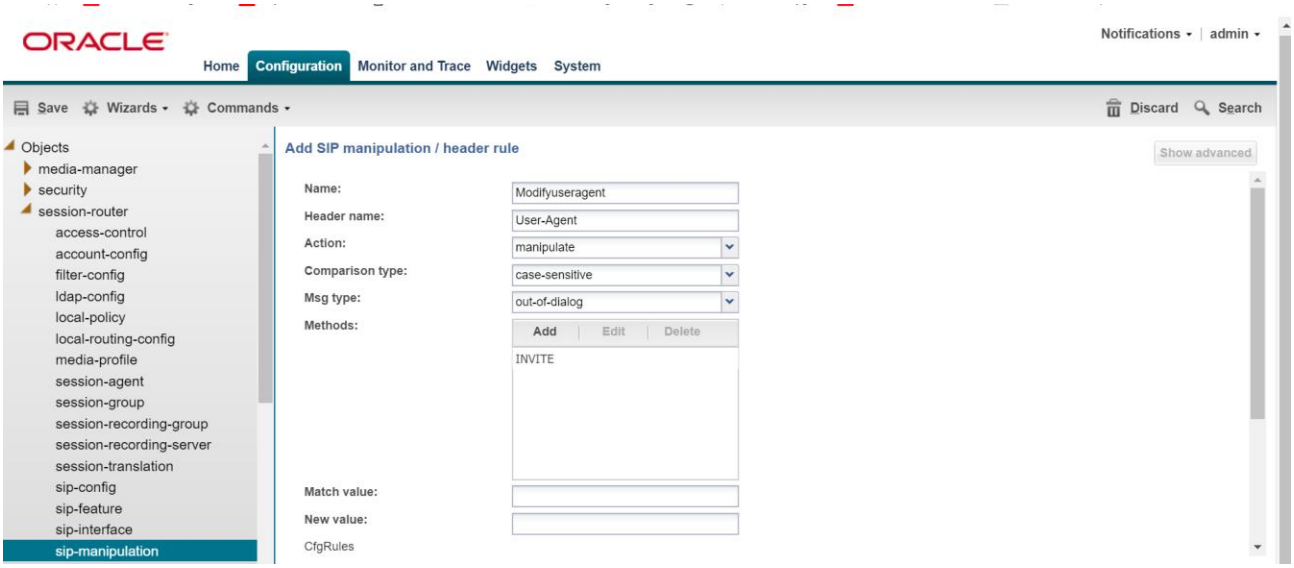
Adduseragent

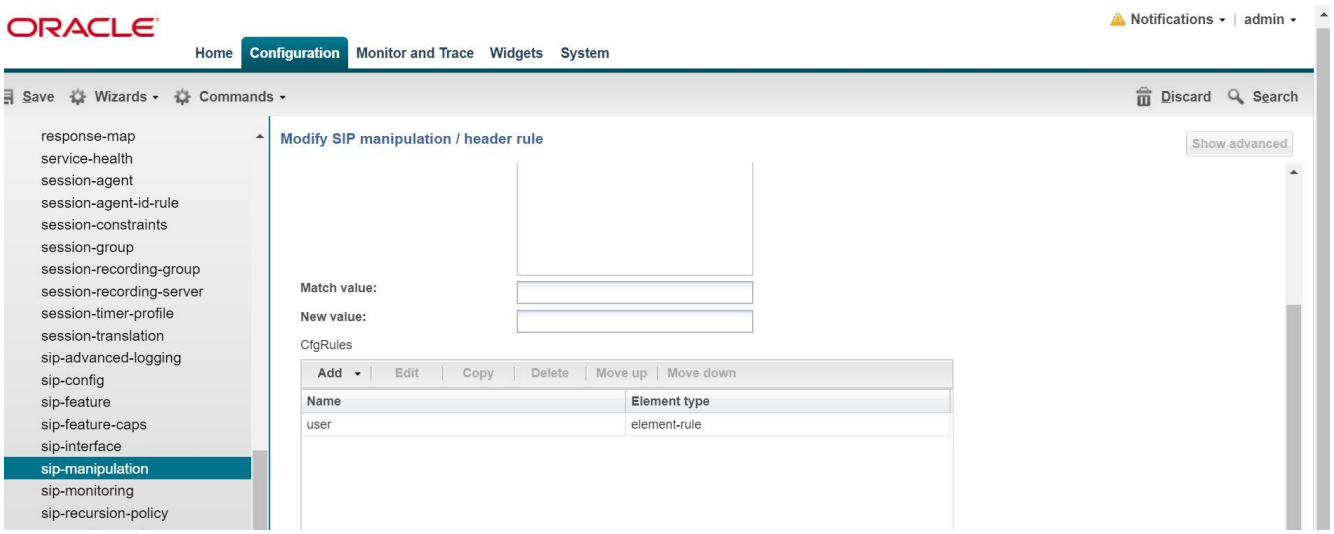
It is configured as a header rule in the sip-manipulation Teamsoutmanip. It adds the user agent to the Invite message,if it is already not present in the invite from Siptrunk.

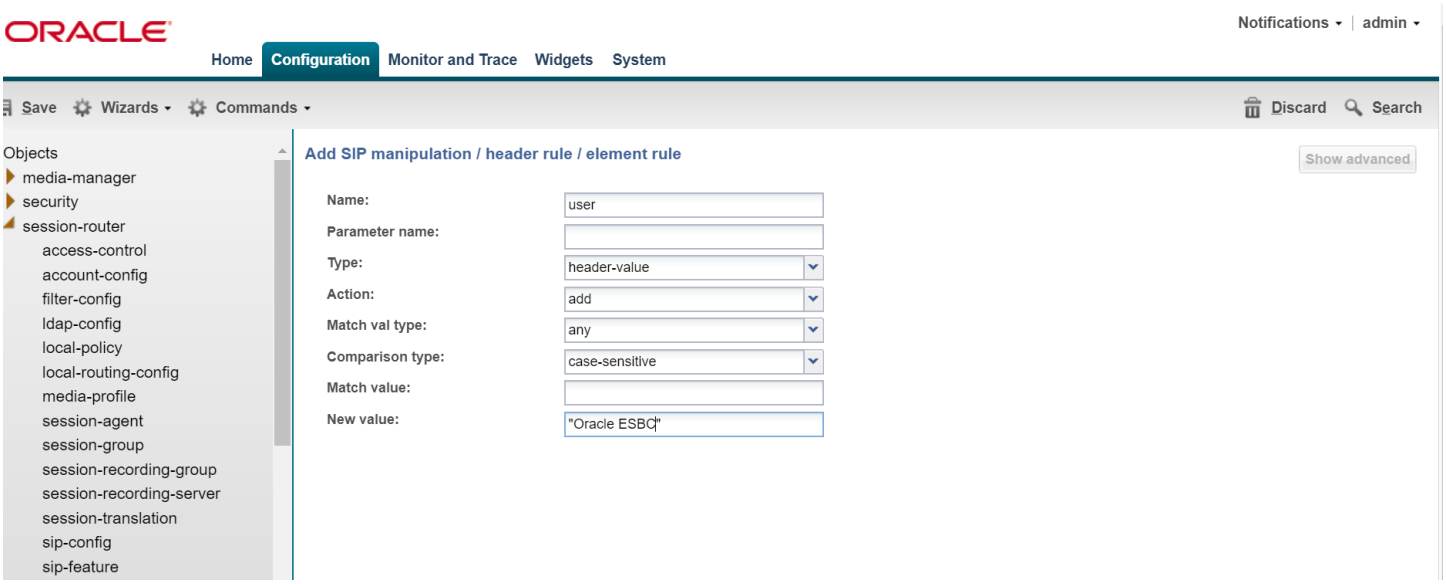


Modifyuseragent

It is configured as a header rule in the sip-manipulation Teamsoutmanip. It modifies the user agent to the Invite message,according to MS Teams requirements.







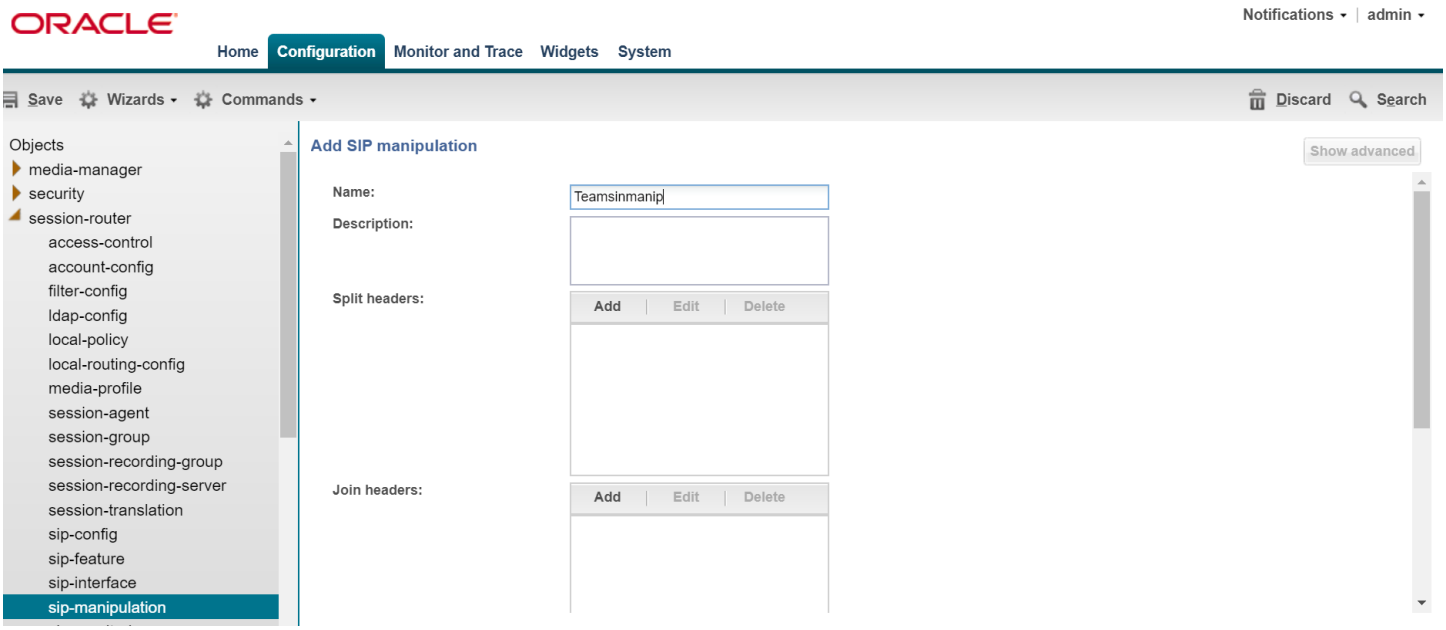
For configuring the following rules in Teamsoutmanip, click on the hyperlink below.

- Reqsendonlytoinactive
- Replyrecvonlytoinactive

Teamsinmanip

The following manipulation is configured to handle the SIP messages received inbound from Teams, Teamsinmanip.

- Respondoptions – to handle the OPTIONS locally
- Reqinactivetosendonly – replaces the inactive SDP attribute to sendonly in the request
- Replyinactivetorecvonly - replaces the inactive SDP attribute to recvonly in the reply
- Change183to180 –Changes 183 Session in Progress to 180 Ringing for ringback requirements


ORACLE
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Objects
media-manager
security
session-router
access-control
account-config
filter-config
ldap-config
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
sip-interface
sip-manipulation
Add SIP manipulation
Show advanced
Name:
Teamsinmanip
Description:
Split headers:
Add
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Delete
Join headers:
Add
Edit
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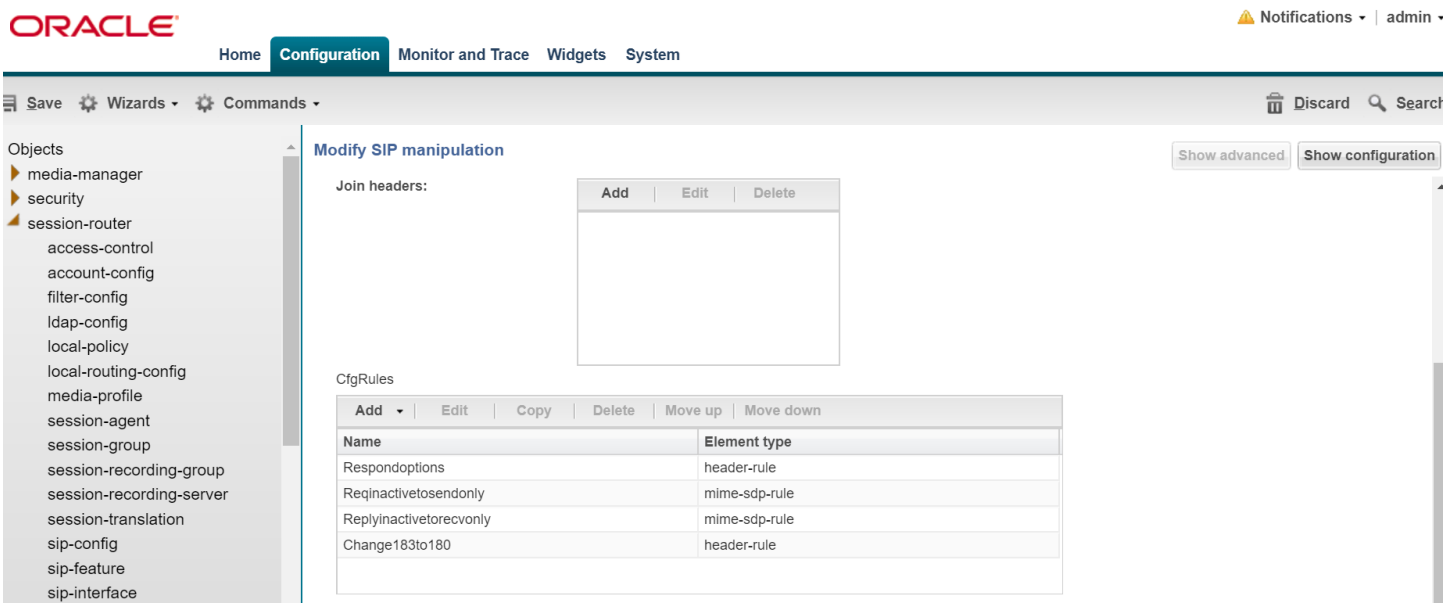
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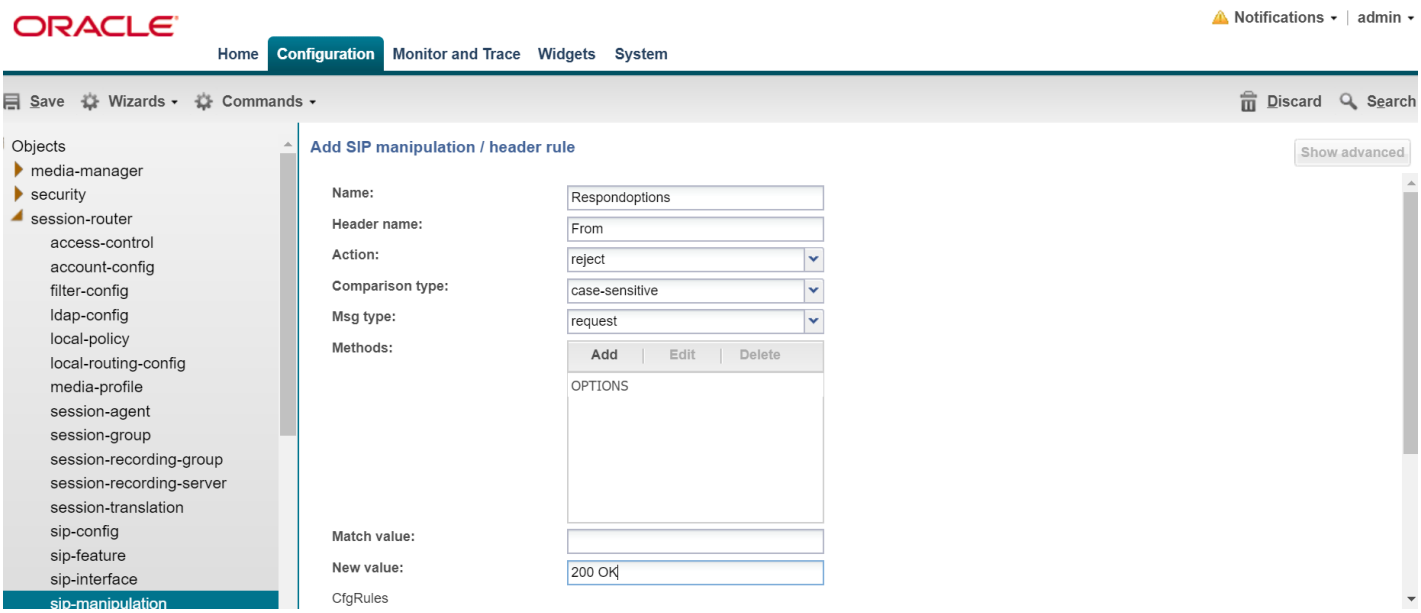
access-control
account-config
filter-config
ldap-config
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
sip-interface
Modify SIP manipulation
Show advanced
Show configuration
Join headers:
Add
Edit
Delete
CfgRules
Add
Edit
Copy
Delete
Move up
Move down
Name
Element type
Respondoptions
header-rule
Reqinactivetosendonly
mime-sdp-rule
Replyinactivetorecvonly
mime-sdp-rule
Change183to180
header-rule

Respondoptions

It is configured as a header-rule rule in the sip-manipulation Teamsinmanip.This handles the options locally.



Please click on the hyperlink for the following rules applied on the Teamsinmanip manipulation.

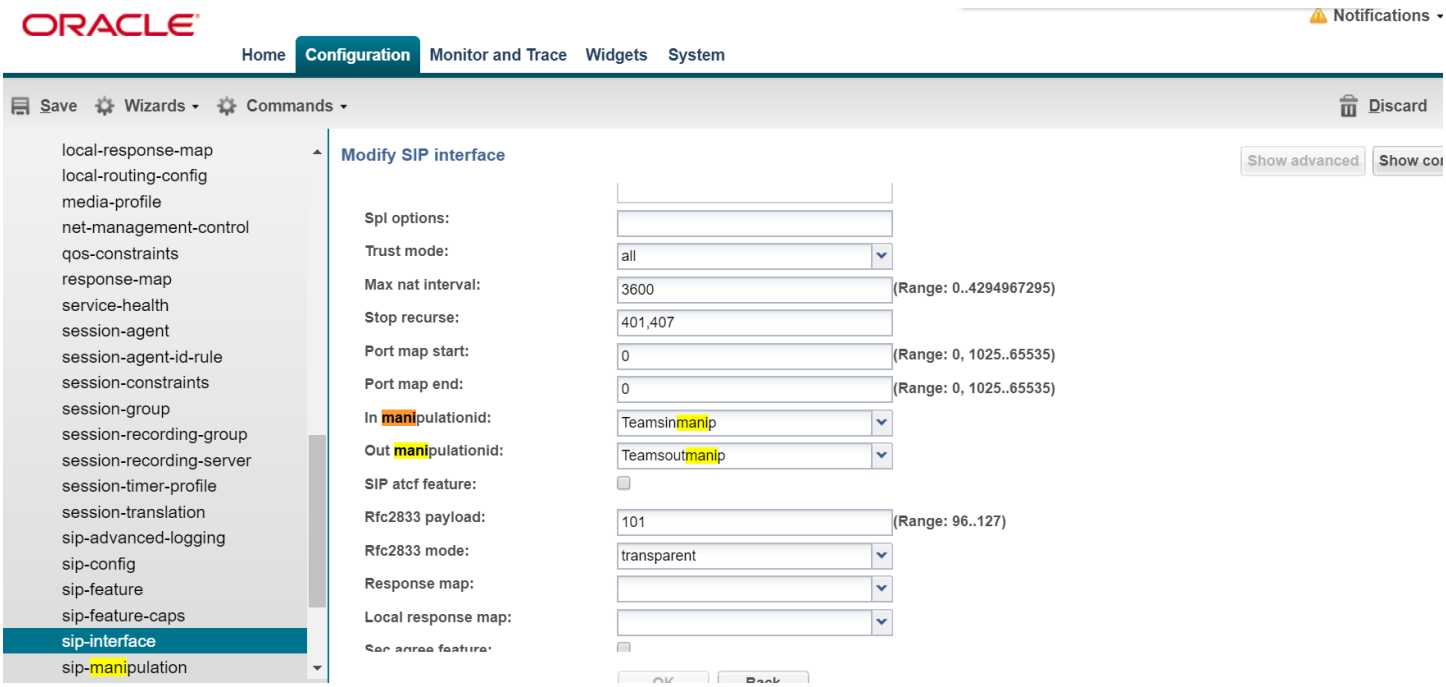
“Change183to180”

Reqinactivetosendonly

Reqinactivetorecvonly

Applying the teams SIP manipulations to Teams SIP Interface

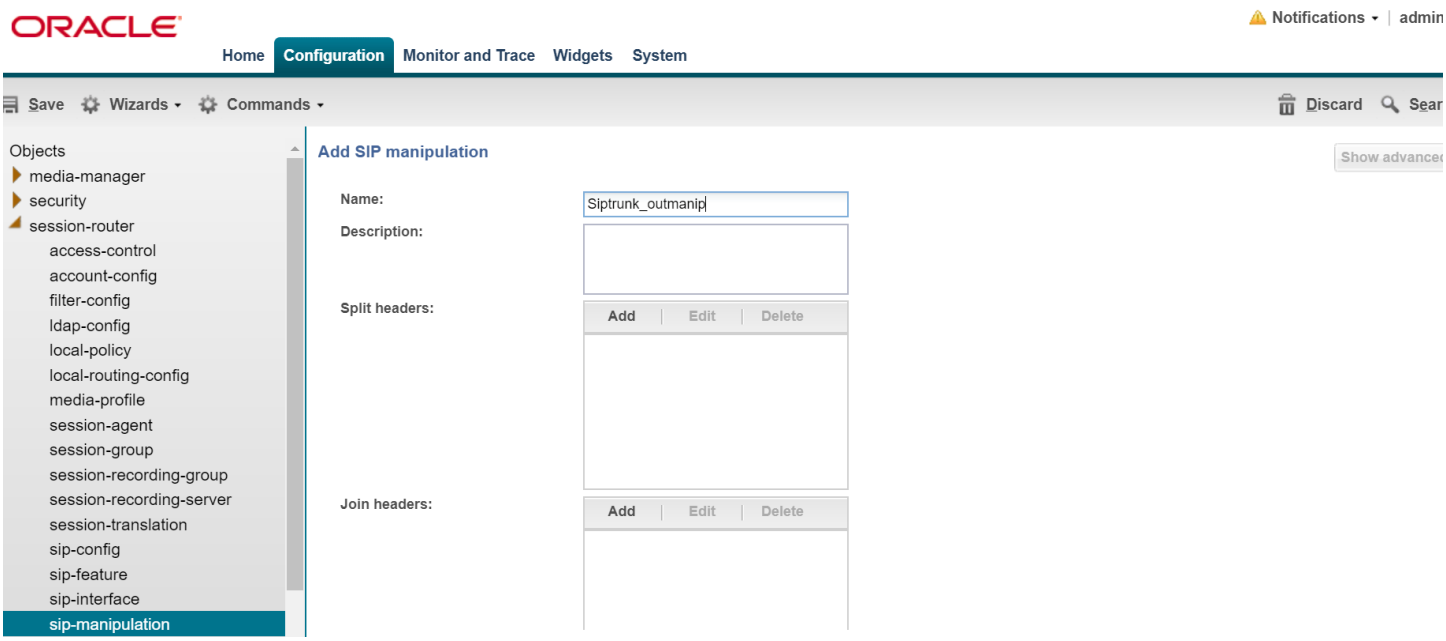
Apply the above sip manipulations to sip-interface as shown below.

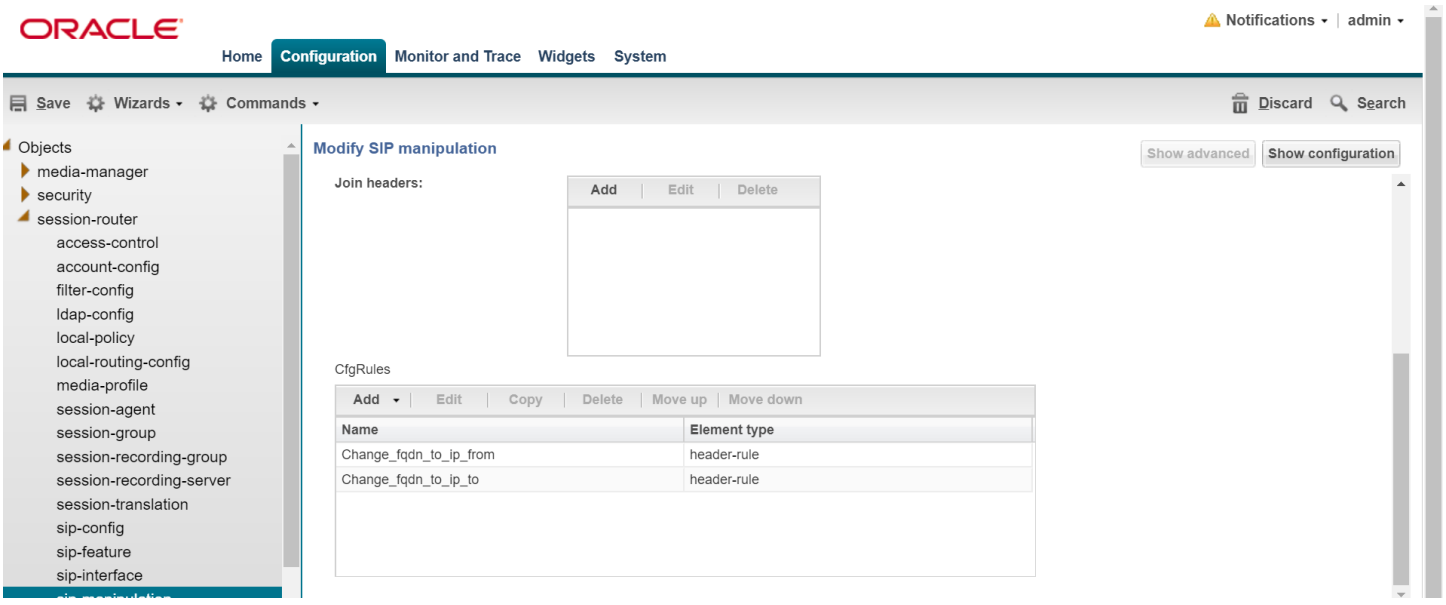


Siptrunk_outmanip

We configure the manipulation Siptrunk_outmanip to modify the SIP messages going to the SIP Trunk as below

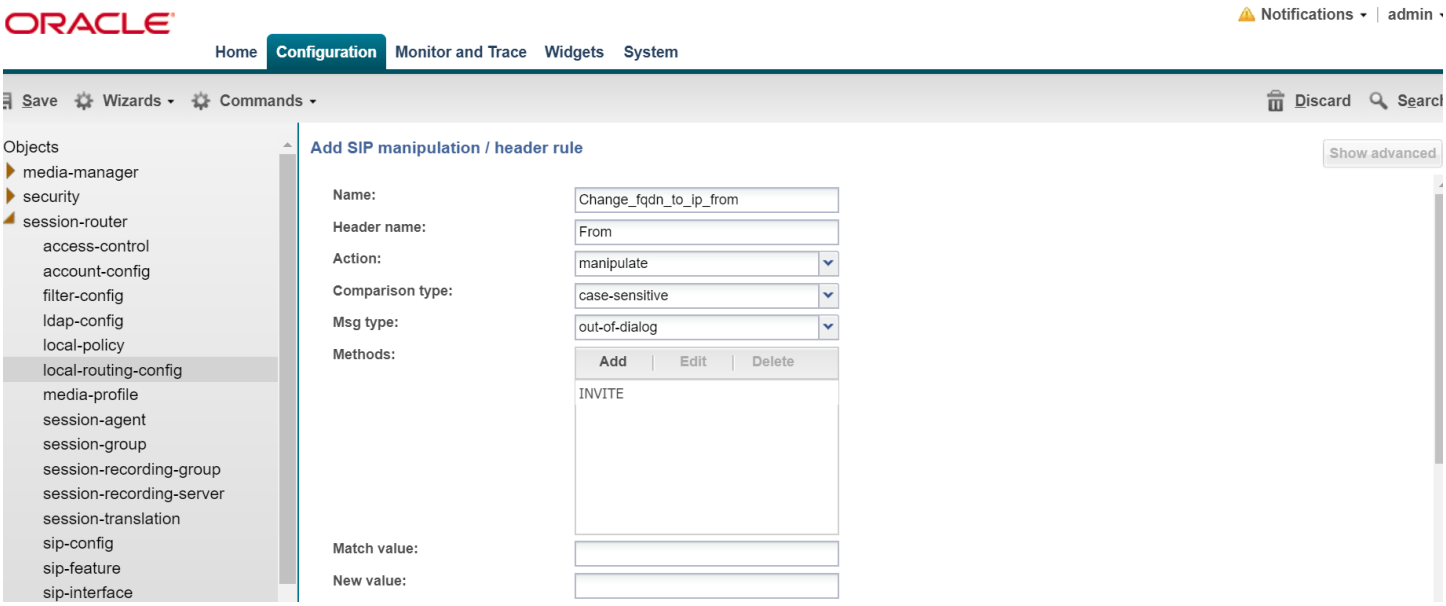
- Change_fqdn_to_ip_from to replace the uri-host of the From header with the SBC's local ip.
- Change_fqdn_to_ip_to to replace the uri-host of the To header with the ip –address of the Trunk device..

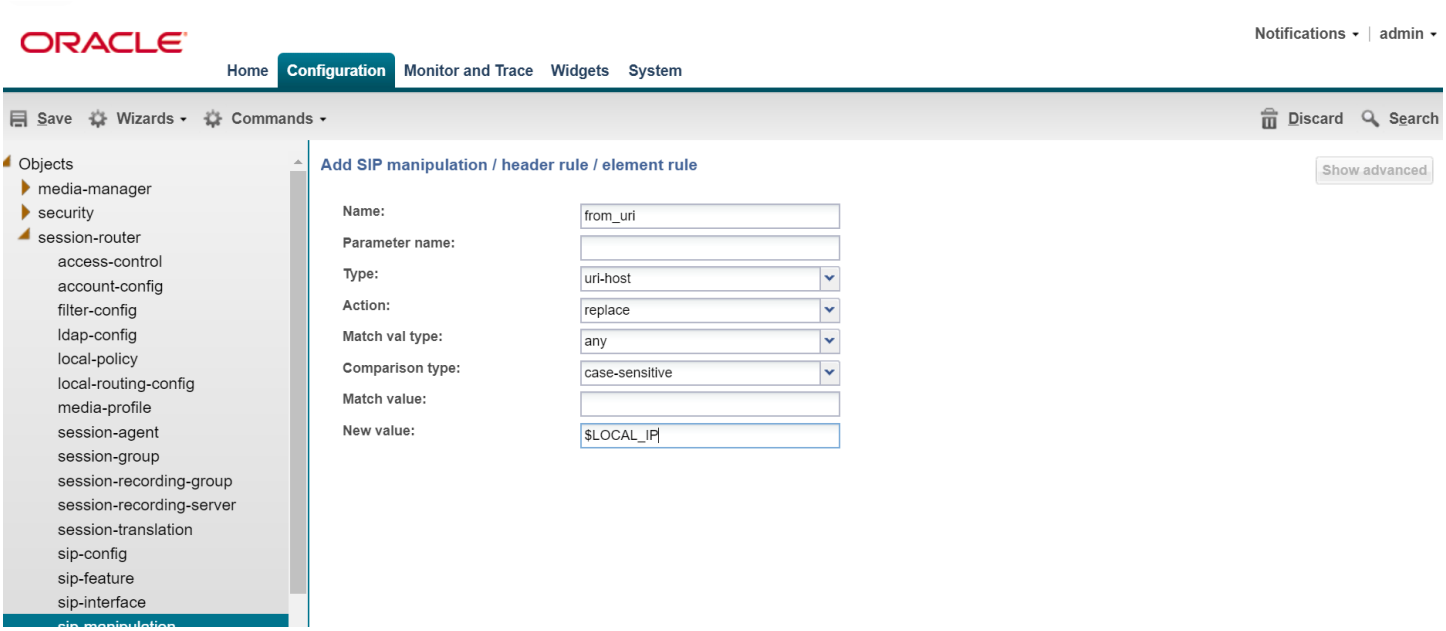




Change_fqdn_to_ip_from

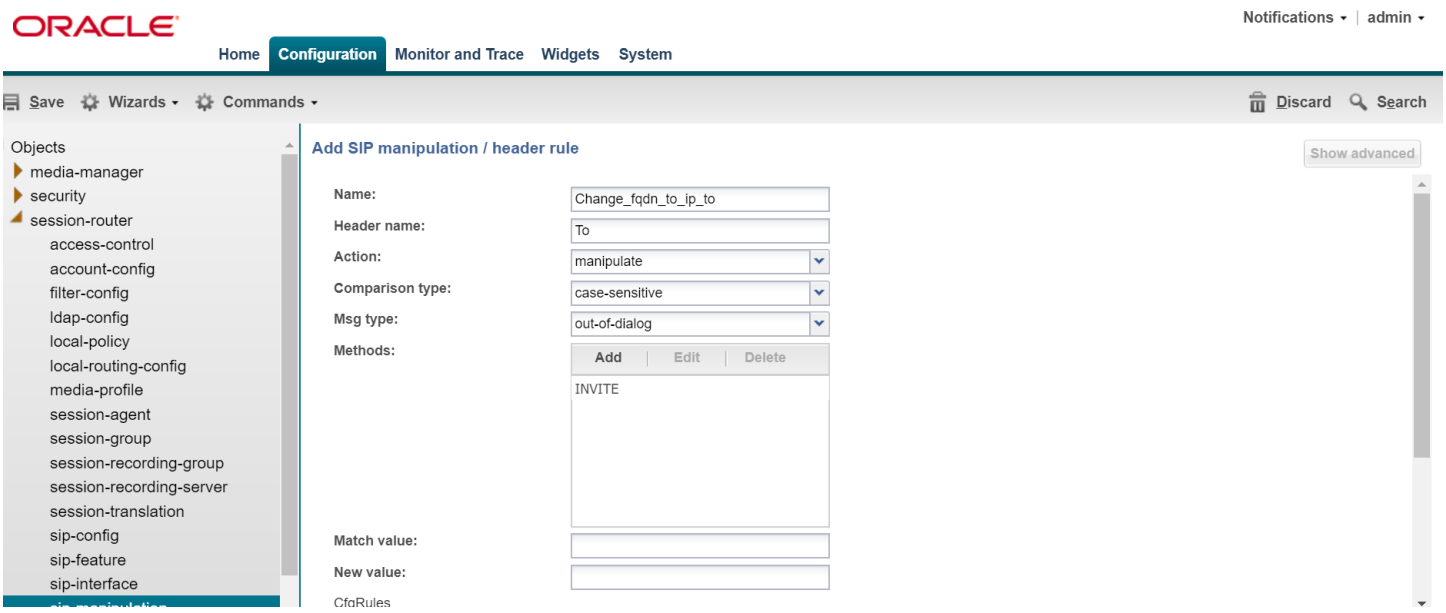
It is applied as a header rule in Siptrunk_outmanip ,to replace the uri-host of the From header with the SBC's local ip.

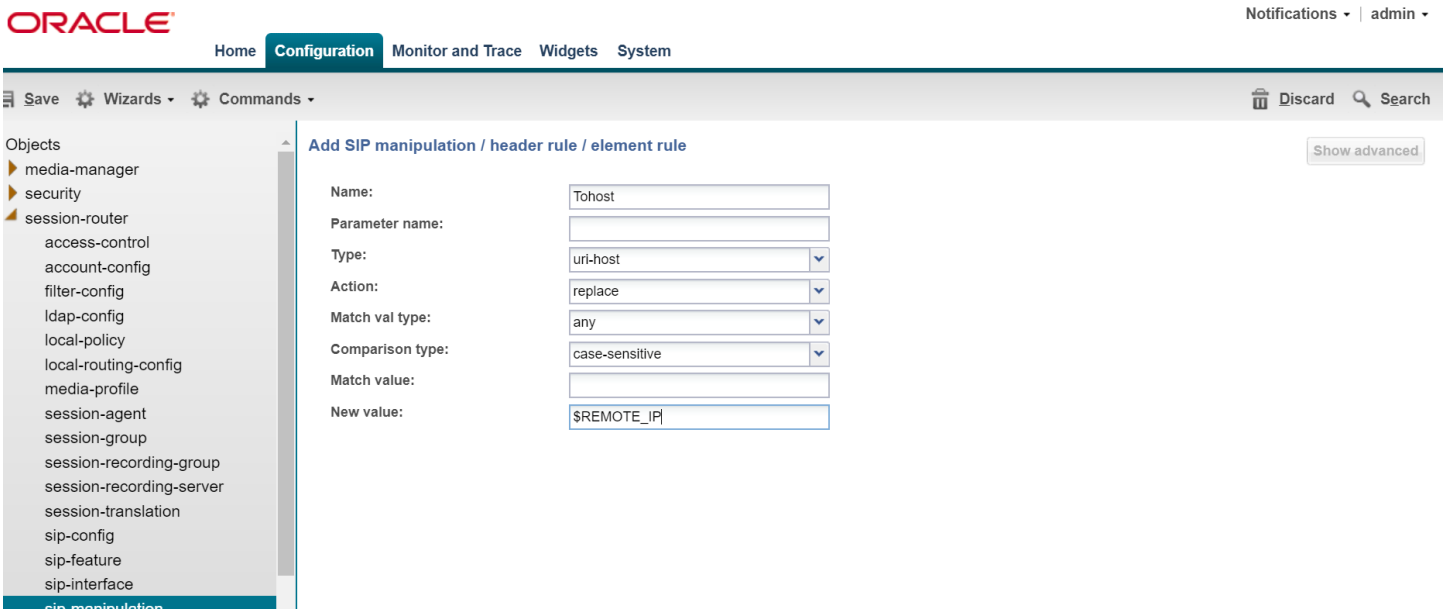




Change_fqdn_to_ip_to

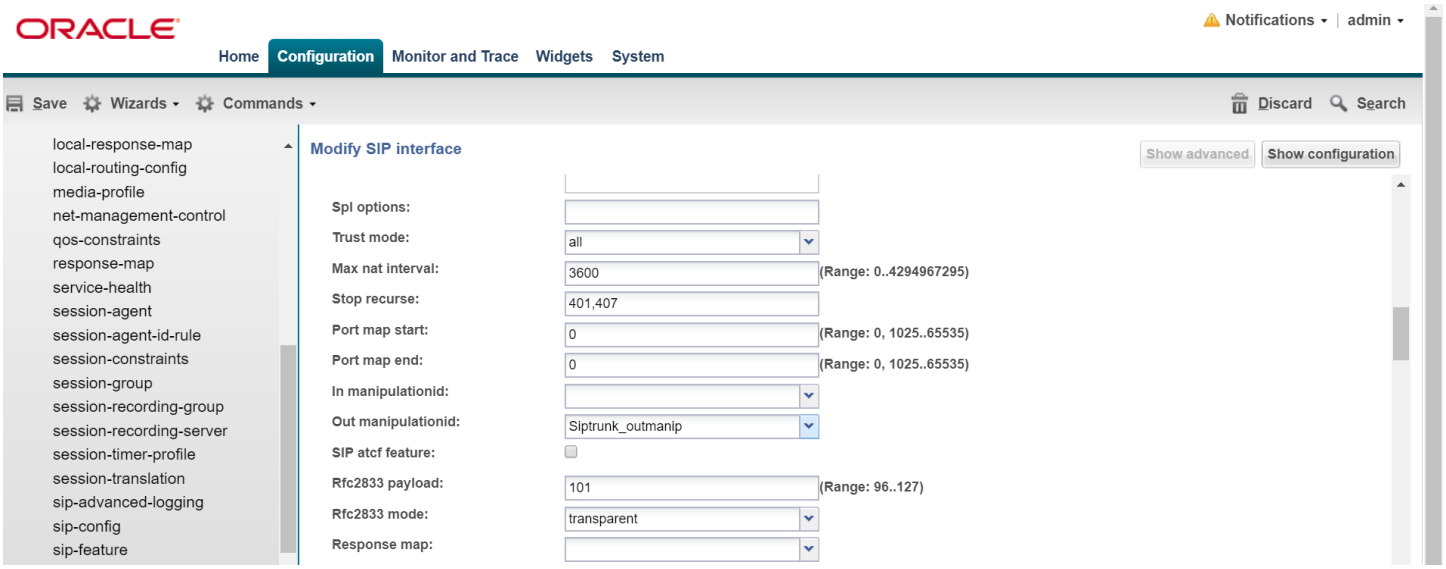
It is applied as a header rule in Siptrunk_outmanip , to replace the uri-host of the To header with the ip –address of the Trunk device





Applying the trunk side SIP manipulations to Trunk SIP Interface

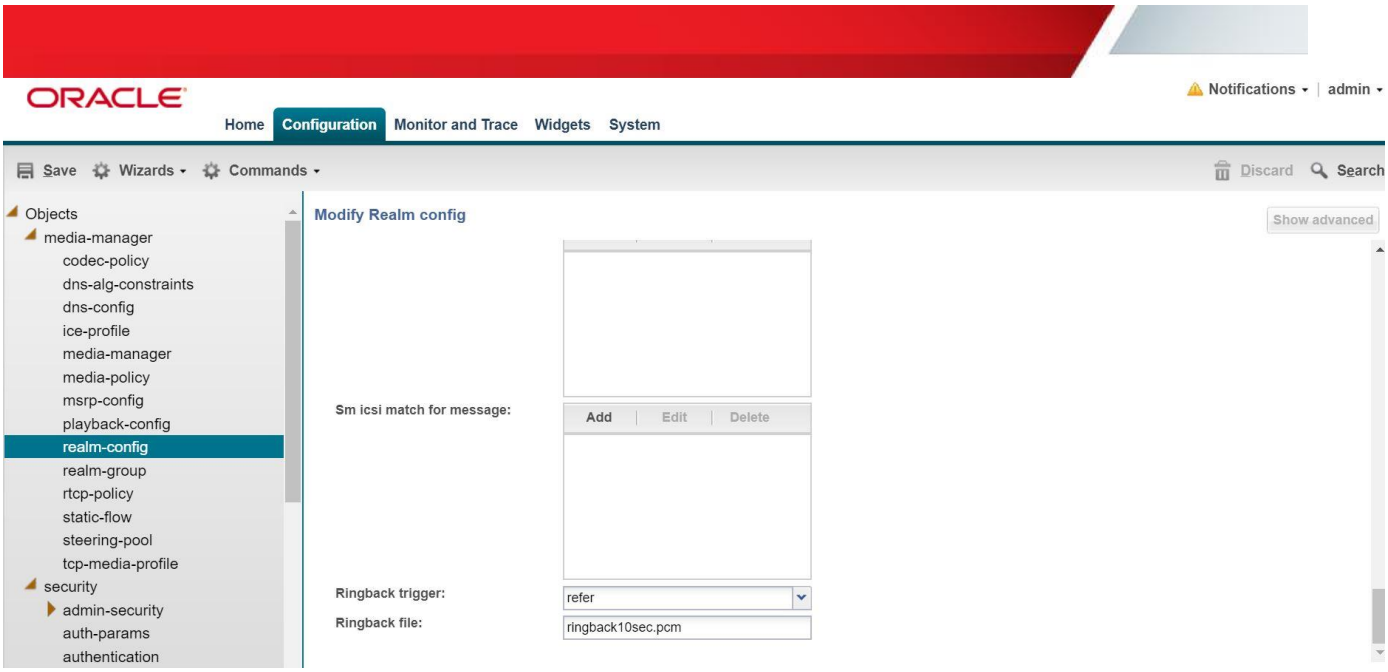
The Siptrunk_outmanip sip-manipulation is applied as the out-manipulationid in the sip-interface facing SIP Trunk



Ringback Configuration

Ringback on Transfers

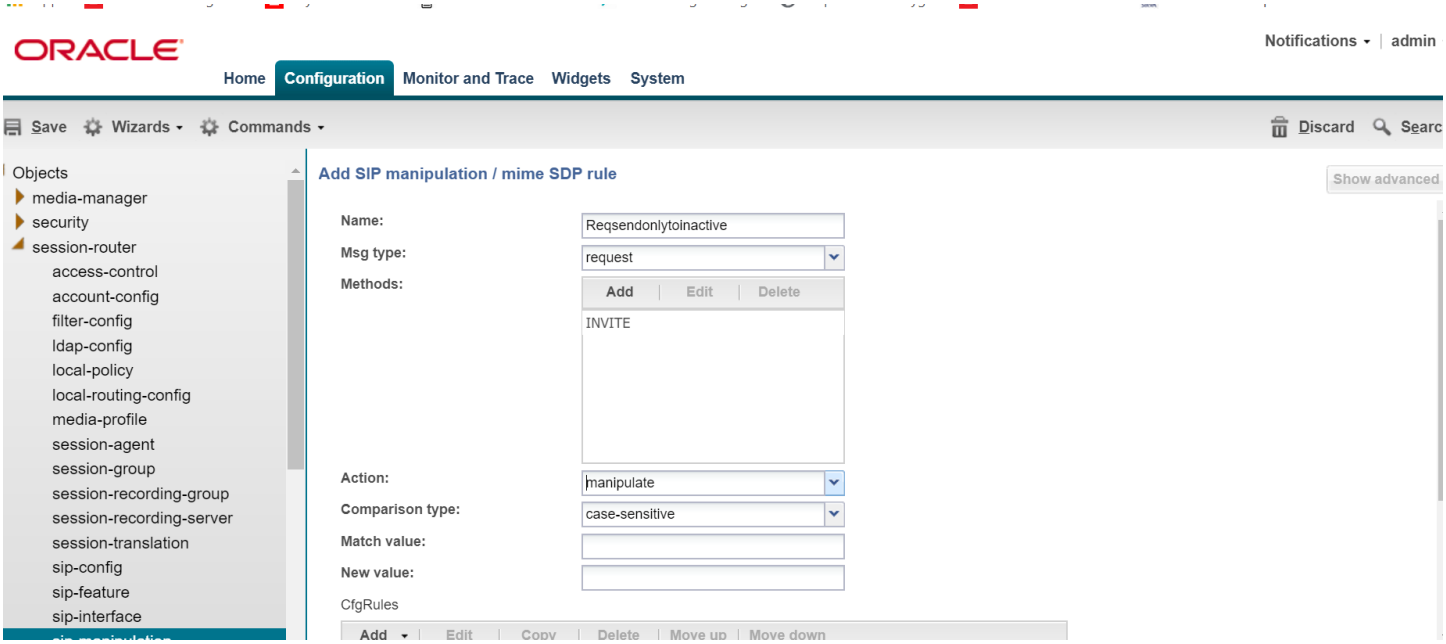
During a call transfer, the calling party does not hear a ring back tone during the process of transfer. We utilize the local playback feature of the SBC to play ring back tone during transfers. The ringback tone is triggered on receiving SIP REFER. You must upload a media playback file to /code/media on the SBC. This file must be in raw media binary format. This ringback trigger and ringback file to be played are configured on the realm facing the trunk.



In addition to the ringback trigger configuration above, SDP manipulations are needed in order to play the ringback tone towards the PSTN caller. The INVITE MS Teams sends to the SBC to initiate the transfer contains the SDP attribute, a=inactive which is forwarded to the trunk and as a result of which the SBC cannot play the ring back tone to the original PSTN caller (while call is being transferred). A sendonly attribute is required by the calling party to be able to hear ringback.
The SBC is able to signal appropriately towards the SIP trunk by changing the a=inactive SDP attribute in the INVITE to a=sendonly towards PSTN. We configure sdp-mime rule under the sip-manipulation Teamsinmanip to change a=inactive to sendonly in the INVITE received from Teams.(Here the MsgType is Request).Similarly we configure the msgtype as Reply and convert the a=inactive to a=recvonly ,so that inactive is not sent towards PSTN.

The 200 OK response received from the trunk contains a=recvonly in the SDP. Since Teams is expecting an a=inactive in the 200 OK for the INVITE, we configure the following sdp-mime under the sip-manipulation – Teamsoutmanip, to convert the a=recvonly to a=inactive in the 200 OK being sent to Teams for the msgtype "Request".Here also we change the a=recvonly to a=inactive for the msgtype "reply" so that recvonly is not sent towards teams.

Manipulation	**Msg Type**	**Match-Value**	**New-Value**
Teamsinmanip	request	inactive	sendonly
Teamsinmanip	reply	inactive	recvonly
Teamsoutmanip	request	sendonly	inactive
Teamsoutmanip	reply	recvonly	inactive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session-router
access-control
account-config
filter-config
ldap-config
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
sip-interface
Add SIP manipulation / mime SDP rule
Show advanced
Name:
Reqsendonlytoinactive
Msg type:
request
Methods:
Add
Edit
Delete
INVITE
Action:
manipulate
Comparison type:
case-sensitive
Match value:
New value:
CfgRules
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Delete
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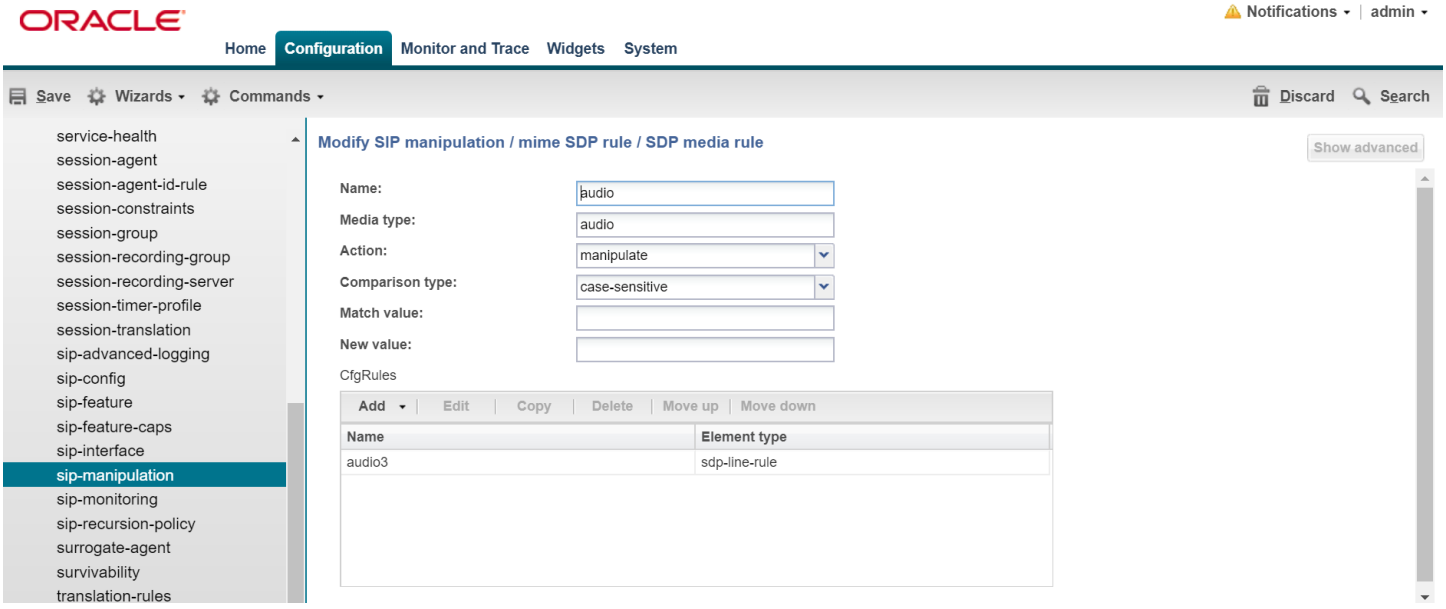
Move down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session-recording-server
session-timer-profile
session-translation
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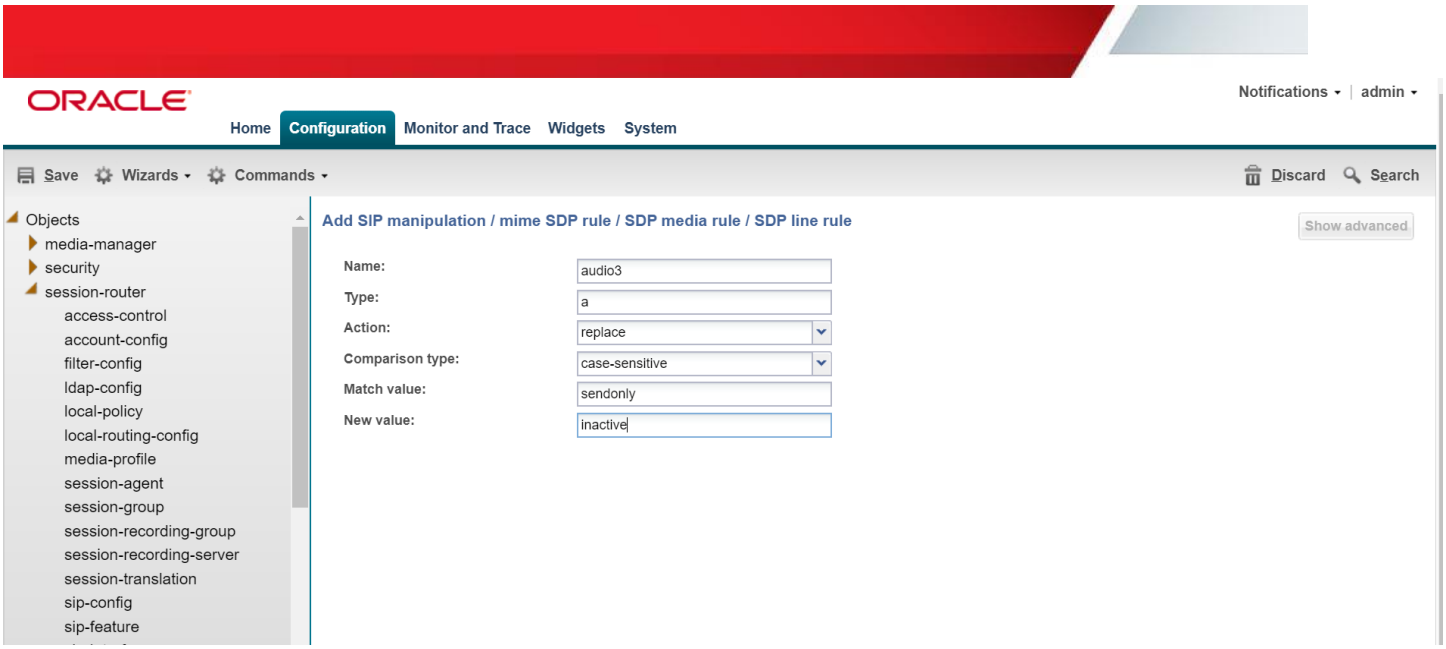
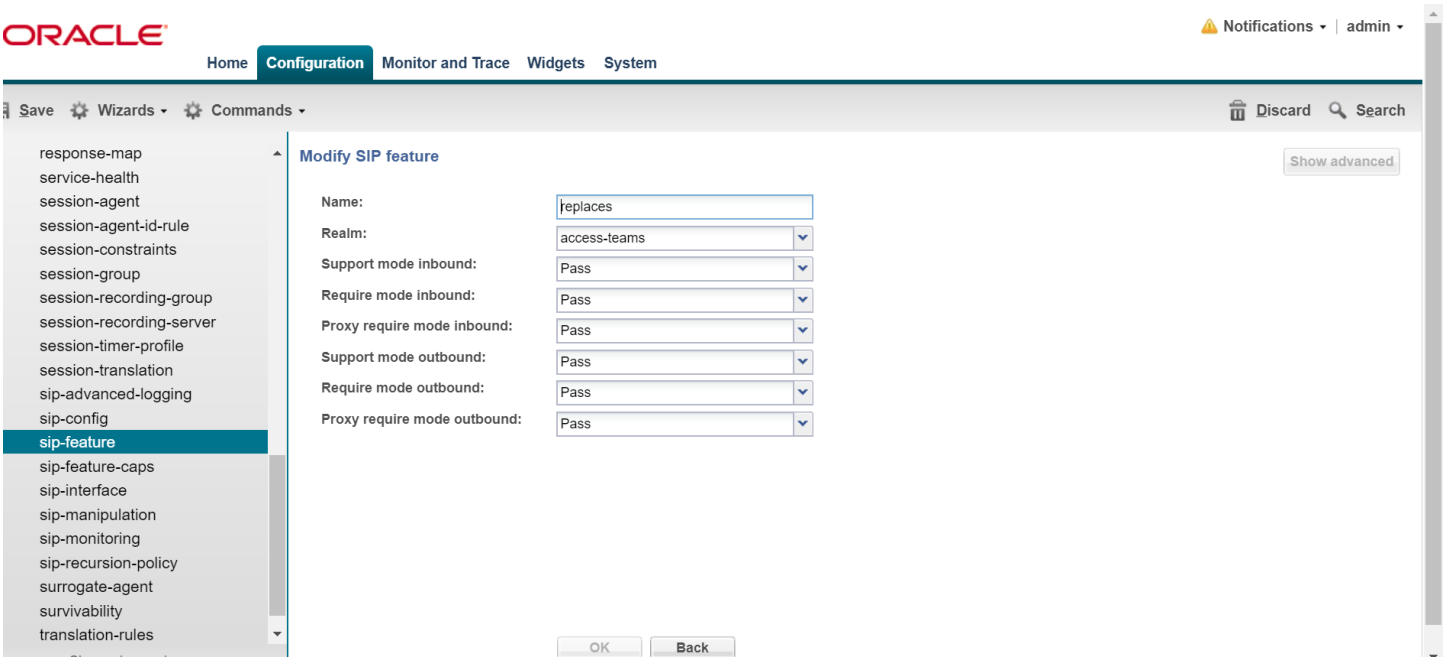
sip-config
sip-feature
sip-feature-caps
sip-interface
sip-manipulation
sip-monitoring
sip-recursion-policy
surrogate-agent
survivability
translation-rules
Modify SIP manipulation / mime SDP rule / SDP media rule
Show advanced
Name:
audio
Media type:
audio
Action:
manipulate
Comparison type:
case-sensitive
Match value:
New value:
CfgRules
Add
Edit
Copy
Delete
Move up
Move down
Name
Element type
audio3
sdp-line-rule



Consultative transfer configuration

The following sip-feature needs to be configured to enable support for the replaces to enable successful consultative transfer.



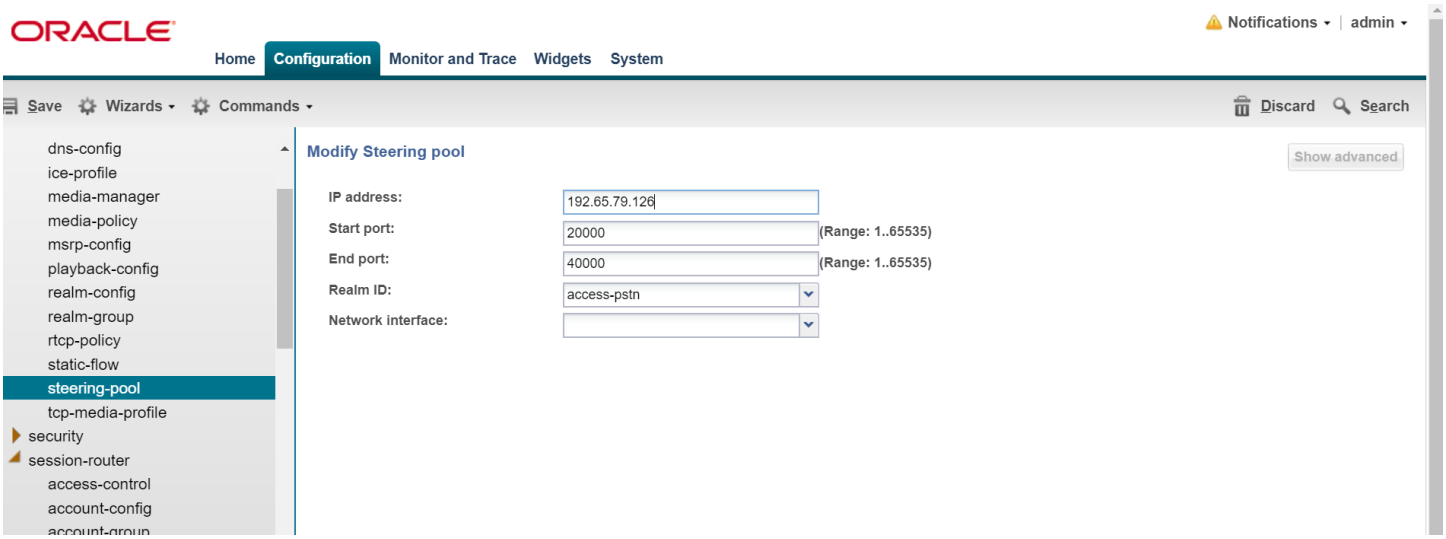
Configure the following sip-profile and apply to the Teams sip interface.

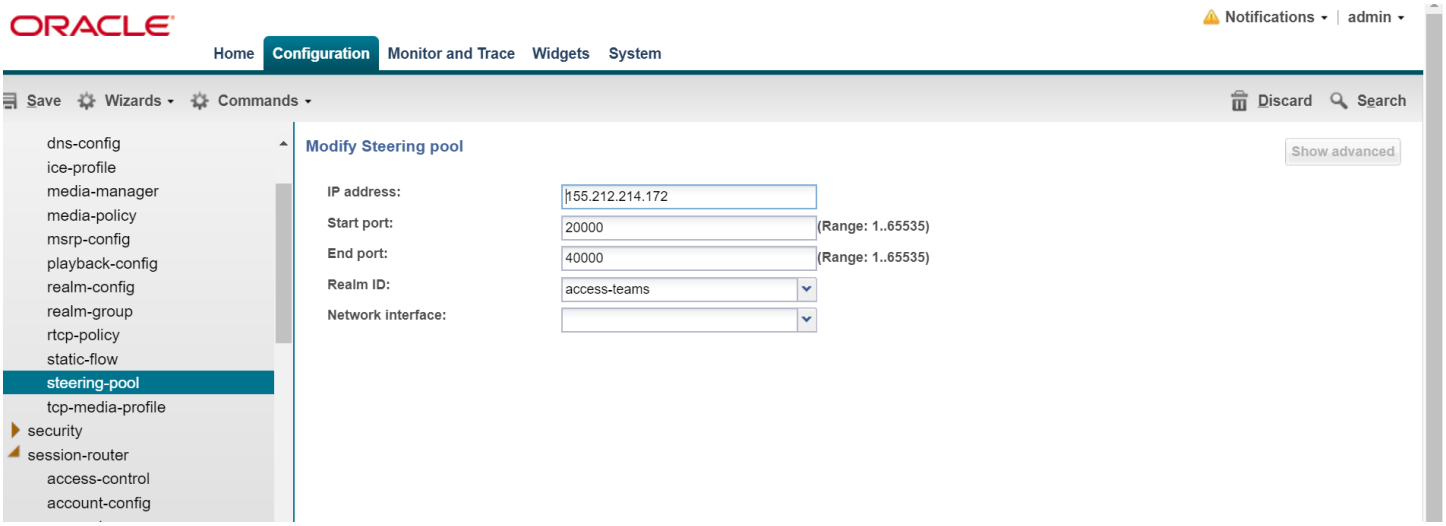
Note:The sip-profile element is available only through te CLI now.the GUI will be enhanced to support this in later releases.
To access the sip-profile element go to configure terminal->session-router->sip-profile

```
sip-profile
        name                                    foreplace
        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
```

Configure steering pool

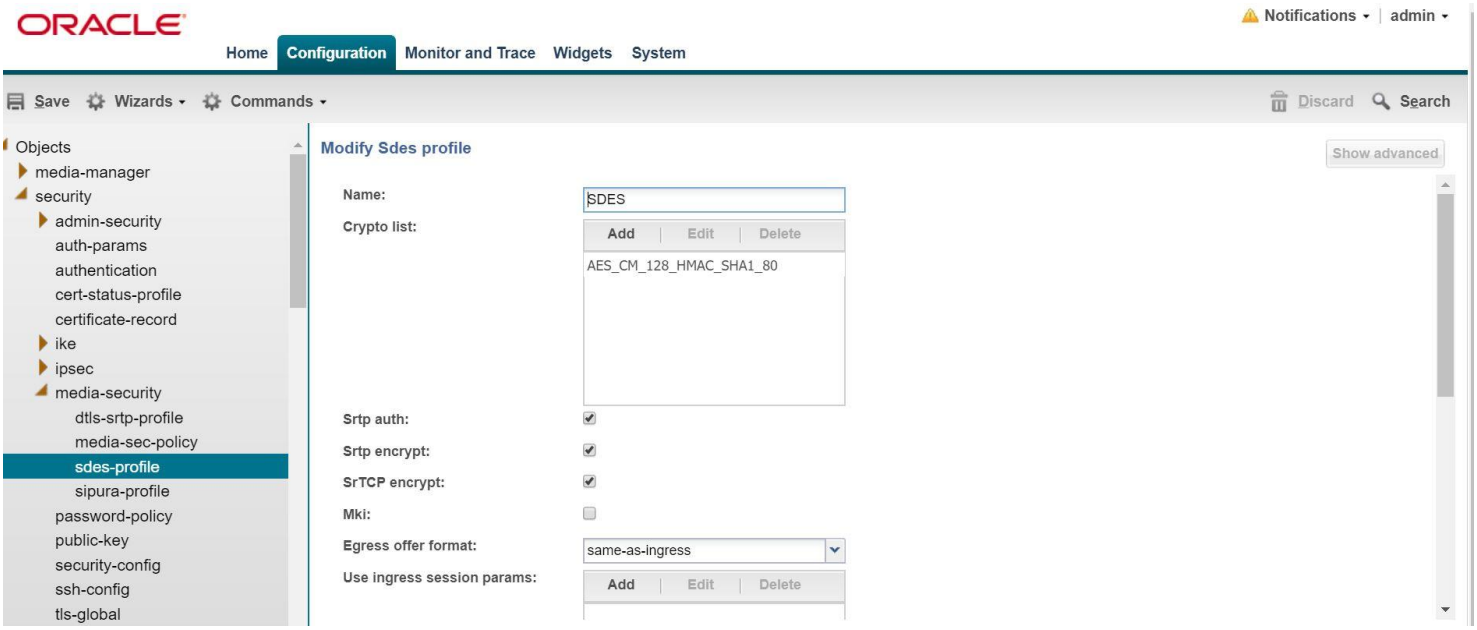
Steering-pool configs allows configuration to assign IP address(es), ports & a realm.



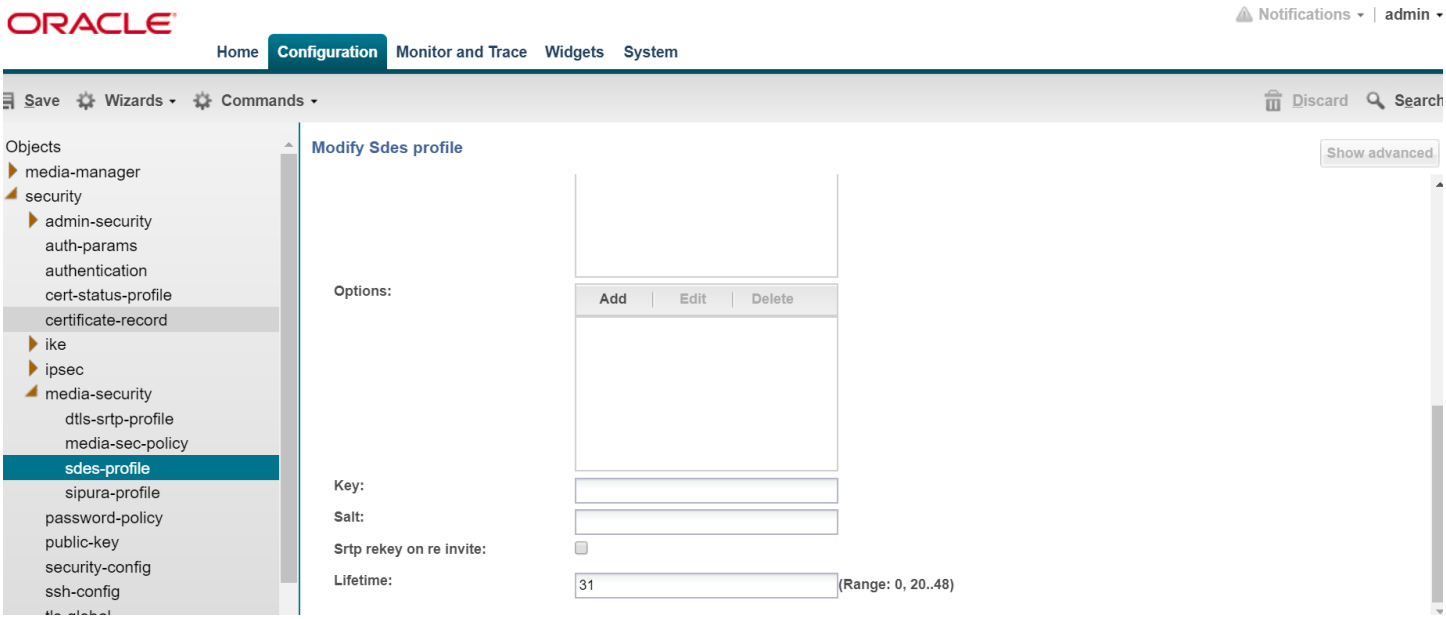


Configure SDES profile

Create a SDES profile as shown below – Microsoft only supports AES_CM_128_HMAC_SHA1_80 encryption. Navigate to media-manager -* security -* sdes-profile.

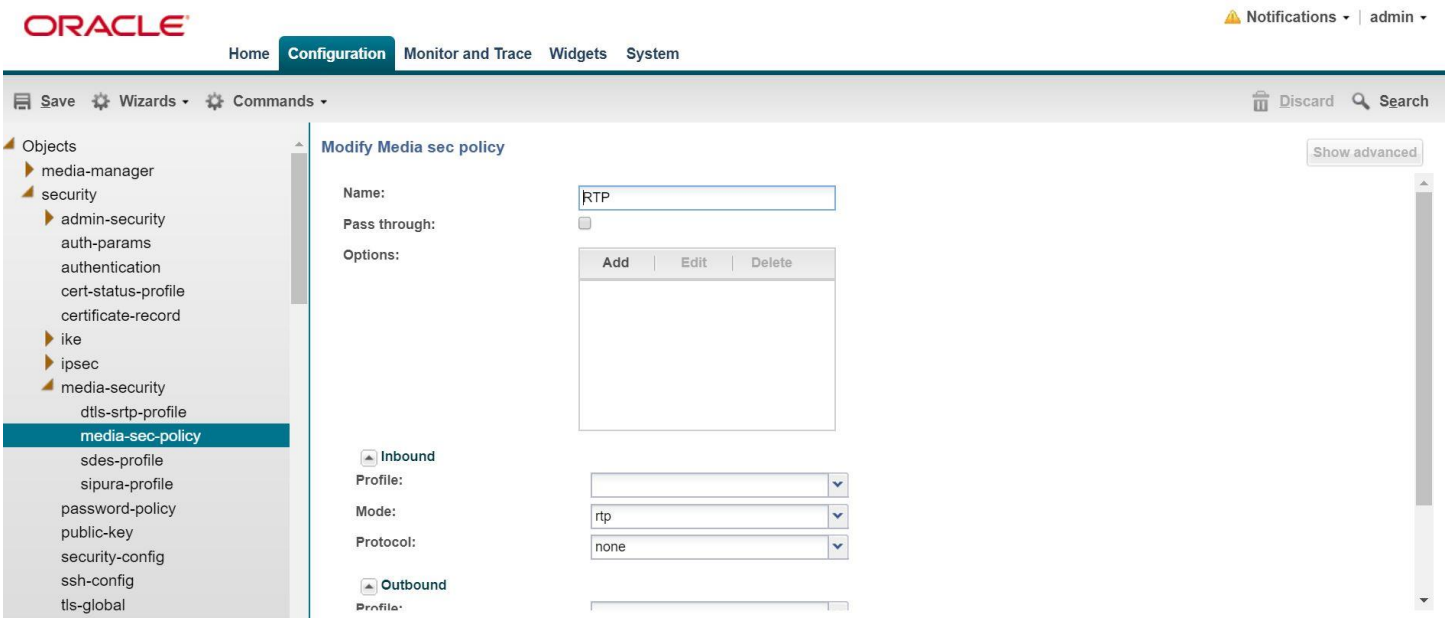


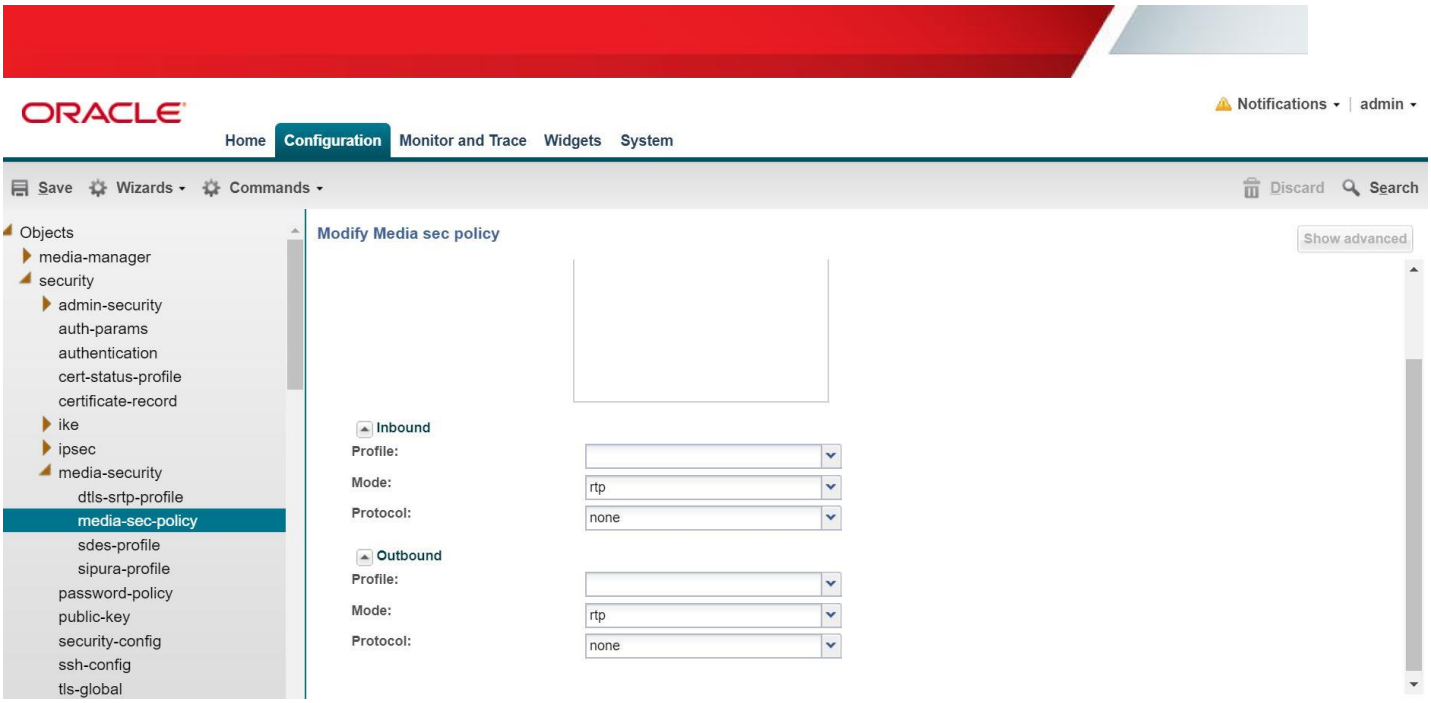
Make sure to configure 31 in the lifetime value as shown



Media-sec-policy

A media-sec-policy configuration creates a policy to allocate media security rule and apply it to the realm configuration.

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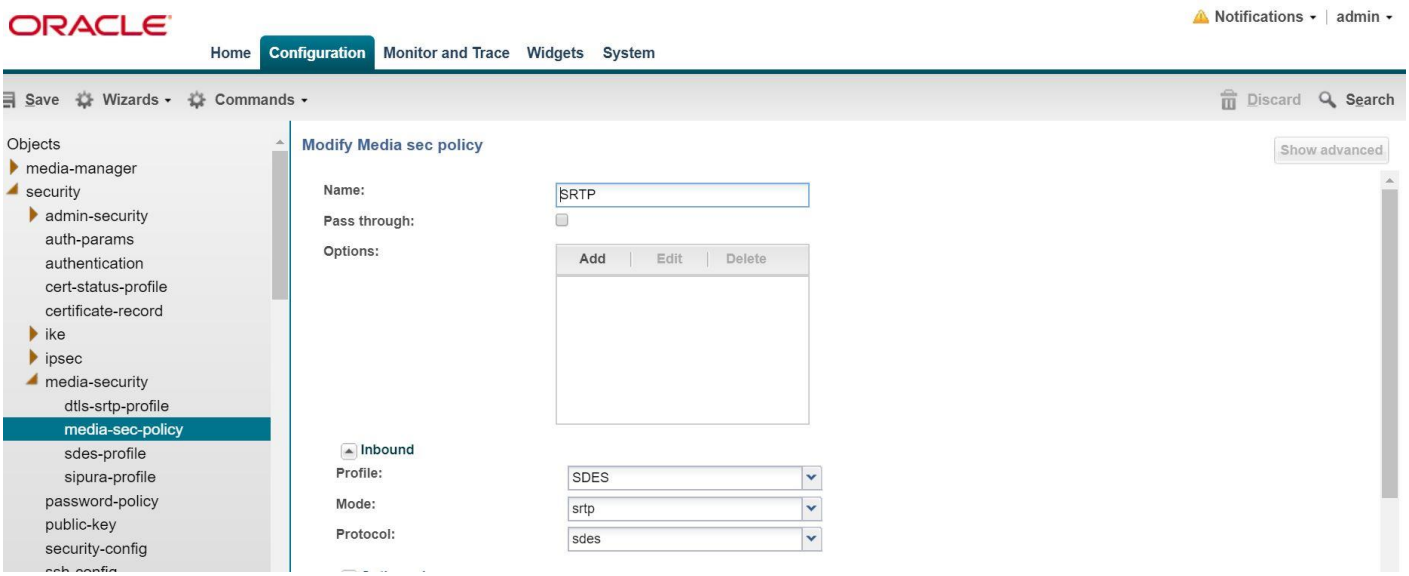
dtls-srtp-profile
media-sec-policy
sdes-profile
sipura-profile
password-policy
public-key
security-config
ssh-config
tls-global
Modify Media sec policy
Show advanced
Inbound
Profile:
Mode: rtp
Protocol: none
Outbound
Profile:
Mode: rtp
Protocol: none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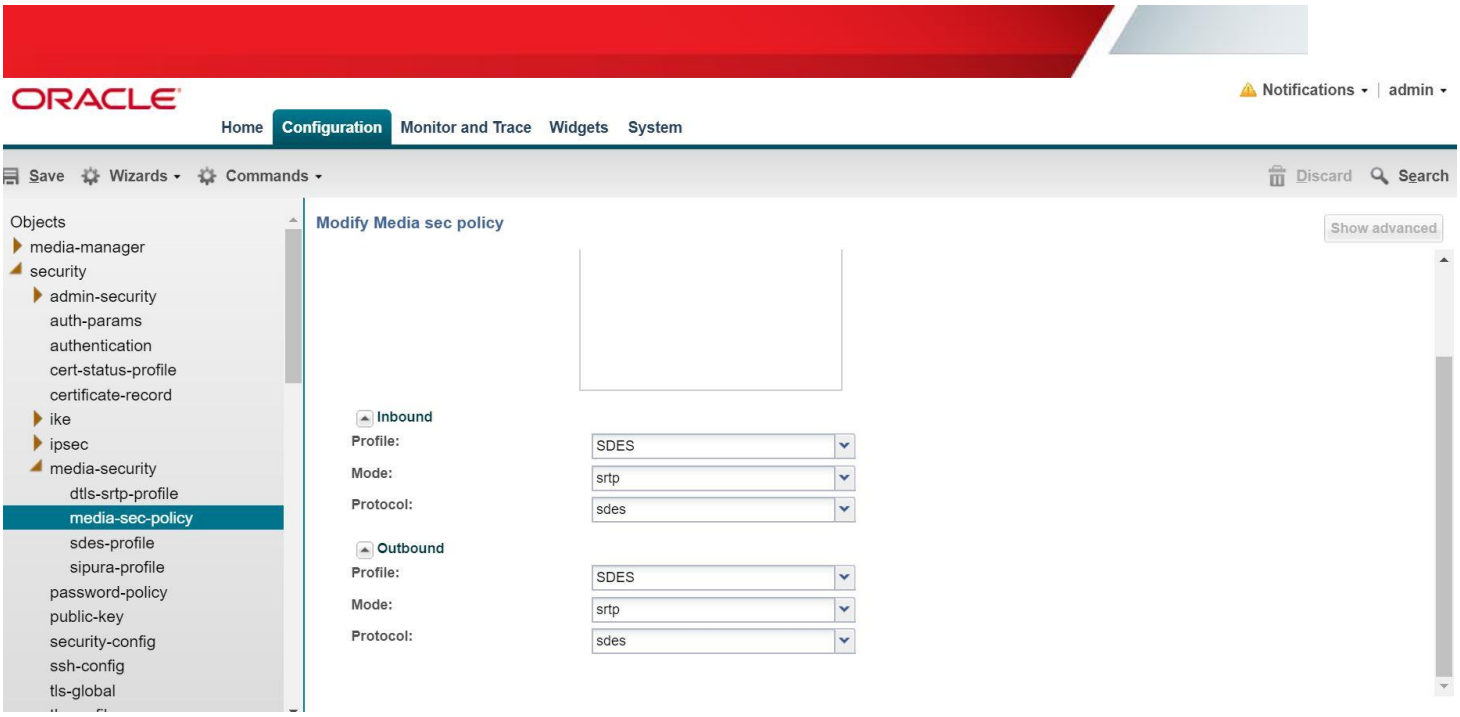
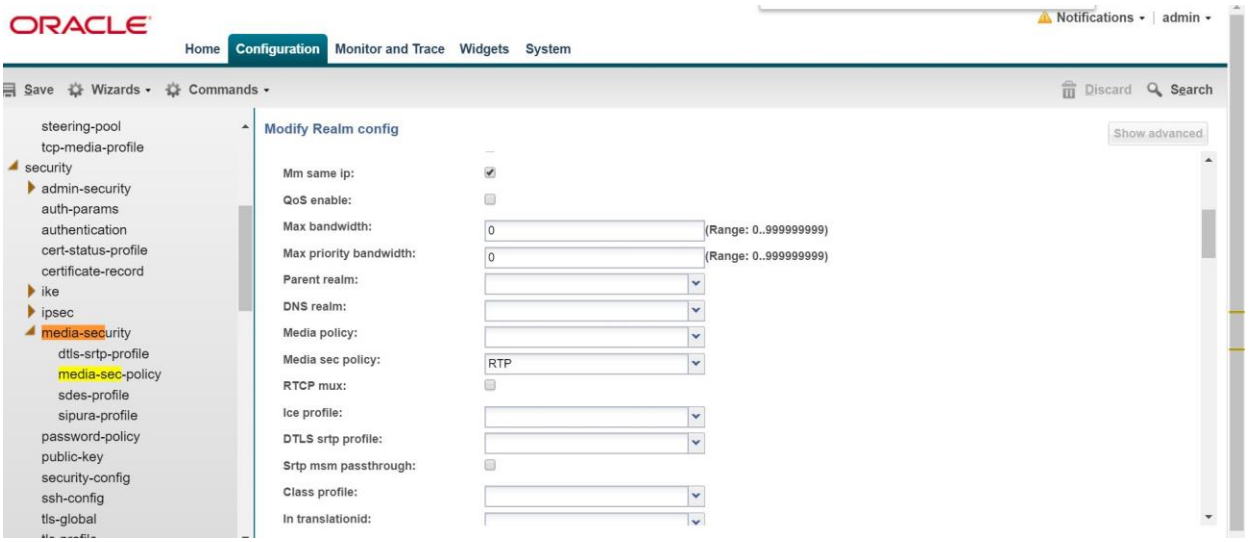
media-security
dtls-srtp-profile
media-sec-policy
sdes-profile
sipura-profile
password-policy
public-key
security-config
Modify Media sec policy
Show advanced
Name: SRTP
Pass through:
Options:
Add Edit Delete
Inbound
Profile: SDES
Mode: srtp
Protocol: sdes

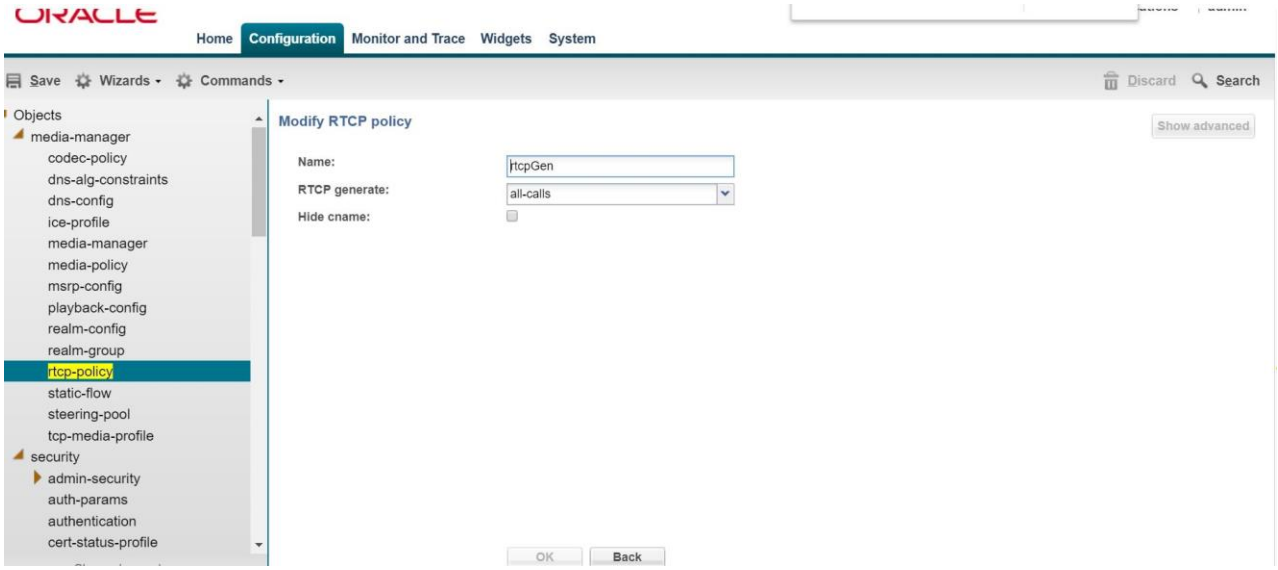


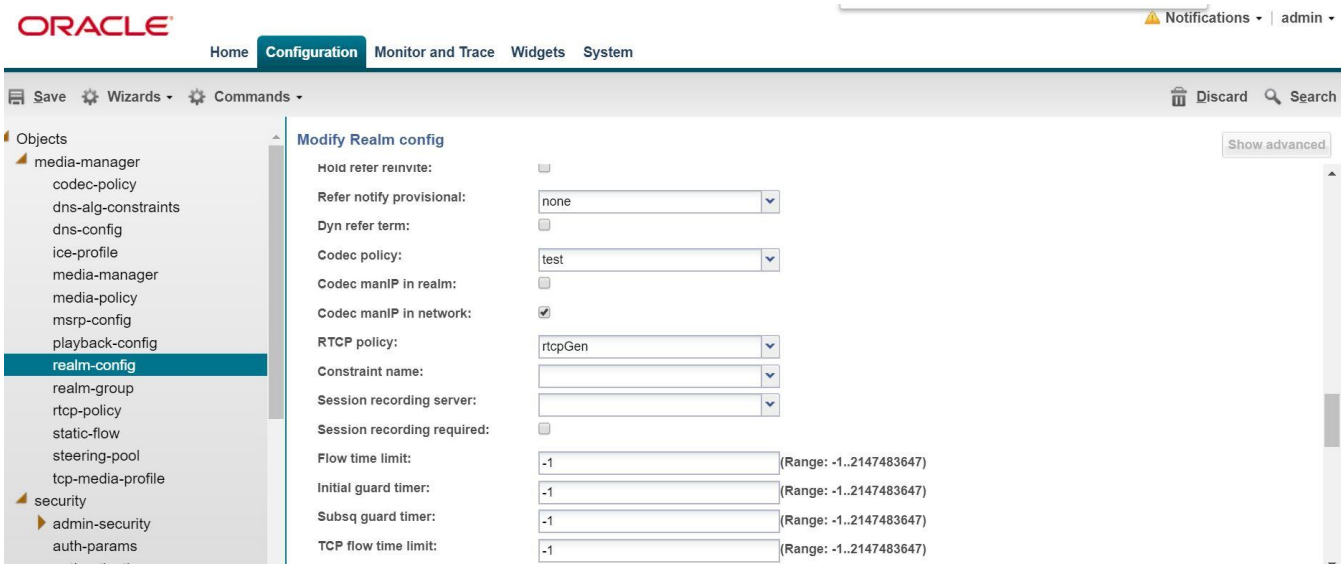
The RTP media-sec-policy is applied on the Access-pstn realm and SRTP media-sec-policy is applied on the Access-teams realm,as shown below.

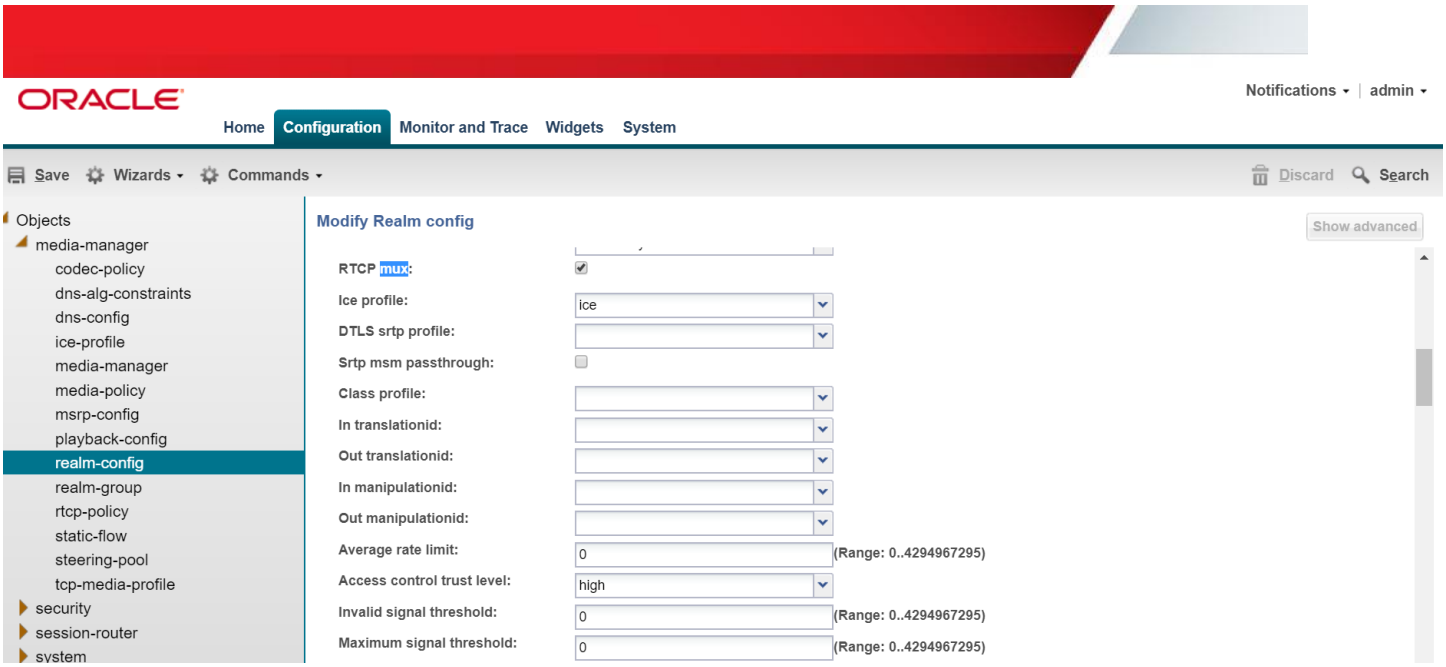


Configure RTCP Policy and RTCP Mux

The following RTCP policy needs to configured to generate RTCP reports towards Teams. It is applied on the realm facing Teams. Media Bypass enabled configuration requires support for RTCP-Mux. It can be enabled on the realm - Access-teams.Go to Media-manager->rtcp-policy to configure rtcp-policy.

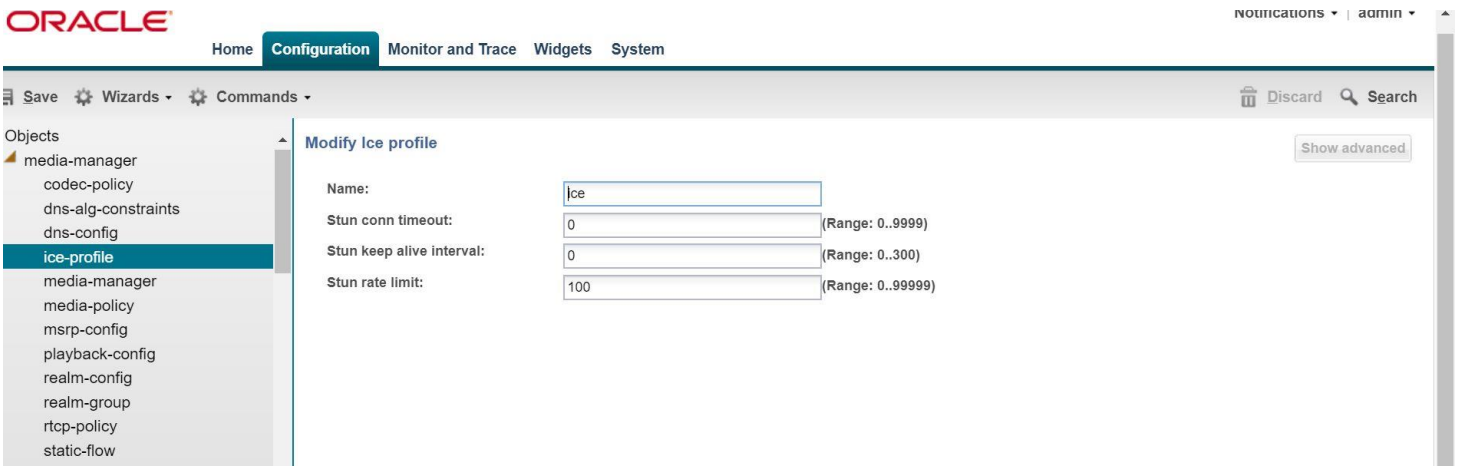


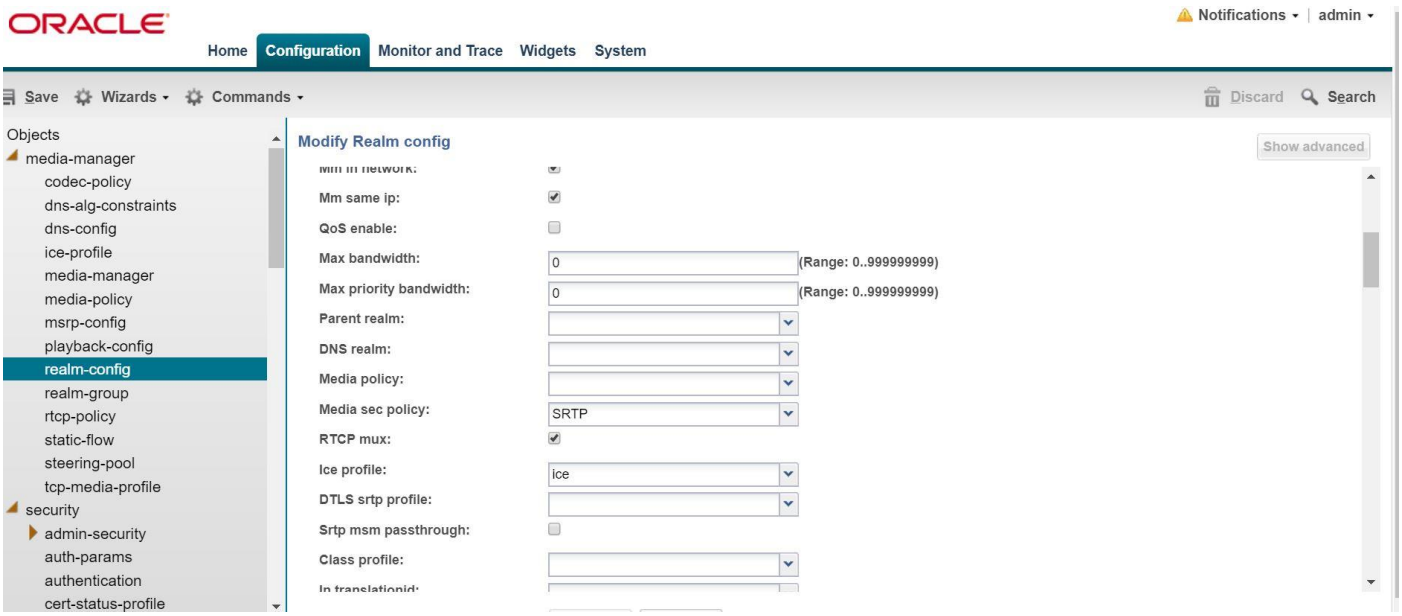




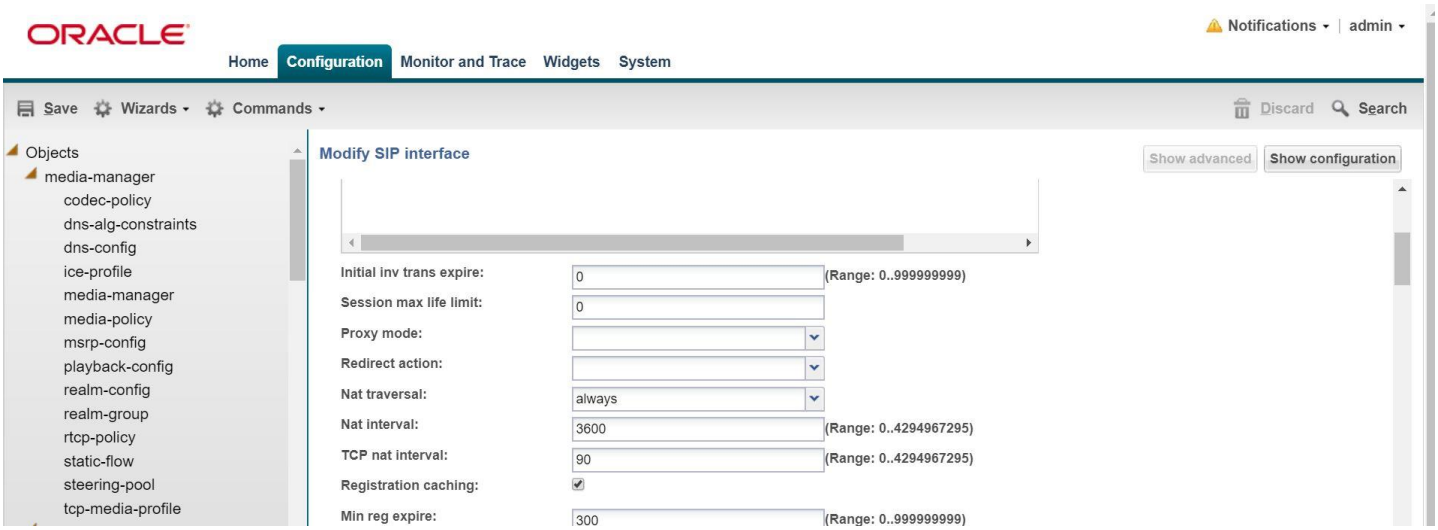
Configure ice-profile

SBC supports ICE-Lite. This configuration is required to support MSTeams media-bypass. Configure the following ice profile and apply it on the realm towards Teams.Go to media-manager->ice-profile





In addition to applying the ice-profile on the Teams realm, we need to enable nat-traversal on the sip-interface for this realm



Existing SBC configuration

If the SBC being used with Microsoft Teams is an existing SBC with functional configuration with a SIP trunk, following configuration elements are required:

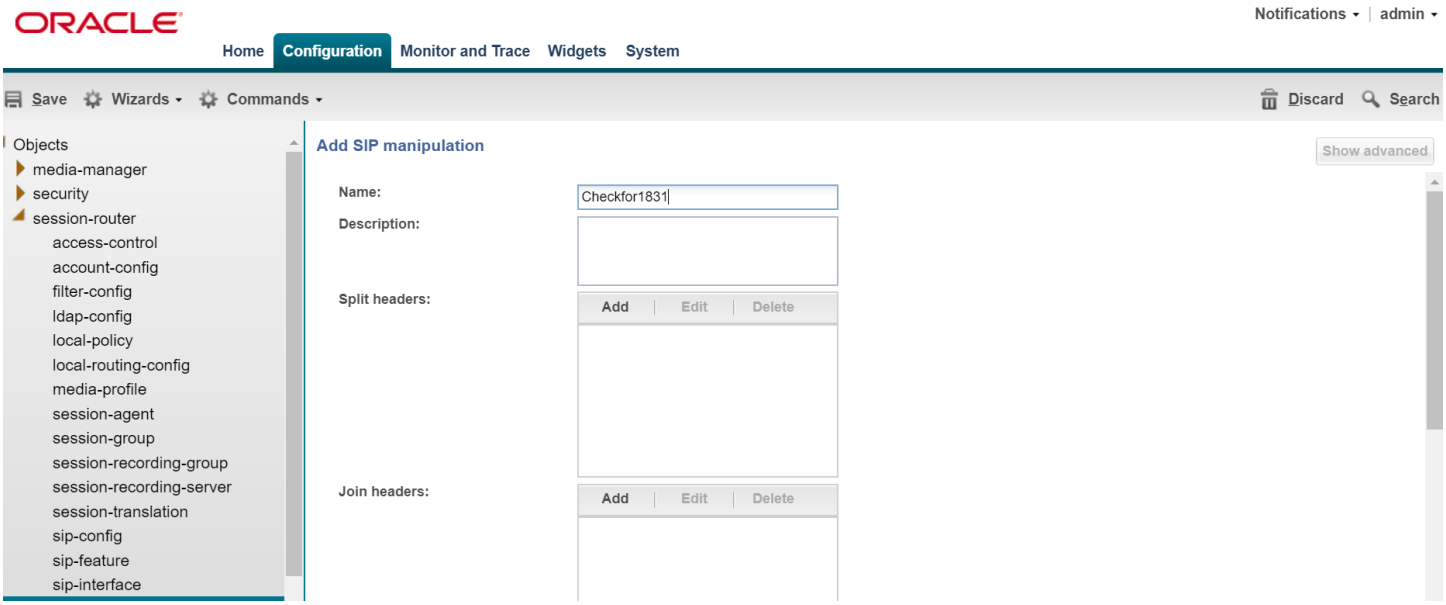
- New realm-config
- Configuring a certificate for SBC Interface
- TLS-Profile
- Enable DNS
- New sip-interface
- New session-agent
- New-Session-Agent-Group
- New steering-pools
- New Local-policy
- Media-profile
- Codec-policy
- SDES Profile
- Media-sec-Policy
- Sip-manipulations
- Ice-profile
- RTCP policy
- RTCP-mux
- Ringback configuration

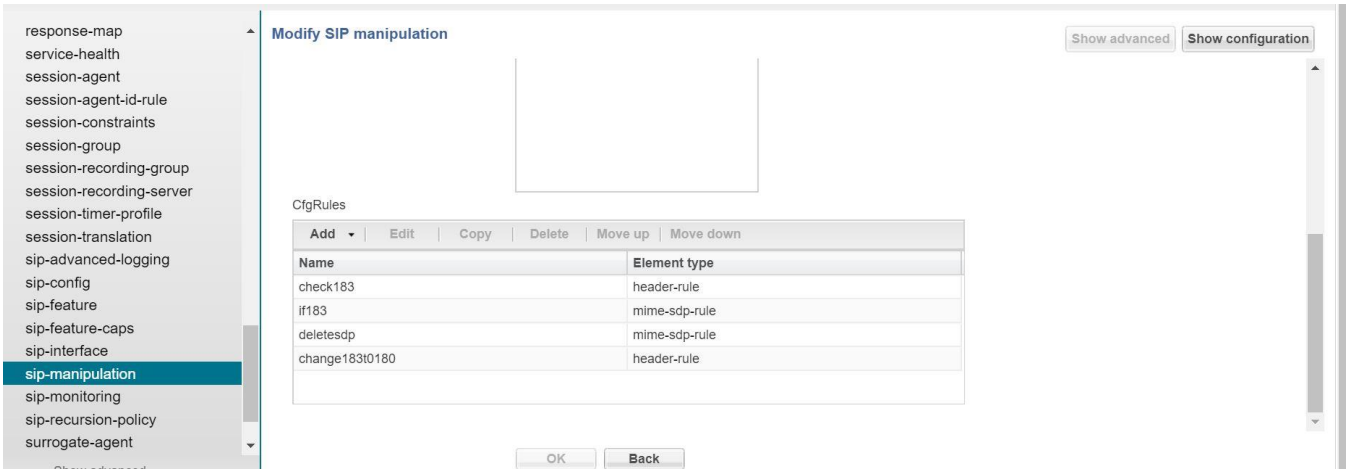
Please follow the steps mentioned in the above chapters ,to configure these elements.

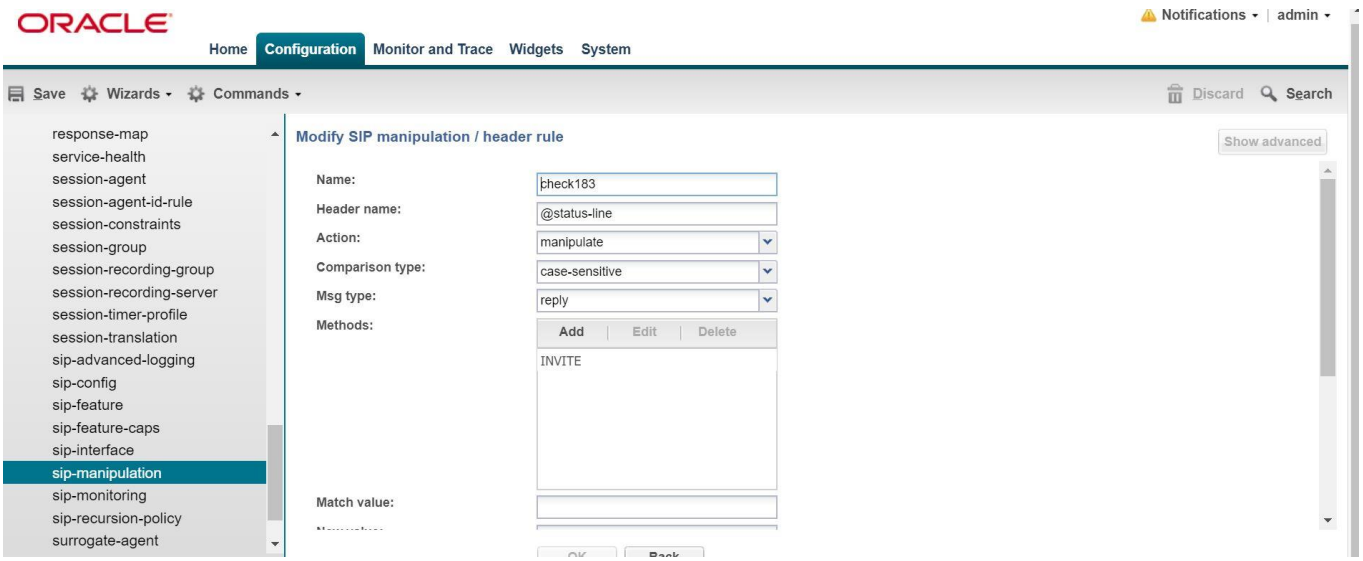
Appendix A

Ringback on inbound calls to Teams and early media

In certain deployments, a PSTN caller may experience silence on an inbound call into Teams in place of a ringback tone. When Teams receives an INVITE, after signaling 183 with SDP, Teams does not play ringback and expects the SBC to signal appropriately to the SIP Trunk provider and play local ringback. To signal the trunk to play the ringback, the SBC presents 180 Ringing to the trunk instead of the 183 Session Progress received from Teams.
In order to accommodate the 183 with SDP messages that signal early media in cases of simultaneous ringing set to IVR, we inspect the SDP of the 183s received before converting them to 180 Ringing messages. 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 strip the SDP from the 183 and convert it to a 180 Ringing message and forward it to the trunk. This is achieved through the following sip-manipulation.
Apply this in the SIP Manipulation Teamsinmanip.



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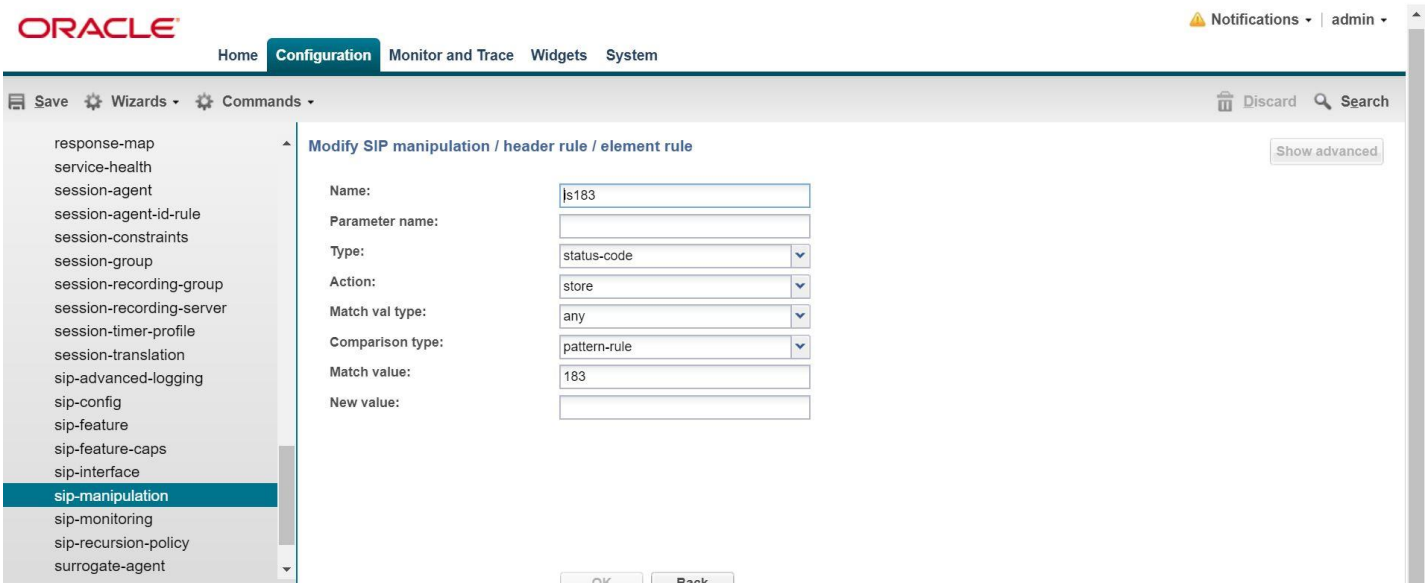
session-recording-server
session-timer-profile
session-translation
sip-advanced-logging
sip-config
sip-feature
sip-feature-caps
sip-interface
sip-manipulation
sip-monitoring
sip-recursion-policy
surrogate-agent
Modify SIP manipulation / header rule
Show advanced
Name:
check183
Header name:
@status-line
Action:
manipulate
Comparison type:
case-sensitive
Msg type:
reply
Methods:
Add
Edit
Delete
INVITE
Match value: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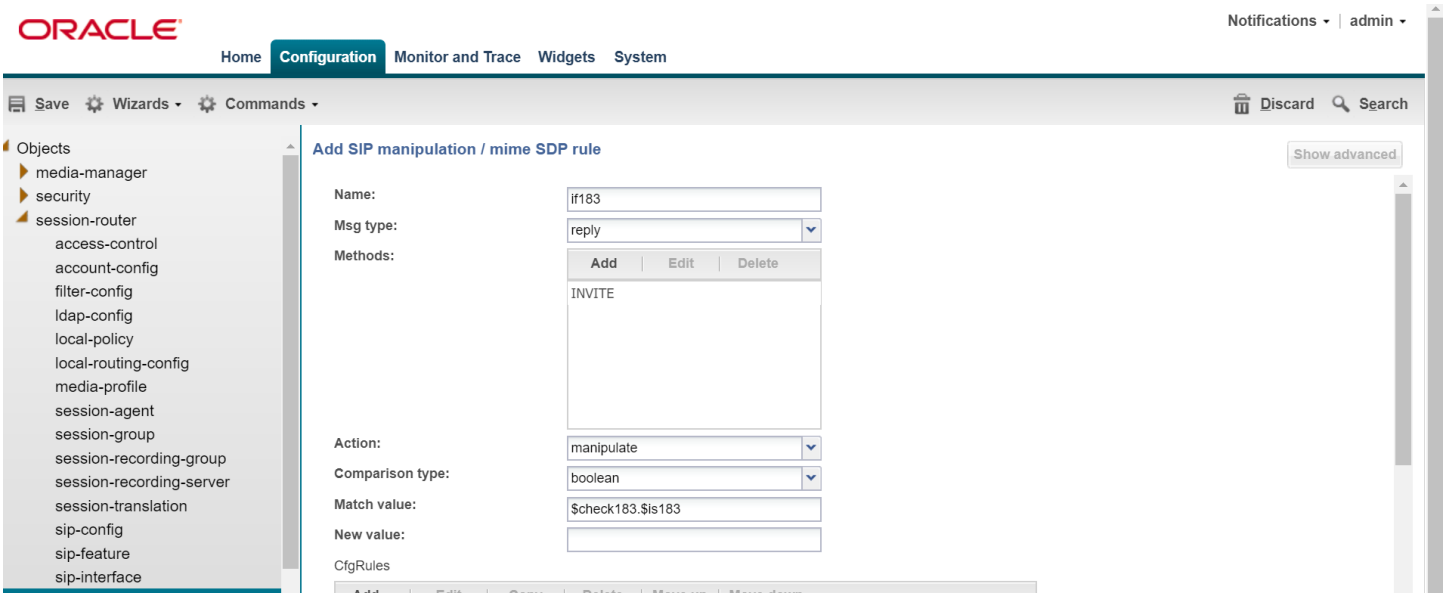
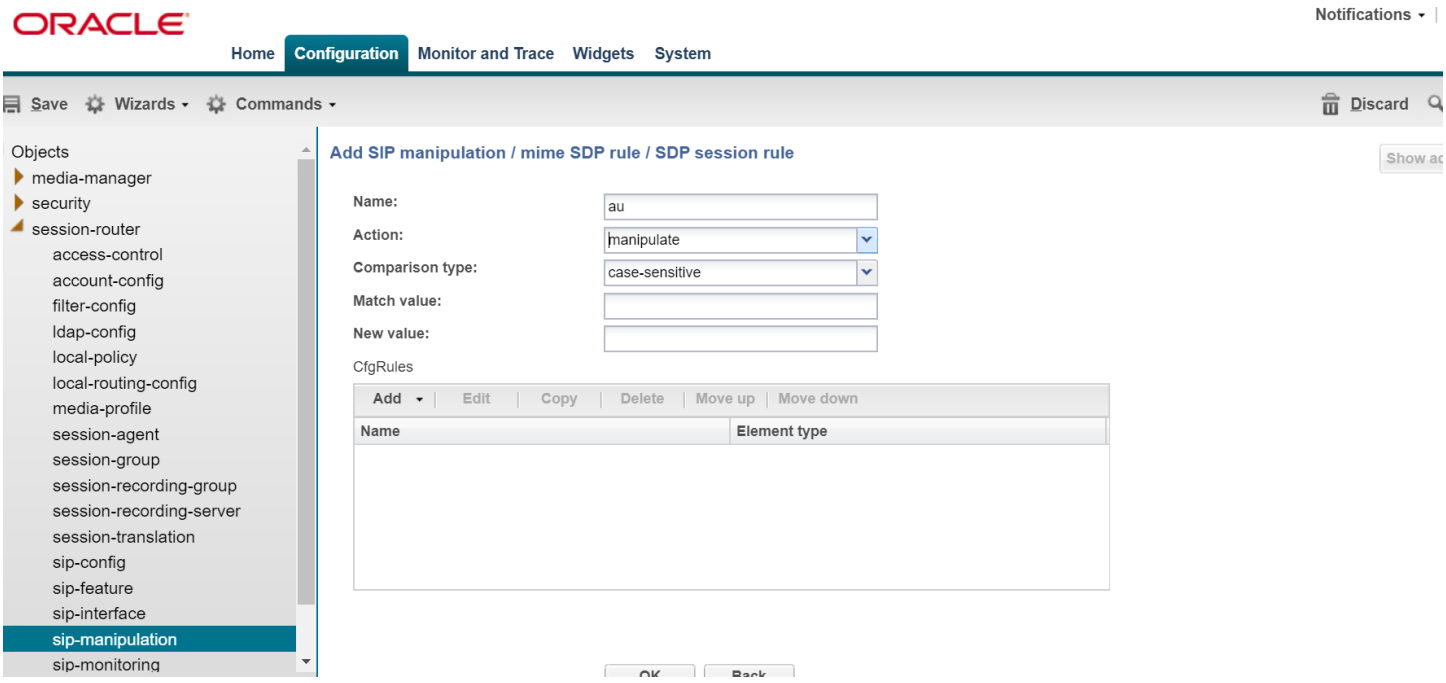
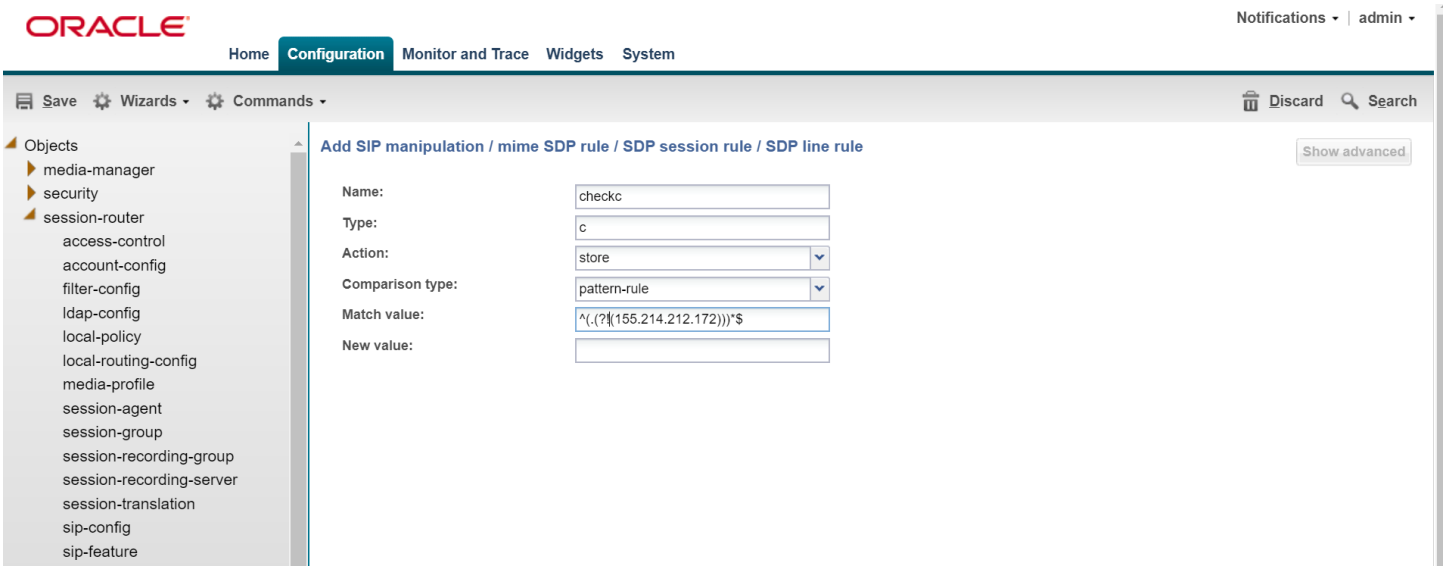
session-group
session-recording-group
session-recording-server
session-timer-profile
session-translation
sip-advanced-logging
sip-config
sip-feature
sip-feature-caps
sip-interface
sip-manipulation
sip-monitoring
sip-recursion-policy
surrogate-agent
Modify SIP manipulation / header rule / element rule
Show advanced
Name:
ls183
Parameter name:
Type:
status-code
Action:
store
Match val type:
any
Comparison type:
pattern-rule
Match value:
183
New value:





Here apply the IP of SIP-Interface facing your MS Teams.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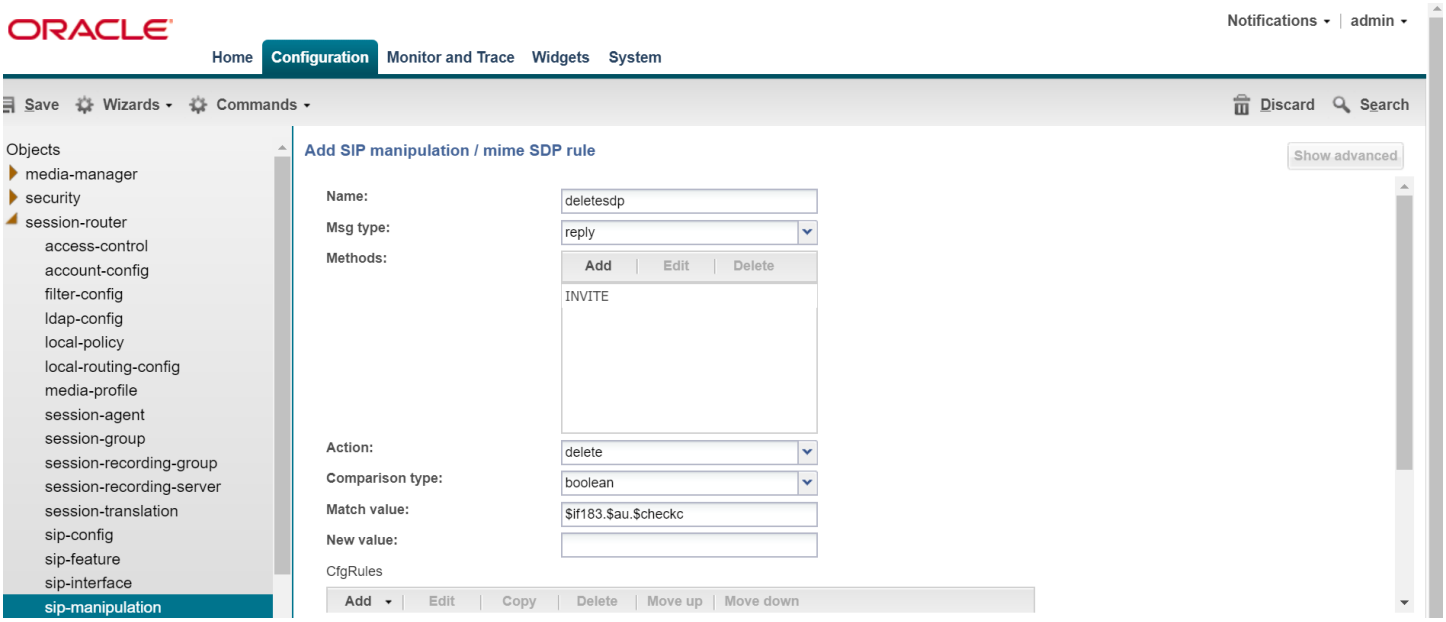
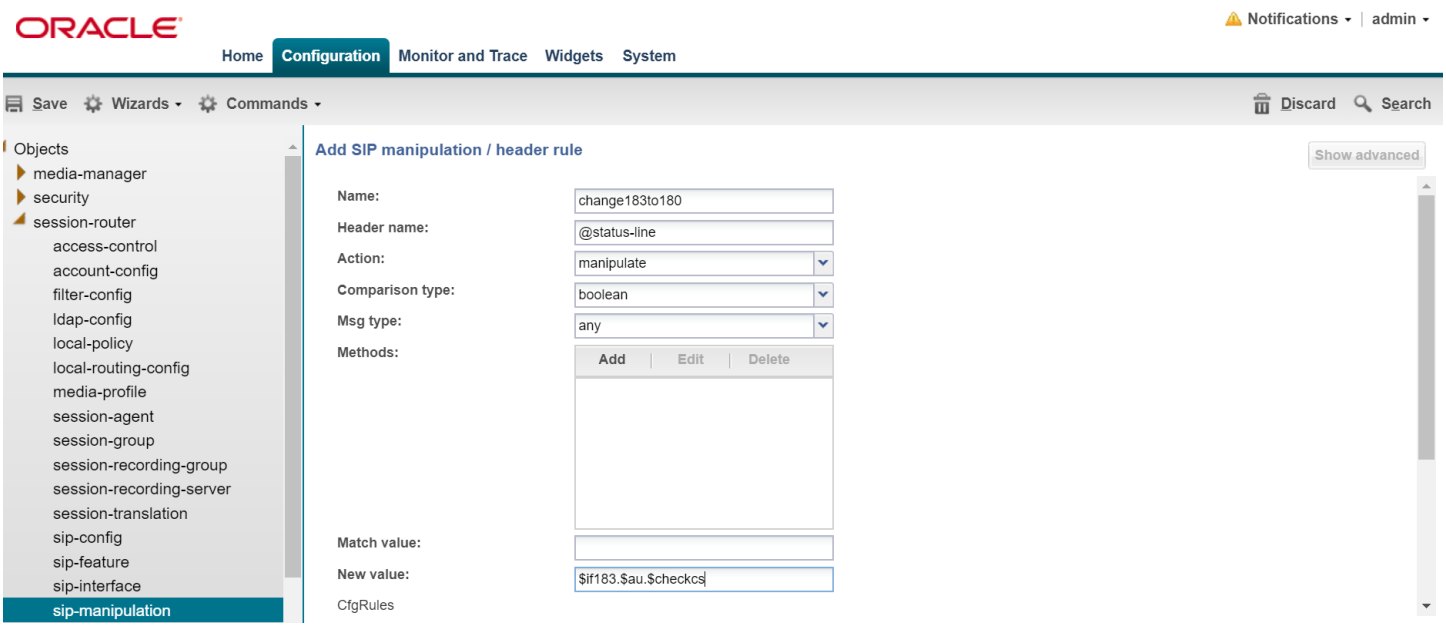
account-config
filter-config
ldap-config
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
Add SIP manipulation / mime SDP rule / SDP session rule / SDP line rule
Show advanced
Name: checkc
Type: c
Action: store
Comparison type: pattern-rule
Match value: ^(.(?!(155.214.212.172)))*$
New value:


ORACLE
Notifications | admin
Home
Configuration
Monitor and Trace
Widgets
System
Save
Wizards
Commands
Discard
Search
Objects
media-manager
security
session-router
access-control
account-config
filter-config
ldap-config
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
sip-interface
sip-manipulation
Add SIP manipulation / mime SDP rule
Show advanced
Name: deletesdp
Msg type: reply
Methods:
Add
Edit
Delete
INVITE
Action: delete
Comparison type: boolean
Match value: $if183.$au.$checkc
New value:
CfgRules
Add
Edit
Copy
Delete
Move up
Move down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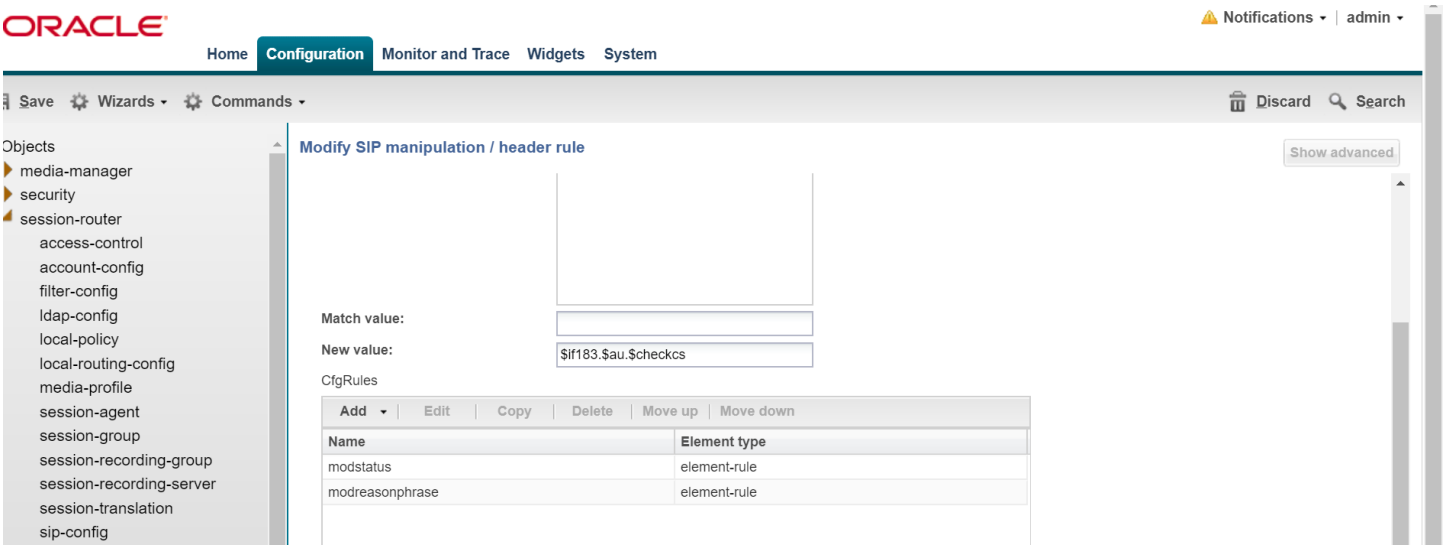
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
sip-interface
sip-manipulation
Add SIP manipulation / header rule
Show advanced
Name:
change183to180
Header name:
@status-line
Action:
manipulate
Comparison type:
boolean
Msg type:
any
Methods:
Add
Edit
Delete
Match value:
New value:
$if183.$au.$checkcs
CfgRules


ORACLE
Notifications
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Home
Configuration
Monitor and Trace
Widgets
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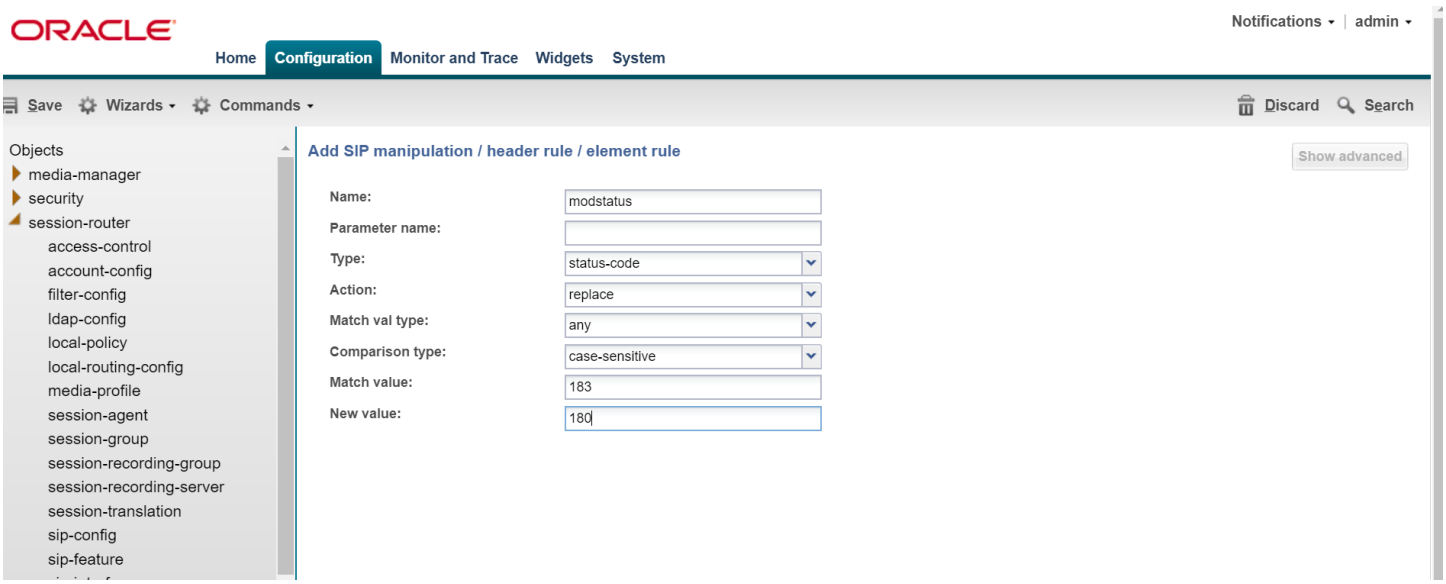
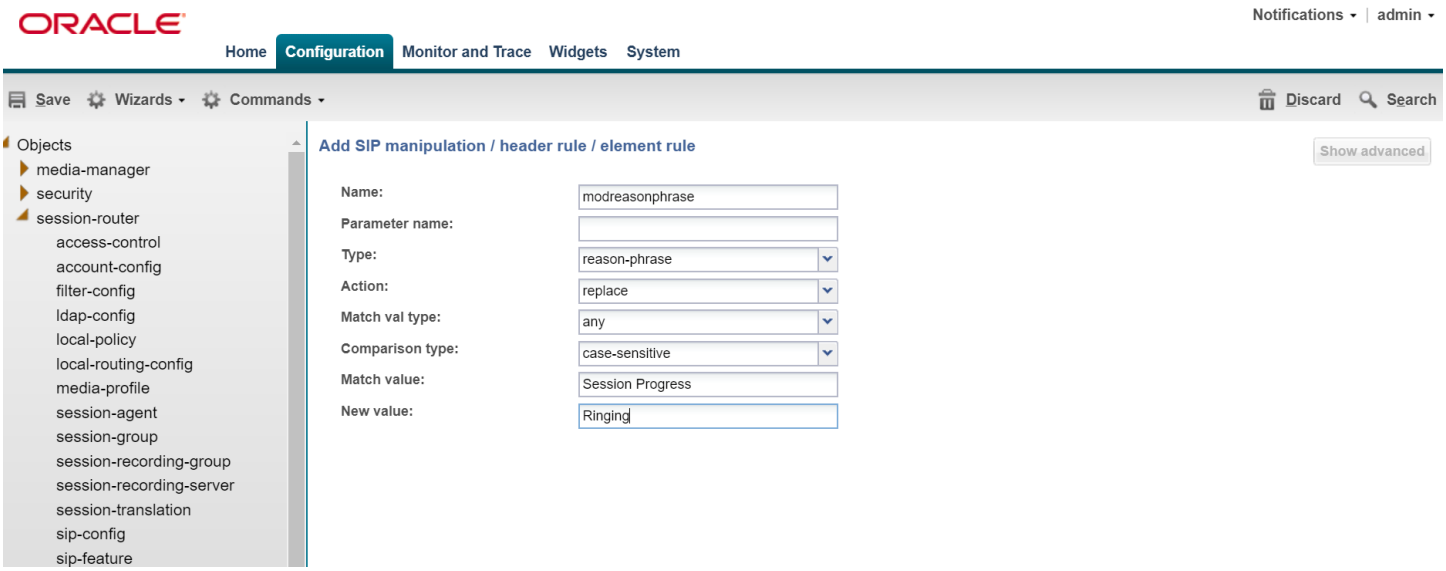
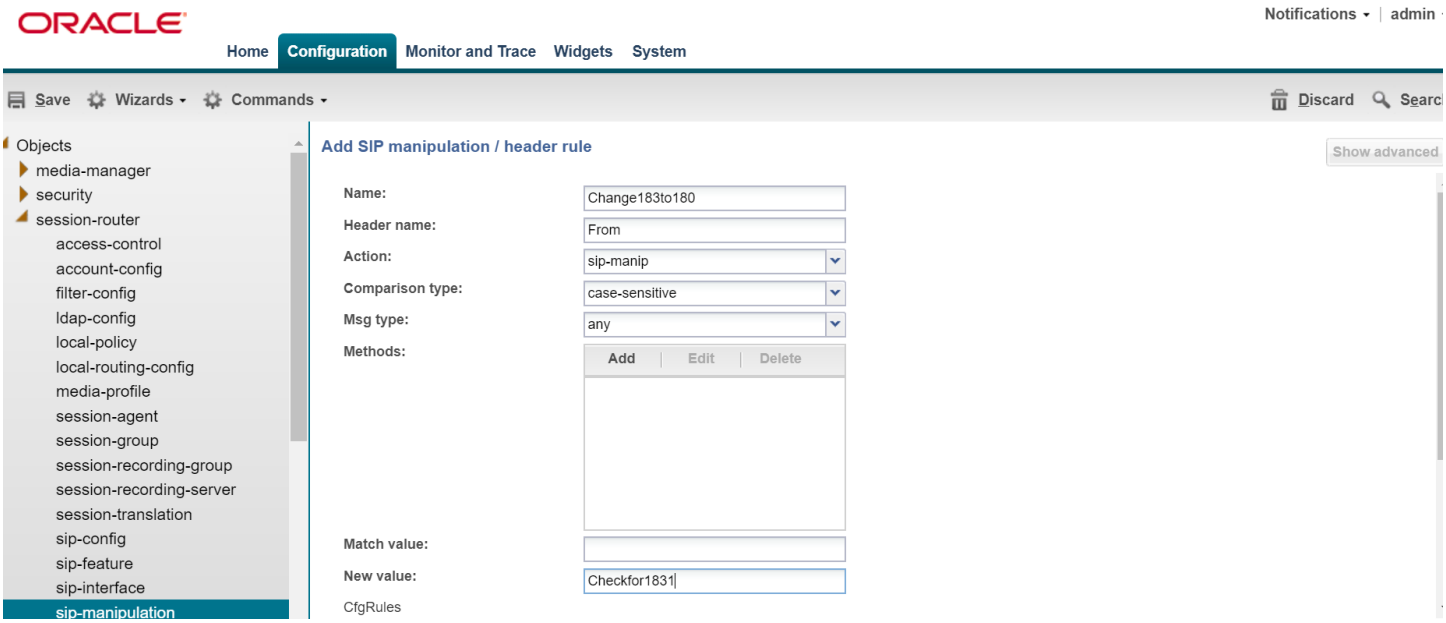
Save
Wizards
Commands
Discard
Search
Objects
media-manager
security
session-router
access-control
account-config
filter-config
ldap-config
local-policy
local-routing-config
media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
Modify SIP manipulation / header rule
Show advanced
Match value:
New value:
$if183.$au.$checkcs
CfgRules
Add
Edit
Copy
Delete
Move up
Move down
Name
Element type
modstatus
element-rule
modreasonphrase
element-rule





Apply this in Teamsinmanip by creating a rule as shown below.


ORACLE
Notifications | admin
Home
Configuration
Monitor and Trace
Widgets
System
Save
Wizards
Commands
Discard
Objects
media-manager
security
session-router
access-control
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filter-config
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media-profile
session-agent
session-group
session-recording-group
session-recording-server
session-translation
sip-config
sip-feature
sip-interface
sip-manipulation
Add SIP manipulation / header rule
Show advanced
Name:
Change183to180
Header name:
From
Action:
sip-manip
Comparison type:
case-sensitive
Msg type:
any
Methods:
Add
Edit
Delete
Match value:
New value:
Checkfor1831
CfgRules

Appendix B

DDoS Prevention for Peering Environments

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/cd/F12246_01/doc/sbc_scz830_security.pdf

The following are the recommended configuration values based on Best Current Practices for an Oracle SBC NN4600 deployed in a Sip Peering Environment:

Acme Packet 4600 1000000 Flow Table 16G memory - copper single GigE

Platform:	AP 4600
Flow Table:	1000000
Memory:	16 GB
Software Release:	SCZ8.1.0

The following table lists the five parameters germane to DDoS Configuration Settings in Peering Environments for the Acme Packet 4600 and their settings on the core and peer realms.

parameter	Core realm-config	Peer Realm-config
access-control-trust-level	high	low
average-rate-limit	0	0
invalid-signal-threshold	0	0
maximum-signal-threshold	0	0

parameter	Core realm-config	Peer Realm-config
untrusted-signal-threshold	0	0

The **media-manager** configuration should be set as suggested in the following table for the Acme Packet 4600 in the respective model.

Parameter	PBRB Model	SSNHTN Model	SNB Model
max-signaling-bandwidth	2651610	2651610	2651610
max-untrusted-signaling	1	1	1
min-untrusted-signaling	1	1	1
tolerance-window	30	30	30

Appendix C

SBC Behind NAT SPL configuration

This configuration is needed when your SBC is behind a NAT device. This is configured to avoid loss in voice path and SIP signaling.
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.

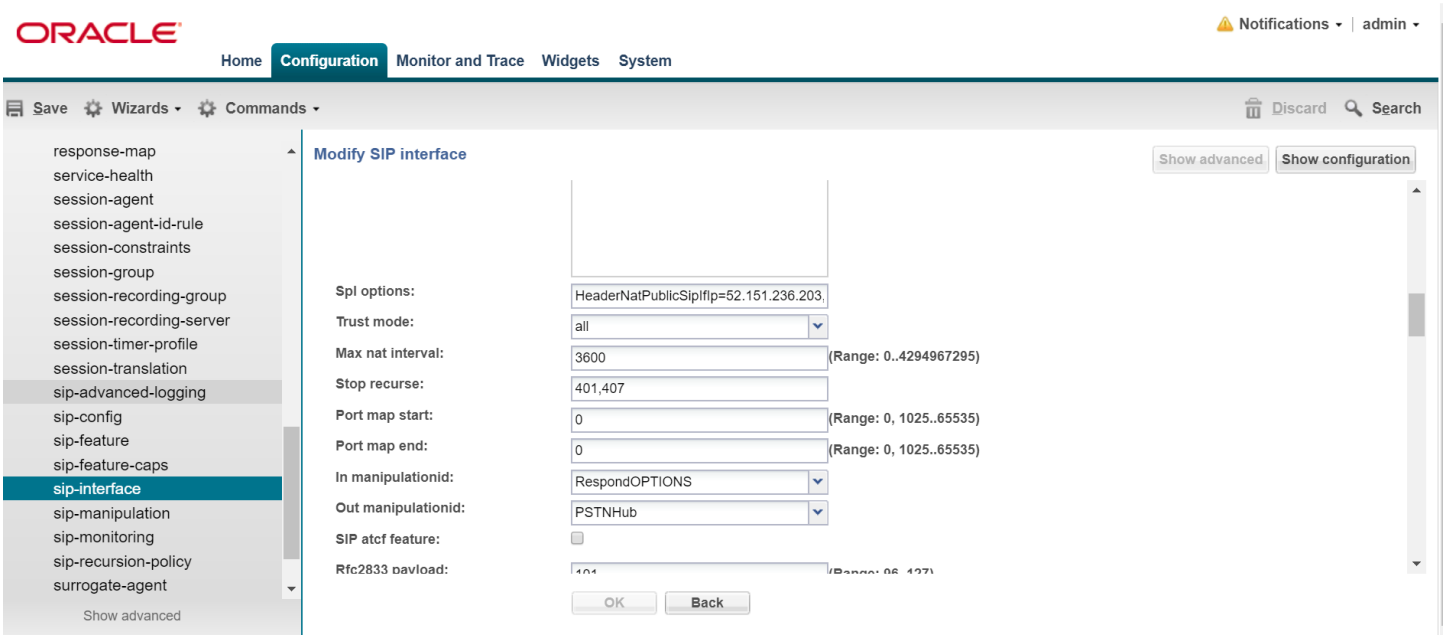
- The private IP address must be the same as the SIP Interface IP address.
- The public IP address must be the public IP address of the NAT device

Here is an example configuration with SBC Behind NAT SPL config. The SPL is applied to the Teams side SIP interface.

To configure SBC Behind NAT SPL Plug in, Go to session-router->sip-interface->spl-options and input the following value, save and activate.

HeaderNatPublicSipIfIp=52.151.236.203,HeaderNatPrivateSipIfIp=10.0.4.4

Here HeaderNatPublicSipIfIp is the public interface ip and HeaderNatPrivateSipIfIp is the private ip.



Similarly configure the PSTN side as well.

Appendix D

Here is a CLI configuration snapshot of the SBC.

```
NN3900-101# sh con sh
certificate-record
        name                                    BaltimoreRoot
        common-name                             Baltimore CyberTrust Root
certificate-record
        name                                    DigiCertInter
        common-name                             DigiCert SHA2 Secure Server CA
certificate-record
        name                                    DigiCertRoot
        common-name                             DigiCert Global Root CA
certificate-record
        name                                    SBCCertificate
        locality                                Bedford
        organization                            sales
        common-name                             Oracleesbc2.woodgrovebank.us
        extended-key-usage-list                 serverAuth
                                                ClientAuth
codec-policy
        name                                    addCN
        allow-codecs                            * SILK:no G729:no
        add-codecs-on-egress                    CN

codec-policy
        name                                    test
        allow-codecs                            SILK::wideband SILK::narrowband
        add-codecs-on-egress                    SILK::wideband SILK::narrowband

ice-profile
        name                                    ice
        stun-conn-timeout                       0
        stun-keep-alive-interval                0
local-policy
        from-address                            *
        to-address                              *
        source-realm                            access-pstn
        policy-attribute
                next-hop                                sag:TeamsGrp
                realm                                   access-teams
local-policy
        from-address                            *
        to-address                              *
        source-realm                            access-teams
        policy-attribute
                next-hop                                ATTTrunk
                realm                                   access-pstn
media-manager
        mbcd-log-level                          DEBUG
        options                                 audio-allow-asymmetric-pt
                                                xcode-gratuitous-rtcp-report-generation
media-profile
        name                                    CN
        subname                                 wideband
        payload-type                            118
        clock-rate                              16000
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                                    RTP
```

```
media-sec-policy
        name                                    SRTP
        inbound
                profile                                 SDES
                mode                                    srtp
                protocol                                sdes
        outbound
                profile                                 SDES
                mode                                    srtp
                protocol                                sdes
network-interface
        name                                    s0p0
        hostname                                oracleesbc2.woodgrovebank.us
        ip-address                              192.65.72.196
        netmask                                 255.255.255.0
        gateway                                 192.65.72.1
          hip-ip-list                           192.65.72.196
        icmp-address                            192.65.72.196

network-interface
        name                                    s0p1
        hostname                                oracleesbc2.woodgrovebank.us
        ip-address                              155.212.214.172
        netmask                                 255.255.255.0
        gateway                                 155.212.214.172
        dns-ip-primary                          8.8.8.8
        dns-domain                              woodgrovebank.us

phy-interface
        name                                    s0p0
        operation-type                          Media
phy-interface
        name                                    s0p1
        operation-type                          Media
        port                                    1

realm-config
        identifier                              access-pstn
        network-interfaces                      s0p0:0.4
        mm-in-realm                             enabled
        media-sec-policy                        RTP
        out-translationid                       removeE164
        access-control-trust-level              high
        spl-options                             LRE-Identifier,X-CALL-ID,Contact
        hide-egress-media-update                enabled
        ringback-trigger                        refer
        ringback-file                           ringback10sec.pcm
realm-config
        identifier                              access-teams
        network-interfaces                      s0p0:0.4
        mm-in-realm                             enabled
        media-sec-policy                        SRTP
        rtcp-mux                                enabled
        ice-profile                             ice
        refer-call-transfer                     enabled
        codec-policy                            addCN
        rtcp-policy                             rtcpGen
        hide-egress-media-update                enabled
rtcp-policy
        name                                    rtcpGen
        rtcp-generate                           all-calls
sdes-profile
        name                                    SDES
session-agent
        hostname                                ATTTrunk
        ip-address                              68.68.117.67
        state                                   disabled
        realm-id                                access-pstn
        ping-method                             OPTIONS
        ping-interval                           60
session-agent
        hostname                                sip-all.pstnhub.microsoft.com
        port                                    5061
```

```
        transport-method                        StaticTLS
        realm-id                                access-teams
        ping-interval                           30
        refer-call-transfer                     enabled
         ping-all-addresses                      enabled

session-agent
        hostname                                sip.pstnhub.microsoft.com
        port                                    5061
        transport-method                        StaticTLS
        realm-id                                access-teams
        ping-method                             OPTIONS
        ping-interval                           30
        refer-call-transfer                     enabled
         ping-all-addresses                      enabled

session-agent
        hostname                                sip2.pstnhub.microsoft.com
        port                                    5061
        transport-method                        StaticTLS
        realm-id                                access-teams
        ping-method                             OPTIONS
        ping-interval                           30
        refer-call-transfer                     enabled
        ping-all-addresses                      enabled

session-agent
        hostname                                sip3.pstnhub.microsoft.com
        port                                    5061
        transport-method                        StaticTLS
        realm-id                                access-teams
        ping-method                             OPTIONS
        ping-interval                           30
        refer-call-transfer                     enabled
        ping-all-addresses                      enabled

session-group
        group-name                              TeamsGrp
        strategy                                RoundRobin
        dest                                    sip.pstnhub.microsoft.com
                                                sip2.pstnhub.microsoft.com
                                                sip3.pstnhub.microsoft.com
        sag-recursion                           enabled
        stop-sag-recurse                        401,407,480

sip-config
        home-realm-id                           access-pstn
        options                                 inmanip-before-validate
                                                max-udp-length=0
        extra-method-stats                      enabled
sip-feature
        name                                    replaces
        realm                                   access-teams
        require-mode-inbound                    Pass
        require-mode-outbound                   Pass

sip-interface
        state                                   enabled
        realm-id                                access-pstn
        description                             to trunk
        sip-port
                address                                 192.65.72.196
                allow-anonymous                         agents-only
        in-manipulationid
        out-manipulationid                      Siptrunk_outmanip
sip-interface
        realm-id                                access-teams
        sip-port
                address                                 155.212.214.172
                port                                    5061
                transport-protocol                      TLS
                tls-profile                             TLSTeams
                allow-anonymous                         agents-only
```

```
        nat-traversal                           always
        nat-interval                            3600
        registration-caching                    enabled
        in-manipulationid                       Teamsinmanip
        out-manipulationid                      Teamsoutmanip
        sip-profile                             foreplace
sip-manipulation
        name                                    Checkfor1831
        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                                    checkc
                                type                                    c
                                action                                  store
                                comparison-type                         pattern-rule
                                match-value                             ^(.(?!(155.214.212.172)))*$
        mime-sdp-rule
                name                                    deletesdp
                msg-type                                reply
                methods                                 INVITE
                action                                  delete
                comparison-type                         boolean
                match-value                             $if183.$au.$checkc
        header-rule
                name                                    change183t0180
                header-name                             @status-line
                action                                  manipulate
                comparison-type                         boolean
                match-value                             $if183.$au.$checkc
                element-rule
                        name                                    modstatus
                        type                                    status-code
                        action                                  replace
                        match-value                             183
                        new-value                               180
                element-rule
                        name                                    modReasonPhrase
                        type                                    reason-phrase
                        action                                  replace
                        match-value                             Session Progress
                        new-value                               Ringing
sip-manipulation
        name                                    Siptrunk_outmanip

header-rule
                name                                    change_fqdn_to_ip_from
                header-name                             From
                action                                  manipulate
                msg-type                                out-of-dialog
                methods                                 INVITE
                element-rule
                        name                                    from_uri
                        type                                    uri-host
```

```
                        action                                  replace
                        new-value                               $LOCAL_IP
        header-rule
                name                                    change_fqdn_to_ip_to
                header-name                             to
                action                                  manipulate
                msg-type                                out-of-dialog
                methods                                 INVITE
                element-rule
                        name                                    urihost
                        type                                    uri-host
                        action                                  replace
                        new-value                               $REMOTE_IP
sip-manipulation
        name                                    Teamsinmanip
        header-rule
                name                                    Respondoptions
                header-name                             From
                action                                  reject
                msg-type                                request
                methods                                 OPTIONS
                new-value                               200 OK

header-rule
                name                                    From
                header-name                             From
                action                                  sip-manip
                new-value                               Checkfor1831
mime-sdp-rule
                name                                    Reqinactivetosendonly
                msg-type                                request
                methods                                 INVITE
                action                                  manipulate
                sdp-media-rule
                        name                                    audio
                        media-type                              audio
                        action                                  manipulate
                        sdp-line-rule
                                name                                    audio1
                                type                                    a
                                action                                  replace
                                match-value                             inactive
                                new-value                               sendonly
        mime-sdp-rule
                name                                    Replyinactivetorecvonly
                msg-type                                reply
                methods                                 INVITE
                action                                  manipulate
                sdp-media-rule
                        name                                    audio
                        media-type                              audio
                        action                                  manipulate
                        sdp-line-rule
                                name                                    audio1
                                type                                    a
                                action                                  replace
                                match-value                             inactive
                                new-value                               recvonly
sip-manipulation
        name                                    Teamsoutmanip
        header-rule
                name                                    Countrycode
                header-name                             Request-URI
                action                                  manipulate
                msg-type                                out-of-dialog
                methods                                 INVITE
                element-rule
                        name                                    uriuser2
                        type                                    uri-user
                        action                                  replace
                        new-value                               "1"+$
        header-rule
                name                                    Change_fromip_fqdn
```

```
                header-name                             To
                action                                  manipulate
                msg-type                                out-of-dialog
                methods                                 INVITE
                element-rule
                        name                                    fixtouri
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          ip
                        new-value                               $RURI_HOST.$0
                element-rule
                        name                                    urinumber
                        type                                    uri-user
                        action                                  replace
                        new-value                               "1"+$
        header-rule
                name                                    Change_to_userandhost
                header-name                             From
                action                                  manipulate
                msg-type                                out-of-dialog
                methods                                 INVITE
                element-rule
                        name                                    FixUriHost
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          ip
                        new-value                               oracleesbc2.woodgrovebank.us
        header-rule
                name                                    Addcontactheaderinoptions
                header-name                             Contact
                action                                  add
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                new-value
"<sip:ping@oracleesbc2.woodgrovebank.us:5061;transport=tls>"
        header-rule
                name                                    Recordroute
                header-name                             Record-Route
                action                                  add
                msg-type                                out-of-dialog
                methods                                 OPTIONS
                new-value                               "<sip:oracleesbc2.woodgrovebank.us>"
        header-rule
                name                                    Alter_contact
                header-name                             Contact
                action                                  manipulate
                msg-type                                out-of-dialog
                methods                                 INVITE
                element-rule
                        name                                    Contact_IP
                        parameter-name                          Contact_IP
                        type                                    uri-host
                        action                                  replace
                        new-value                               oracleesbc2.woodgrovebank.us

        header-rule
                name                                    Adduseragent
                header-name                             User-Agent
                action                                  add
                msg-type                                out-of-dialog
                methods                                 INVITE
                new-value                               "Oracle ESBC"
        header-rule
                name                                    Modifyuser
                header-name                             User-Agent
                action                                  manipulate
                msg-type                                out-of-dialog
                methods                                 INVITE
                element-rule
                        name                                    user
                        type                                    header-value
                        action                                  add
                        new-value                               "Oracle ESBC"
```

```
mime-sdp-rule
                name                                    Reqsendonlytoinactive
                msg-type                                request
                methods                                 INVITE
                action                                  manipulate
                sdp-media-rule
                        name                                    audio
                        media-type                              audio
                        action                                  manipulate
                        sdp-line-rule
                                name                                    audio3
                                type                                    a
                                action                                  replace
                                match-value                             sendonly
                                new-value                               inactive
        mime-sdp-rule
                name                                    Reprecvonlytoinactive
                msg-type                                reply
                methods                                 INVITE
                action                                  manipulate
                sdp-media-rule
                        name                                    audio
                        media-type                              audio
                        action                                  manipulate
                        sdp-line-rule
                                name                                    audio3
                                type                                    a
                                action                                  replace
                                match-value                             recvonly
                                new-value                               inactive
sip-monitoring
        match-any-filter                        enabled
        monitoring-filters                      *
sip-profile
        name                                    foreplace
        replace-dialogs                         enabled


steering-pool
        ip-address                              155.212.214.172
        start-port                              20000
        end-port                                40000
        realm-id                                access-teams
steering-pool
        ip-address                             192.65.72.196
        start-port                              20000
        end-port                                40000
        realm-id                                access-pstn

system-config
        system-log-level                        DEBUG
        process-log-level                       DEBUG
        comm-monitor
                state                                   enabled
                qos-enable                              disabled
                monitor-collector
                        address                                 129.213.175.152
                        network-interface                       s0p0:0.4
                monitor-collector
                        address                                 172.18.255.181
        source-routing                          enabled
tls-global
        session-caching                         enabled
tls-profile
        name                                    TLSTeams
        end-entity-certificate                  SBCCertificate
        trusted-ca-certificates                 DigiCertInter
                                                DigiCertRoot
                                                BaltimoreRoot
        cipher-list                             ALL
        mutual-authenticate                     enabled

web-server-config
```

```
        inactivity-timeout                  0
        http-interface-list
```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