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Oracle Enterprise Communications Broker & Oracle Enterprise Session Border Controller with Avaya Aura 7.0, Cisco's UCM 11.0, Microsoft's Lync2013, Skype for Business & CCE

Technical Application Note

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Intended Audience

This is a technical document intended for telecommunications engineers with the purpose of configuring the Oracle Communications Enterprise-SBC, Microsoft Skype for Business, Avaya Aura Session Manager and Cisco Unified Communications Manager. There will be steps that require navigating Microsoft Windows Server as well as the Acme Packet Command Line Interface (ACLI). Understanding the basic concepts of TCP/UDP, IP/Routing, and SIP/RTP are also necessary to complete the configuration and for troubleshooting, if necessary.

Document Overview

This technical application note documents the implementation of the Oracle Enterprise Session Border Controller (ESBC) in an Enterprise network consisting of multi-vendor Unified Communications platforms – Microsoft's Cloud Connector Edition & Skype for Business 2015, Avaya Aura Session Manager and Cisco Unified Communications Manager - connecting to a SIP trunk.

Introduction

Requirements

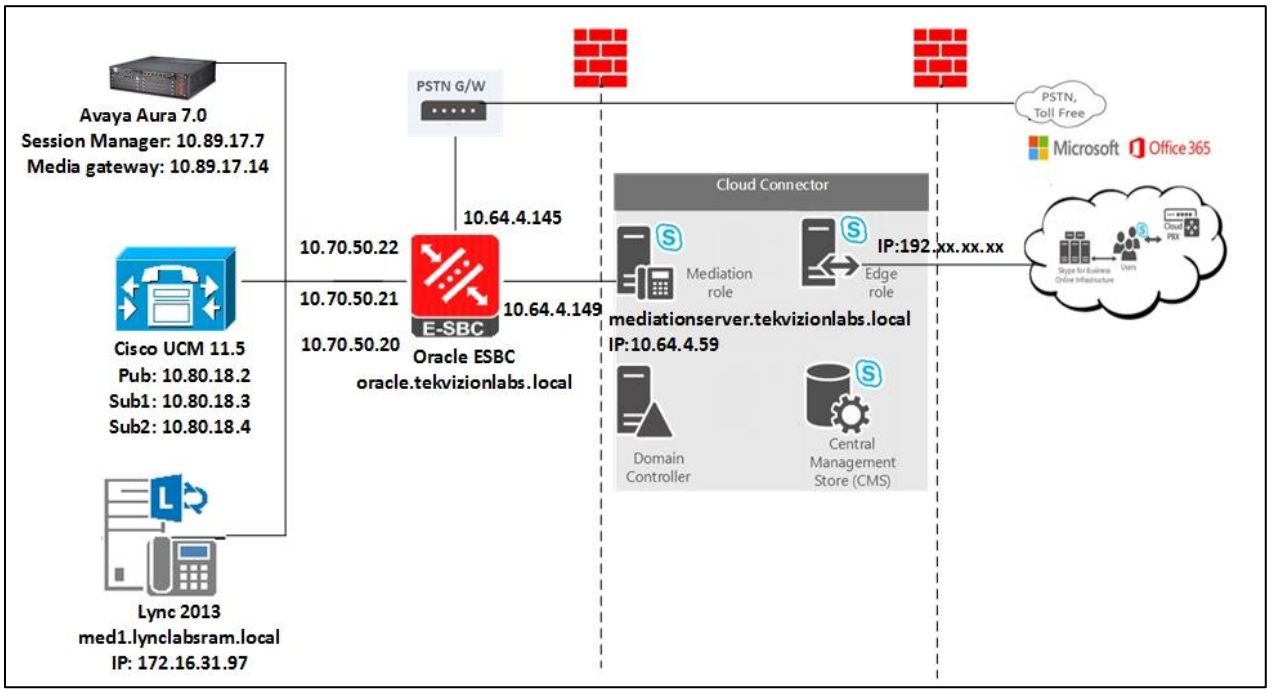
- Oracle Enterprise Session Border Controller ECZ750 or higher
- Microsoft Skype for Business 2015
- Microsoft Lync 2013
- Microsoft Cloud Connector Edition
- Avaya Aura 7.0
- Cisco Unified Communications Manager 11.0
- SIP Trunk (Verizon)

Components, Versions and Debugging Tools

Components and Debugging Tools	Version
E-SBC	Acme Packet 3900 ECZ7.5.0 or above
Microsoft Lync 2013 Server	5.0.8308.872
Microsoft Lync 2013 Client	15.0.4551.1007
Microsoft Skype for Business Cloud Server	6.0.9319.377
Microsoft Cloud Connector Edition	1.4.2
Microsoft Skype for Business 2015 Client	16.0.4417.1000
Cisco Unified Communication Manager	11.5.1.12900-21
Avaya Aura	7.0
Wireshark	2.2.7
CLS Logger for Skype for Business	6.0.9319.0

Lab Configuration

The following diagram illustrates the lab environment created by tekVizion to facilitate certification testing. tekVizion is a Certification house dedicated to the telecommunications industry. Their core services include consulting/solution design, interoperability/verification testing, integration, custom software development and solution support services.



The network architecture consists of two areas. Area 1 represents the Enterprise network and Area 2 is the service provide network. The Enterprise network has the ESBC at its core connecting together multiple UC platforms.

Configuring the Oracle Enterprise SBC

In this section we describe the steps for configuring an Oracle Enterprise SBC (E-SBC) for use with the Oracle ECB, Microsoft CCE & Skype for Business, Cisco CUCM, and Avaya Aura. The E-SBC will connect the Enterprise network to the Service Provider network in a SIP trunking scenario.

In Scope

The following guide for configuring the Oracle SBC assumes that this is a newly deployed device dedicated to a single customer. Please see the ACLI Configuration Guide on http://docs.oracle.com/cd/E61547_01/index.html for a better understanding of the Command Line Interface (CLI).

Note that Oracle offers several models of the SBC. This document covers the setup for the 1100, 3820, 4500, 4600, and 6300 platforms running OS ECZ7.3.0 MR-1 or later. If instructions are needed for other Oracle SBC models, please contact your Oracle representative.

Out of Scope

- Configuration of Network management including SNMP and RADIUS
- Configuration of Distributed Denial of Service (DDoS) protection parameters as these are based on individual customer requirements.

What will you need

- RJ45/DB9 serial adapter provided with the SBC, along with a straight-through Ethernet cable to go from the adapter to the SBC's console port (on the rear of the 1100, 4600, and 6300, and the front of the 3820 and 4500).
- Terminal emulation application such as PuTTY or HyperTerm
- Passwords for the User and Superuser modes on the Oracle SBC
- IP address to be assigned to the management interface (eth0, labeled Mgmt0 on the SBC chassis) of the SBC - the eth0 management interface must be connected and configured to a management network separate from the service interfaces. Otherwise the SBC is subject to ARP overlap issues, loss of system access when the network is down, and compromised DDoS protection. Oracle does not support SBC configurations with management and media/service interfaces on the same subnet.
- IP address of the Oracle ECB.
- IP addresses to be used for the SBC internal and external facing ports (Service Interfaces)

SBC- Getting Started

Once the Oracle SBC is racked and the power cable connected, you are ready to set up physical network connectivity. **Note: use the console port on the front of the SBC, not the one on the back, on platforms such as the 3820 and 4500 that have two console ports.**

Plug the slot 0 port 0 (s0p0) interface into your outside (SIP Trunk-facing) network and the slot 1 port 0 (s1p0) interface into your inside (ECB-facing) network. Once connected, you are ready to power on and perform the following steps.

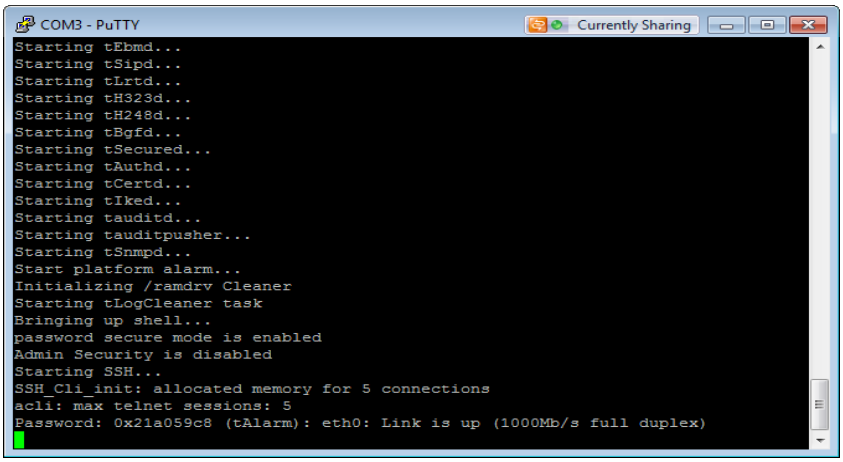
All commands are in bold, such as **`configure terminal`**; parameters in bold red such as **oraclesbc1** are parameters which are specific to an individual deployment. **Note:** The CLI is case sensitive.

Establish the serial connection and logging in the SBC

Confirm the SBC is powered off and connect one end of a straight-through Ethernet cable to the console port on the SBC and the other end to console adapter that ships with the SBC, connect the console adapter (a DB9 adapter) to the DB9 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 bootup sequence.



Enter the following commands to login to the SBC and move to the configuration mode. Note that the default SBC password is "**acme**" and the default super user password is "**packet**".

```
Password: acme
oraclesbc1> enable
Password: packet
oraclesbc1# configure terminal
oraclesbc1(configure)#
```

You are now in the global configuration mode.

Initial Configuration – Assigning the management Interface an IP address

To assign an IP address, one has to configure the bootparams on the SBC by going to

oraclesbc1# configure terminal --- >bootparams

- Once you type "bootparam" you have to use "carriage return" key to navigate down
- A reboot is required if changes are made to the existing bootparams. **Note these example boot parameters are specific to the 4600 platform. Other platforms will have different boot parameters. Use nnECZ730m1.64.bz for the 1100, 4500, 4600, and the 6300. Use nnECZ730m1.32.bz for the 3820.**

```
ORACLESBC1(configure)# bootparam

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

```
Boot File               : /boot/nnECZ750.bz
IP Address              : 192.168.79.44
VLAN                    :
Netmask                 : 255.255.255.224
Gateway                 : 192.168.79.33
IPv6 Address            :
IPv6 Gateway            :
Host IP                 : 0.0.0.0
FTP username            : vxftp
FTP password            : vxftp123
Flags                   :
Target Name             : oraclesbc1
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.
```

Configuring the SBC

The following section walks you through configuring the Oracle Enterprise SBC in an environment with Microsoft Lync, Skype for Business, Cisco CUCM, and Avaya Aura.

It is outside the scope of this document to include all the interoperability working information as it will differ in every deployment.

***Please note** – All the configs sections contain output of "show running-config short" – the short command only prints out non-standard configs required for the SBC to operate in the model configured*

High Availability

The Mgmt1 and Mgmt2 (labeled wancom1 and wancom2 in the configuration) ports which are on the rear panel of the SBC are used for the purpose of High Availability on the E-SBC. Crossover cables must be connected between these ports on the SBCs, i.e. Mgmt1 to Mgmt1 and Mgmt2 to Mgmt2. Please refer to the "High Availability Nodes" in the ACLI configuration guide for ECZ730 for more details.

Local Policies

Path: **`configure terminal > session-router > local-policy`**

Policy number	Trigger	Destination	Logic
1	25/52600025	Avaya	• All extensions which start with 25 – would terminate on Avaya cluster • If an external (outside of the local network) user dials 52600025 – those calls also would land on Avaya Cluster
2	26/52600026	CUCM	• All extensions which start with 26 – would terminate on CUCM cluster

			• If an external (outside of the local network) user dials 52600026 – those calls also would land on CUCM Cluster
3	27/52600027	Lync 2013	• All extensions which start with 27 – would terminate on SFB medPool • If an external (outside of the local network) user dials 52600027 – those calls also would land on Mediation server pool
4	28/52600028	O365	• All extensions which start with 28 – would terminate on SFB online running on Office 365 – these calls would route via CCE • If an external (outside of the local network) user dials 52600028 – those calls also would land on Office365 medPool
5	*	PSTN	• Any calls sourced by Avaya/CUCM/SFB/CCE realms would be delivered to PSTN
6	2432 2601 5270002601	LDAP	• The following numbers 2432/2601/5270002601 were configured specifically for LDAP based routing – 2432 was a Avaya user, 2601 & 5270002601 were CUCM users.
7	med1.lynclabsram.local	Lync2013	• This policy was created to assist with refer-call-transfer feature where the SBC terminates REFER message and sets up a new call based on refer-to header.
8	mediationserver.tekvizionlabs.local	CCE	• This policy was created to assist with refer-call-transfer feature where the SBC terminates REFER message and sets up a new call based on refer-to header
9	9876543210	SFB	• All calls made to 9876543210 would be routed to SFB
10	*	Lync2013	• All OPTIONS messages that landed on the SBC would be routed to Lync 2013 for proper OPTIONS handling.

Please Note *– the numbers in brackets below are only for reference for the table above*

```
(1)local-policy
        from-address                            *
        to-address                              25
                                                52600025
        source-realm                            *
        policy-attribute
                next-hop                                10.89.17.7
                realm                                   AvayaRealm
(2)local-policy
        from-address                            *
        to-address                              26
                                                52700026
        source-realm                            *
        policy-attribute
```

```
                next-hop                                10.80.18.3
                realm                                   CUCMRealm
(3)local-policy
        from-address                            *
        to-address                              27
                                                52800027
        source-realm                            *
        policy-attribute
                next-hop                                med1.lynclabsram.local
                realm                                   inside
(4)local-policy
        from-address                            *
        to-address                              28
                                                52900028
        source-realm                            *
        policy-attribute
                next-hop                                mediationserver.tekvizionlabs.local
                realm                                   outside
(5)local-policy
        from-address                            *
        to-address                              2142425
                                                800
                                                9725
        source-realm                            *
        description                             topstn
        policy-attribute
                next-hop                                10.64.1.72
                realm                                   PSTN
(6)local-policy
        from-address                            *
        to-address                              2432
                                                2601
                                                5270002601
        source-realm                            *
        policy-attribute
                next-hop                                ldap:ldapCfg
                realm                                   inside
(7)local-policy
        from-address                            *
        to-address                              med1.lynclabsram.local
        source-realm                            *
        policy-attribute
                next-hop                                med1.lynclabsram.local
                realm                                   inside
(8)local-policy
        from-address                            *
        to-address                              mediationserver.tekvizionlabs.local
        source-realm                            *
        policy-attribute
                next-hop                                mediationserver.tekvizionlabs.local
                realm                                   outside
(9)local-policy
        from-address                            *
        to-address                              9876543210
        source-realm                            *
        policy-attribute
```

```
                next-hop                                172.16.29.71
                realm                                   toSFB
(10)local-policy
        from-address                            *
        to-address                              *
        source-realm                            outside
        policy-attribute
                next-hop                                med1.lynclabsram.local
                realm                                   inside
                methods                                 OPTIONS
```

Media Manager

Path: **configure terminal > media-manager > media-manager > select > done**

```
media-manager
        initial-guard-timer                     86400
        options                                 xcode-gratuitous-rtcp-report-generation
```

Network Interfaces

Path: **configure terminal > system > network-interface**

```
network-interface
        name                                    s0p0
        description                             WAN
        ip-address                              10.64.4.149
        netmask                                 255.255.0.0
        gateway                                 10.64.1.1
        gw-heartbeat
                state                                   enabled
        dns-ip-primary                          10.64.4.61
        dns-domain                              tekvizionlabs.local
        hip-ip-list                             10.64.4.149
                                                10.64.4.145
                                                10.64.4.147
        icmp-address                            10.64.4.149
                                                10.64.4.145
                                                10.64.4.147
network-interface
        name                                    s0p1
        description                             LAN
        ip-address                              10.70.50.20
        netmask                                 255.255.255.0
        gateway                                 10.70.50.1
        dns-ip-primary                          172.16.31.91
        dns-domain                              lynclabsram.local
        hip-ip-list                             10.70.50.20
                                                10.70.50.21
                                                10.70.50.22
                                                10.70.50.23
        icmp-address                            10.70.50.20
                                                10.70.50.21
                                                10.70.50.22
                                                10.70.50.23
```

Physical Interfaces

Path: **configure terminal > system > phy-interface**

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

Realm Configs

Path: **configure terminal > media-manager > realm-config**

Realm	Audio	Transcoding	RTCP generation
Avaya	RTP	CN generation enabled	Yes
CUCM	RTP	G729 only, no PCMU/PCMA	Yes
PSTN	RTP	G711 only	Yes
Inside (Lync2013)	RTP	G711 only	Yes
Outside (Office365 SFB)	SRTP	G711 only, CN generation enabled	Yes
Outside-rtp (Office365 SFB)	RTP	G711 only	No
toSFB	SRTP	G711 only, CN generation enabled	Yes

```
realm-config
        identifier                              AvayaRealm
        network-interfaces                      s0p1:0
        media-sec-policy                        RTP
        early-media-allow                       none
        codec-policy                            Xcode
        rtcp-policy                             rtcpGen
realm-config
        identifier                              CUCMRealm
        network-interfaces                      s0p1:0
        media-sec-policy                        RTP
        codec-policy                            G729only
        codec-manip-in-realm                    enabled
        rtcp-policy                             rtcpGen
realm-config
        identifier                              PSTN
        network-interfaces                      s0p0:0
        media-sec-policy                        RTP
        codec-policy                            G711Only
        rtcp-policy                             rtcpGen
realm-config
```

```
        identifier                          inside
        network-interfaces                  s0p1:0
        media-sec-policy                    RTP
        spl-options                         comfort-noise-generate
        codec-policy                        G711Only
        rtcp-policy                         rtcpGen
realm-config
        identifier                          outside
        network-interfaces                  s0p0:0
        media-sec-policy                    SRTP
        spl-options                         comfort-noise-generate
        codec-policy                        G711Only
        rtcp-policy                         rtcpGen
realm-config
        identifier                          outside-rtp
        network-interfaces                  s0p0:0
realm-config
        identifier                          toSFB
        network-interfaces                  s0p1:0
        media-sec-policy                    RTP
        codec-policy                        Xcode
        rtcp-policy                         rtcpGen
```

Playback Config

Path: **configure terminal > media-manager > playback-config**

We utilize the local playback feature of the SBC to play ring back tone during transfers. The ringback tone is played based on REFER termination. You must upload an audio file (in .raw format) to /code/media onto the ESBC for the media you want played during the transfer. A separate file is required for each different codec type, even if the media itself is the same.

The playback configuration is defined listing the media files that you want to play. The playback-config element is configured under media-manager.

```
playback-config
        name                                    transferrbt
        entry
                encoding                                PCMU
                filename                                US_ringbackPCMU.raw
                bytes-per-sec                           8000
```

The playback options can be applied to realms, sip-interfaces or session agents using the `spl-options` command.

Realm which requires media playback on REFER termination needs to have the following spl-options enabled

```
oraclesbc1(sip-interface)# spl-options  playback-on-refer="transferrbt"
oraclesbc1(sip-interface)# done
```

Session Agents

Path: **configure terminal > session-router > session-agent**

Session agent	Transport	Enabled features
10.64.1.72 (PSTN)	TCP	OPTIONS
10.80.18.3 (CUCM cluster)	TCP	OPTIONS
10.89.17.7 (Avaya Aura)	TCP	OPTIONS
172.16.29.71 (SFB)	TCP	OPTIONS
med1.lynclabsram.local(Lync 2013)	TLS	OPTIONS REFER termination
mediationserver.tekvizionlabs.local (CCE – SFB)	TLS	OPTIONS REFER Termination Delete +1 from RequestURI/TO/FROM headers

```
session-agent
        hostname                        10.64.1.72
        ip-address                      10.64.1.72
        transport-method                StaticTCP
        realm-id                        PSTN
        description                     PSTN
        ping-method                     OPTIONS;hops=0
        ping-interval                   30
session-agent
        hostname                        10.80.18.3
        ip-address                      10.80.18.3
        transport-method                StaticTCP
        realm-id                        CUCMRealm
        description                     CUCM
        ping-method                     OPTIONS;hops=0
        ping-interval                   30
session-agent
        hostname                        10.89.17.7
        ip-address                      10.89.17.7
        transport-method                StaticTCP
        realm-id                        AvayaRealm
        description                     Avaya
        ping-method                     OPTIONS;hops=0
        ping-interval                   30
session-agent
        hostname                        172.16.29.71
        ip-address                      172.16.29.71
        transport-method                StaticTCP
        realm-id                        toSFB
        ping-method                     OPTIONS
        ping-interval                   30
session-agent
```

```
        hostname                                med1.lynclabsram.local
        ip-address                              172.16.31.97
        port                                    5067
        transport-method                        StaticTLS
        realm-id                                inside
        ping-method                             OPTIONS;hops=0
        ping-interval                           30
        refer-call-transfer                     enabled
session-agent
        hostname                                mediationserver.tekvizionlabs.local
        ip-address                              10.64.4.59
        port                                    5067
        transport-method                        StaticTLS
        realm-id                                outside
        ping-method                             OPTIONS;hops=0
        ping-interval                           30
        in-translationid                        delplus1
        refer-call-transfer                     enabled
```

Session Translation

Path: **configure terminal > session-router > session-translation**

```
session-translation
        id                                      addPlus
        rules-calling                           addPlus1
        rules-called                            addPlus1
session-translation
        id                                      delplus1
        rules-calling                           delPlus1
        rules-called                            delPlus1
```

SIP Config

Path: **configure terminal > session-router > sip-config > select**

```
sip-config
        home-realm-id                           inside
        registrar-domain                        *
        registrar-host                          *
        registrar-port                          5060
        options                                 max-udp-length=0
```

SIP Interfaces

Path: **configure terminal > session-router > sip-interface**

SIP-Interface	IP-Address	Transport	Optional features
AvayaRealm	10.70.50.21	TCP	• Configure NatIpAvaya as out-manipulation • Change 183 session progress to 180 Ringing
CUCMRealm	10.70.50.22	TCP	• Enabled Secured-Network to allow calls into this realm with SRTP while not using TLS signaling • Configured NatIp as out-manipulation

PSTN	10.64.4.145	TCP	• Enabled Playback feature while terminating REFER • Apply NatIp as out-manipulation
Inside	10.70.50.20	TCP & TLS	• Enabled Secured-Network to allow calls into this realm with SRTP while not using TLS signaling • Enabled Playback feature while terminating REFER • Apply Stripsdp183 as in-manipulation • Apply NatIpLync as out-manipulation
Outside	10.64.4.149	TCP&TLS	• Apply Stripsdp183 as in-manipulation • Apply NatIpCce as out-manipulation
outside-rtp	10.64.4.147	TCP	
toSFB	10.70.50.23	TCP	

```
sip-interface
        realm-id                                AvayaRealm
        sip-port
                address                                 10.70.50.21
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        out-manipulationid                      NAT_IP_Avaya
        response-map                            change183to180
sip-interface
        realm-id                                CUCMRealm
        sip-port
                address                                 10.70.50.22
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        secured-network                         enabled
        out-manipulationid                      NAT_IP
sip-interface
        realm-id                                PSTN
        sip-port
                address                                 10.64.4.145
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        spl-options                             playback-on-refer="transferrbt"
        out-manipulationid                      NAT_IP
sip-interface
        realm-id                                inside
        sip-port
                address                                 10.70.50.20
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        sip-port
                address                                 10.70.50.20
                port                                    5061
```

```
                transport-protocol                      TLS
                tls-profile                             LyncTLS
                allow-anonymous                         agents-only
        secured-network                         enabled
        spl-options                             playback-on-refer="transferrbt"
        in-manipulationid                       Stripsdp183
        out-manipulationid                      NatIpLync
sip-interface
        realm-id                                outside
        sip-port
                address                                 10.64.4.149
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        sip-port
                address                                 10.64.4.149
                port                                    5061
                transport-protocol                      TLS
                tls-profile                             CCETLS
                allow-anonymous                         agents-only
        in-manipulationid                       Stripsdp183
        out-manipulationid                      NatIpCce
sip-interface
        realm-id                                outside-rtp
        sip-port
                address                                 10.64.4.147
                transport-protocol                      TCP
sip-interface
        realm-id                                toSFB
        sip-port
                address                                 10.70.50.23
                transport-protocol                      TCP
                allow-anonymous                         agents-only
```

SIP Manipulations (Header Manipulation Rules – HMR)

Path: **`configure terminal > session-router > sip-manipulation`**

SIP manipulation (HMR)	Purpose
Changeinactosendonly	• Following HMR changes inactive attribute in SDP to sendonly
NatIp	• NAT From/To/Request-URI/PAI headers to contain appropriate uri-host info & • Delete ms-source header from the INVITE
NatIpAvaya	• NAT From/To/Request-URI/PAI headers to contain appropriate uri-host • PAI header required to contain specific info – had to delete and overwrite contents form “From” header
NatIpCce	• NAT From/To/Request-URI/PAI/Contact headers to contain appropriate uri-host • Add +1 to refered by header • Check if Request-uri/From/To contain 10 digits – if they do – add +1 • Delete phone-context parameter from “From” header
NatIpLync	• NAT From/To/Request-URI/PAI/Contact headers

Stripsdp183	• Check & delete SDP from 183 Session Progress message, delete SDP & change inactive to sendonly
alter4xxOPTIONS	• Change 483 & 404 responses OPTIONS to 200 OK
delReqNatIp	• Delete Require Header & Apply NatIp sip-manipulation
alterreferby	• NAT uri-host part of refered-By header
stripRR	• Delete any record-route headers

```
sip-manipulation
        name                                    Changeinactosendonly
        description                             Change inactive to sendonly for pstn tran
        header-rule
                name                                    changeSDP
                header-name                             Content-Type
                action                                  manipulate
                msg-type                                request
                methods                                 INVITE
                element-rule
                        name                                    inacttosendonly
                        parameter-name                          application/sdp
                        type                                    mime
                        action                                  find-replace-all
                        comparison-type                         pattern-rule
                        match-value                             a=inactive
                        new-value                               a=sendonly
sip-manipulation
        name                                    NatIp
        header-rule
                name                                    From
                header-name                             From
                action                                  manipulate
                msg-type                                request
                element-rule
                        name                                    fromEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    To
                header-name                             To
                action                                  manipulate
                msg-type                                request
                element-rule
                        name                                    ToEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $REMOTE_IP
        header-rule
                name                                    RequestURI
                header-name                             request-uri
                action                                  manipulate
                methods                                 INVITE
```

```
                element-rule
                        name                                    ruriEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $REMOTE_IP
        header-rule
                name                                    alterPAI
                header-name                             P-Asserted-Identity
                action                                  manipulate
                element-rule
                        name                                    alterPAIEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $LOCAL_IP
        header-rule
                name                                    msSource
                header-name                             ms-call-source
                action                                  delete
                methods                                 INVITE
sip-manipulation
        name                                    NatIpAvaya
        header-rule
                name                                    From
                header-name                             From
                action                                  manipulate
                msg-type                                request
                element-rule
                        name                                    fromEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
                element-rule
                        name                                    store_user
                        type                                    uri-user
                        action                                  store
        header-rule
                name                                    To
                header-name                             To
                action                                  manipulate
                msg-type                                request
                element-rule
                        name                                    ToEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $REMOTE_IP
        header-rule
                name                                    RequestURI
                header-name                             request-uri
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    ruriEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $REMOTE_IP
        header-rule
```

```
                name                                    delPAI
                header-name                             P-Asserted-Identity
                action                                  delete
                msg-type                                request
                methods                                 INVITE
        header-rule
                name                                    msSource
                header-name                             ms-call-source
                action                                  delete
                methods                                 INVITE
        header-rule
                name                                    createPAI
                header-name                             Contact
                action                                  manipulate
                msg-type                                request
                methods                                 INVITE
                match-value
                element-rule
                        name                                    updateContact
                        type                                    uri-user
                        action                                  find-replace-all
                        new-value                               $From.$store_user.$0
        header-rule
                name                                    storeContact
                header-name                             Contact
                action                                  store
                comparison-type                         pattern-rule
                msg-type                                request
                methods                                 INVITE
        header-rule
                name                                    addPAI
                header-name                             P-Asserted-Identity
                action                                  add
                comparison-type                         boolean
                msg-type                                request
                methods                                 INVITE
                match-value                             $delPAI
                new-value                               $storeContact.$0
sip-manipulation
        name                                    NatIpCce
        header-rule
                name                                    From
                header-name                             From
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    fromEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    To
                header-name                             To
                action                                  manipulate
                methods                                 INVITE
                element-rule
```

```
                        name                                    ToEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value
mediationserver.tekvizionlabs.local
        header-rule
                name                                    RequestURI
                header-name                             request-uri
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    ruriEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value
mediationserver.tekvizionlabs.local
        header-rule
                name                                    alterPAI
                header-name                             P-Asserted-Identity
                action                                  manipulate
                element-rule
                        name                                    alterPAIEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $LOCAL_IP
        header-rule
                name                                    Contact
                header-name                             Contact
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    contactEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    AddPlus1
                header-name                             referred-by
                action                                  manipulate
                element-rule
                        name                                    addplus1
                        type                                    uri-user
                        action                                  find-replace-all
                        new-value                               "+1"+$ORIGINAL
        header-rule
                name                                    alterreferby
                header-name                             From
                action                                  sip-manip
                msg-type                                request
                new-value                               alterreferby
        header-rule
                name                                    removePC
                header-name                             From
                action                                  manipulate
                methods                                 INVITE
                element-rule
```

```
                        name                                    removePCEr
                        parameter-name                          phone-context
                        type                                    uri-user-param
                        action                                  delete-element
        header-rule
                name                                    FromUser
                header-name                             from
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    fromEr
                        type                                    uri-user
                        action                                  find-replace-all
                        match-value                             ^(\d{10})
                        new-value                               "+1"+$ORIGINAL
        header-rule
                name                                    Plus1RURI
                header-name                             Request-URI
                action                                  manipulate
                element-rule
                        name                                    PlusRURIEr
                        type                                    uri-user
                        action                                  find-replace-all
                        match-value                             ^(\d{10})
                        new-value                               "+1"+$ORIGINAL
                element-rule
                        name                                    PlusRURI_store
                        type                                    uri-user
                        action                                  store
        header-rule
                name                                    Plus1To
                header-name                             To
                action                                  manipulate
                element-rule
                        name                                    PlusToEr
                        type                                    uri-user
                        action                                  find-replace-all
                        match-value                             ^(\d{10})
                        new-value                               "+1"+$ORIGINAL
                element-rule
                        name                                    copyRURI
                        type                                    uri-user
                        action                                  find-replace-all
                        match-value                             ^(\d{4})
                        new-value
$Plus1RURI.$PlusRURI_store.$0
sip-manipulation
        name                                    NatIpLync
        header-rule
                name                                    from
                header-name                             From
                action                                  sip-manip
                new-value                               NAT_IP
        header-rule
                name                                    alterPAI
                header-name                             P-Asserted-Identity
```

```
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    alterPAIEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    alterContact
                header-name                             Contact
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    alterContactEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    To
                header-name                             To
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    toEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               med1.lynclabsram.local
        header-rule
                name                                    ruri
                header-name                             request-uri
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    ruriEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               med1.lynclabsram.local
        header-rule
                name                                    alterReferredBy
                header-name                             Referred-By
                action                                  manipulate
                msg-type                                request
                methods                                 INVITE
                element-rule
                        name                                    alterRB
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
sip-manipulation
        name                                    Stripsdp183
        description                             For incoming 183 from Lync, strip SDP
        header-rule
                name                                    check183
                header-name                             @status-line
                action                                  store
                comparison-type                         pattern-rule
```

```
                element-rule
                        name                                    is183
                        type                                    status-code
                        action                                  store
                        comparison-type                         pattern-rule
                        match-value                             183
        header-rule
                name                                    delSDP
                header-name                             Content-Type
                action                                  manipulate
                comparison-type                         case-insensitive
                match-value                             $check183.$is183
                element-rule
                        name                                    del183SDP
                        parameter-name                          application/sdp
                        type                                    mime
                        action                                  delete-element
                        comparison-type                         boolean
        header-rule
                name                                    delContentType
                header-name                             Content-Type
                action                                  manipulate
                comparison-type                         boolean
                match-value                             $check183.$is183
                element-rule
                        name                                    delCT
                        parameter-name                          *
                        type                                    header-param
                        action                                  delete-header
        header-rule
                name                                    inactosendonly
                header-name                             From
                action                                  sip-manip
                msg-type                                request
                new-value                               Changeinactosendonly
sip-manipulation
        name                                    alter4xxOPTIONS
        header-rule
                name                                    alterRURI
                header-name                             Request-URI
                action                                  manipulate
                msg-type                                reply
                methods                                 OPTIONS
                element-rule
                        name                                    alterRURIStatusCode
                        type                                    status-code
                        action                                  find-replace-all
                        match-value                             483 || 404
                        new-value                               200
                element-rule
                        name                                    alterRURIReasonPhrase
                        type                                    reason-phrase
                        action                                  find-replace-all
                        match-value                             Too Many Hops || Not Found
                        new-value                               OK
```

```
sip-manipulation
        name                                    delReqNatIp
        header-rule
                name                                    delRequire
                header-name                             Require
                action                                  delete
                msg-type                                reply
                methods                                 INVITE
        header-rule
                name                                    nat
                header-name                             From
                action                                  sip-manip
                new-value                               NAT_IP
sip-manipulation
        name                                    alterreferby
        header-rule
                name                                    checkReferBy
                header-name                             REFERRED-BY
                action                                  manipulate
                element-rule
                        name                                    checkReferBy
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
sip-manipulation
        name                                    stripRR
        join-headers                            Record-Route
        header-rule
                name                                    delRR
                header-name                             Record-Route
                action                                  delete
```

SIP Monitoring

Path: **configure terminal > session-router > sip-monitoring > select**

```
sip-monitoring
        match-any-filter                        enabled
        monitoring-filters                      all
```

Steering Pools

Path: **configure terminal > media-manager > steering-pool**

```
steering-pool
        ip-address                              10.64.4.145
        start-port                              49600
        end-port                                65535
        realm-id                                PSTN
steering-pool
        ip-address                              10.64.4.147
        start-port                              49600
        end-port                                65535
        realm-id                                outside-rtp
steering-pool
```

```
        ip-address                      10.64.4.149
        start-port                      49600
        end-port                        65535
        realm-id                        outside
steering-pool
        ip-address                      10.70.50.20
        start-port                      49562
        end-port                        65535
        realm-id                        inside
steering-pool
        ip-address                      10.70.50.21
        start-port                      49600
        end-port                        65535
        realm-id                        AvayaRealm
steering-pool
        ip-address                      10.70.50.22
        start-port                      49600
        end-port                        65535
        realm-id                        CUCMRealm
steering-pool
        ip-address                      10.70.50.23
        start-port                      49562
        end-port                        65535
        realm-id                        toSFB
```

Certificate record

Path: **configure terminal > security > certificate-record**

```
certificate-record
        name                            LyncMed
        state                           TX
        locality                        Plano
        common-name                     medserver1.lynclabsram.local
        digest-algor                    sha1
certificate-record
        name                            LyncRoot
        state                           TX
        locality                        Plano
        common-name                     lynclabsram-DC-CA
        digest-algor                    sha1
certificate-record
        name                            SBCCCE2
        state                           TX
        locality                        Plano
        common-name                     oracle.tekvizionlabs.local
        digest-algor                    sha1
certificate-record
        name                            SBCCert
        state                           TX
        locality                        Plano
        common-name                     oracle.tekvizionlabs.local
        digest-algor                    sha1
certificate-record
        name                            SBCCertCCE
```

```
        state                                   TX
        locality                                Plano
        common-name                             oracle.tekvizionlabs.local
        digest-algor                            sha1
certificate-record
        name                                    cceRoot
        state                                   TX
        locality                                Plano
        common-name                             SfB CCE Root
        digest-algor                            sha1
certificate-record
        name                                    newCCERoot
        state                                   TX
        locality                                Plano
        common-name                             SfB CCE Root
        digest-algor                            sha1
certificate-record
        name                                    rootcert
        state                                   TX
        locality                                Plano
        common-name                             lynclabsram-DC-CA
        digest-algor                            sha1
```

TLS profile

Path: **configure terminal > security > tls-profile**

Following two tls-profiles are required – one towards CCE while the other towards Lync 2013 – as both CCE & Lync 2013 use different root certs

```
tls-profile
        name                                    CCETLS
        end-entity-certificate                  SBCCCE2
        trusted-ca-certificates                 newCCERoot
        mutual-authenticate                     enabled
        tls-version                             tlsv12
tls-profile
        name                                    LyncTLS
        end-entity-certificate                  SBCCert
        trusted-ca-certificates                 rootcert
                                                LyncRoot
        mutual-authenticate                     enabled
        tls-version                             tlsv1
```

Tls Global config

Path: **configure terminal > security > tls-global**

The following config element needs to be enabled in order for the SBC to cache TLS connections

```
tls-global
        session-caching                         enabled
```

Sdes Profile

Path: **configure terminal > security > media-security >sdes-profile**

```
sdes-profile
        name                                    SRTP
        use-ingress-session-params              srtcp-encrypt
```

Media-sec-policy

Path: **configure terminal > security > media-security > media-sec-policy**

```
media-sec-policy
        name                                    RTP
media-sec-policy
        name                                    SRTP
        inbound
                profile                                 SRTP
                mode                                    srtp
                protocol                                sdes
        outbound
                profile                                 SRTP
                mode                                    srtp
                protocol                                sdes
```

RTCP Policy

Path: **configure terminal > media-manager > rtcp-policy**

```
rtcp-policy
        name                                    rtcpGen
        rtcp-generate                           all-calls
```

Response Map

Path: **configure terminal > session-router > sip-response-map**

```
response-map
        name                                    change183to180
        entries
                recv-code                               183
                xmit-code                               180
                reason                                  Ringing
```

LDAP Config

Path: **configure terminal > session-router > ldap-config**

```
ldap-config
        name                                    ldapCfg
        ldap-servers                            172.16.31.91:389
        realm                                   inside
        username                                administrator@lynclabsram.local
        password                                ********
        ldap-search-base                        CN=Users,DC=lynclabsram,DC=local
        ldap-transactions
                route-mode                              attribute-order-only
                ldap-cfg-attributes
                        name                                    msRTCSIP-Line
                        next-hop                                med1.lynclabsram.local
                        realm                                   inside
                        extraction-regex                        (.*)
                        value-format                            tel:$0
                ldap-cfg-attributes
                        name                                    telephoneNumber
                        next-hop
mediationserver.tekvizionlabs.local
                        realm                                   outside
                        extraction-regex                        (.*)
                        value-format                            tel:$0
```

Codec-policy

Path: **configure terminal > media-manager > codec-policy**

Codec-policy	Purpose
G711Only	Allow only G711 & telephone-event, remove G729
G729only	Allow G729 but remove G711 codecs
Xcode	Allow all codecs, but add comfort noise (payload 13)
toSFB	Allow all codecs, but add comfort noise (payload 13)

```
codec-policy
        name                                    G711Only
        allow-codecs                            * G729:no
        add-codecs-on-egress                    PCMU PCMA telephone-event
codec-policy
        name                                    G729only
        allow-codecs                            * PCMA:no PCMU:no
        add-codecs-on-egress                    G729
codec-policy
        name                                    Xcode
        allow-codecs                            *
        add-codecs-on-egress                    CN
```

```
codec-policy
        name                                    toSFB
        allow-codecs                            *
        add-codecs-on-egress                    CN
```

System Config

Path: **configure terminal > system > system-config > select**

```
system-config
        process-log-level                       WARNING
        default-gateway                         192.65.79.97
```

Translation Rules

Path: **configure terminal > session-router > translation-rule**

```
translation-rules
        id                                      addPlus1
        type                                    add
        add-string                              +1
translation-rules
        id                                      delPlus1
        type                                    delete
        delete-string                           +1
```

Web Server Config

Path: **configure terminal > system > web-server-config > select**

```
web-server-config
        state                                   enabled
        inactivity-timeout                      5
        http-state                              enabled
        http-port                               80
        https-state                             disabled
        https-port                              443
        tls-profile
```

Save, Activate, and Reboot

You will now save your configuration with the **save-config** command. This will make it persistent through reboots, but it will not take effect until after you issue the **activate-config** command. Some config elements are not Real-Time Configuration (RTC) supported, so a reboot is required after the initial configuration.

```
oraclesbc1# save-config
checking configuration
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'.
oraclesbc1# activate-config
Activate-Config received, processing.
waiting for request to finish
Setting phy0 on Slot=0, Port=0, MAC=00:08:25:03:FC:43, VMAC=00:08:25:03:FC:43
Setting phy1 on Slot=1, Port=0, MAC=00:08:25:03:FC:45, VMAC=00:08:25:03:FC:45
Request to 'ACTIVATE-CONFIG' has Finished,
Activate Complete
oraclesbc1# reboot force
```

The E-SBC configuration is now complete.

Sections below will walk thru configuring all of the 3rd party products and how they need to be configured in order for them to communicate with Oracle ESBC.

- Lync 2013
- Avaya Session Manager
- Cisco UCM
- Microsoft CCE

Lync 2013(10.70.50.20)

Topology builder with PSTN gateway

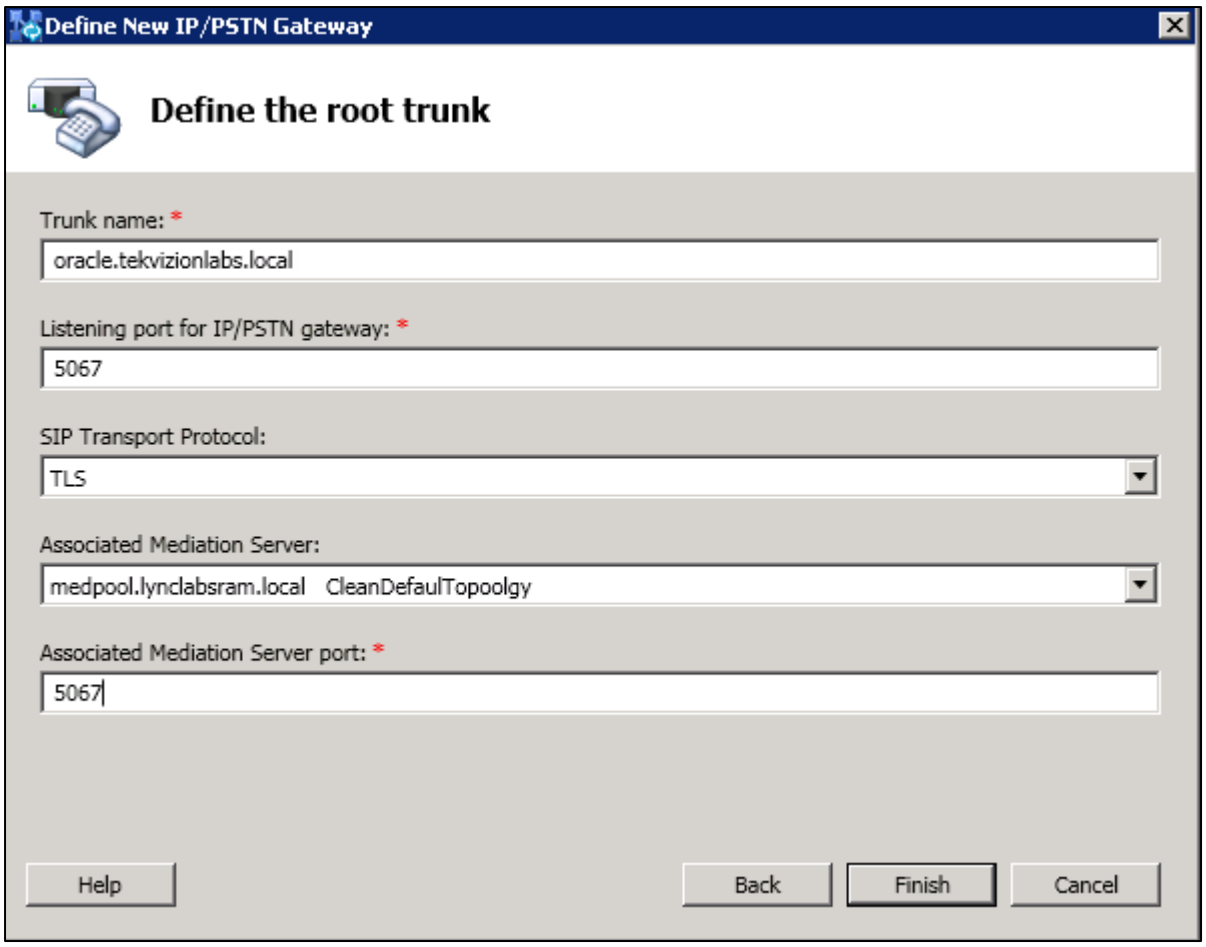


Figure 1: Defining the Root Trunk Details

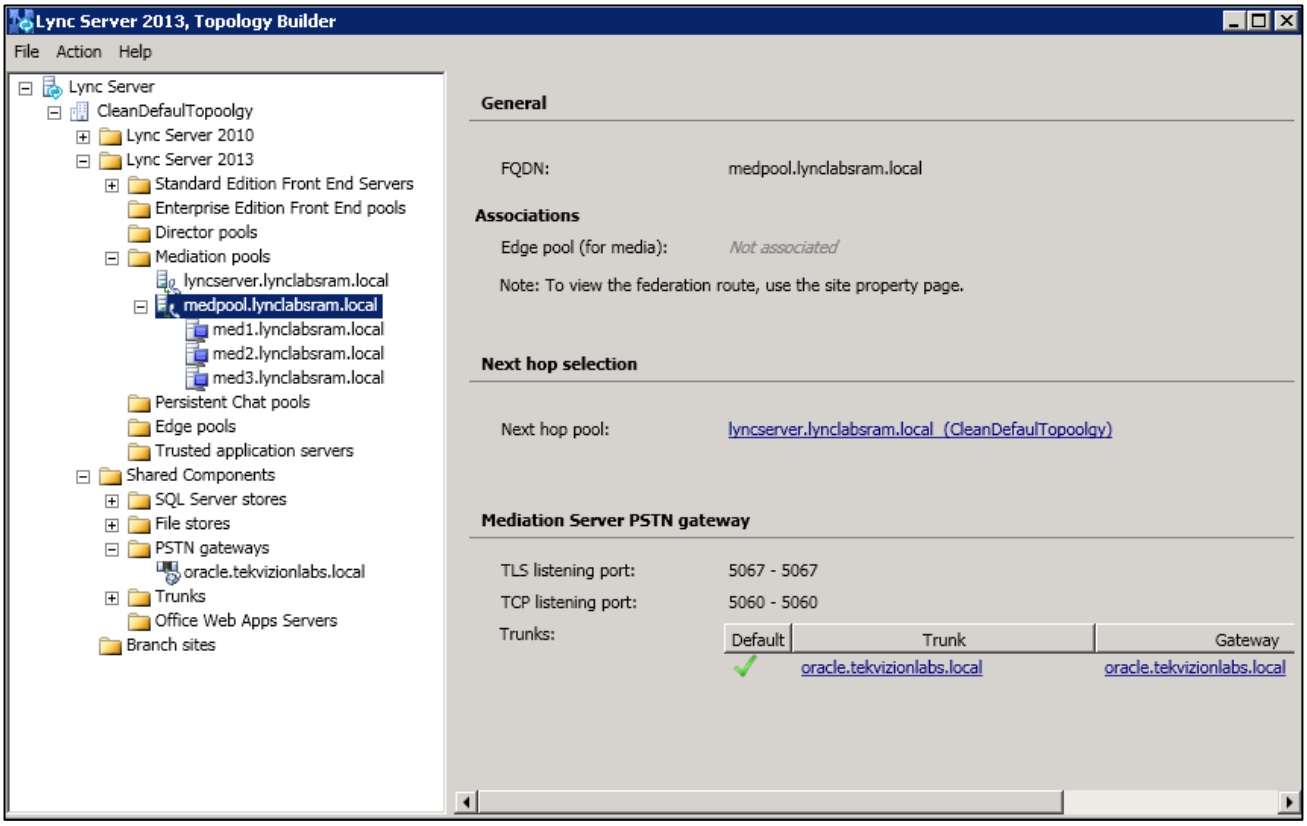


Figure 2: Mediation server with Associated PSTN gateway

Lync 2013 Control panel with "Associated PSTN gateway"

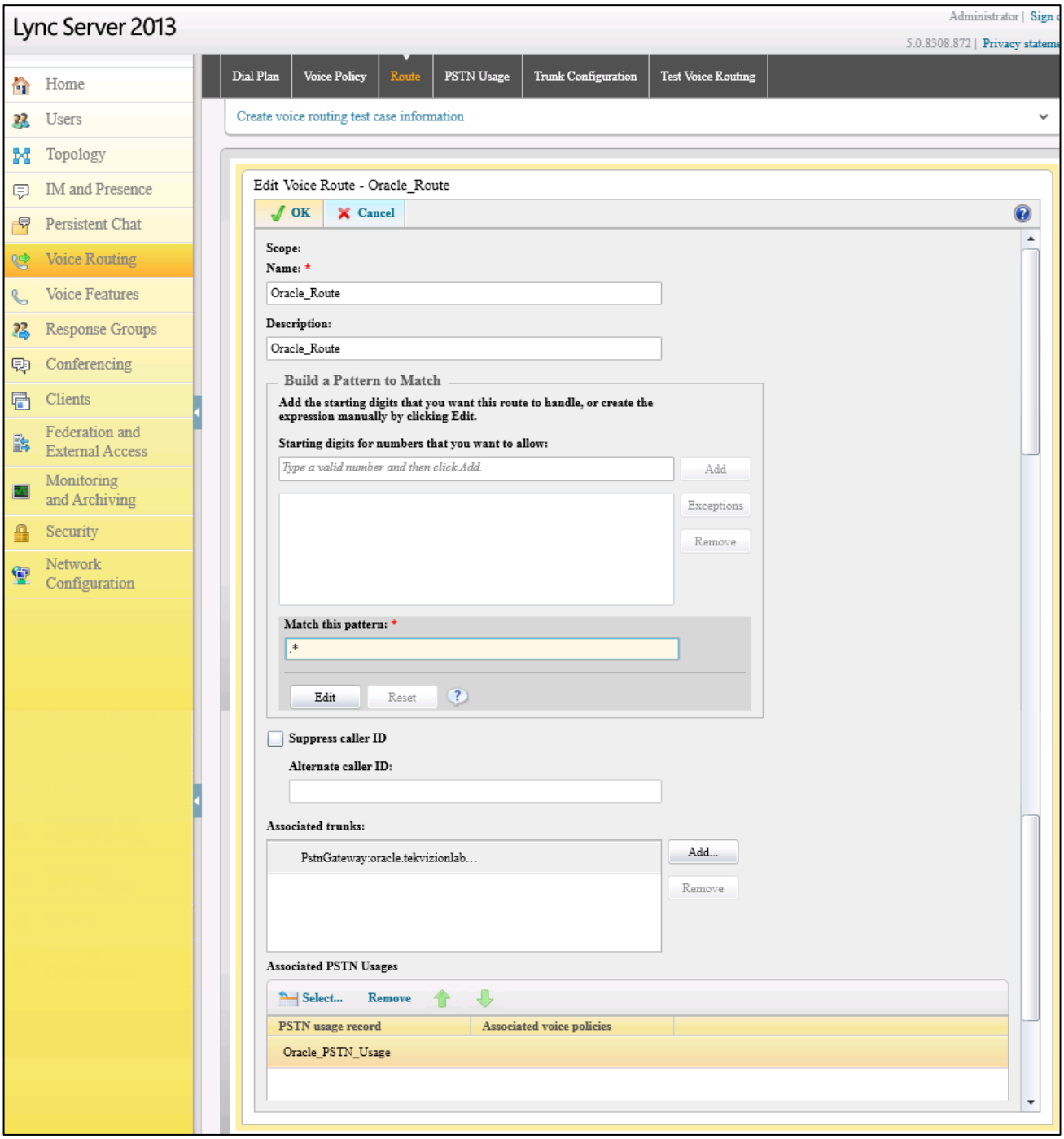


Figure 3: Associating PSTN Gateway to newly created Route

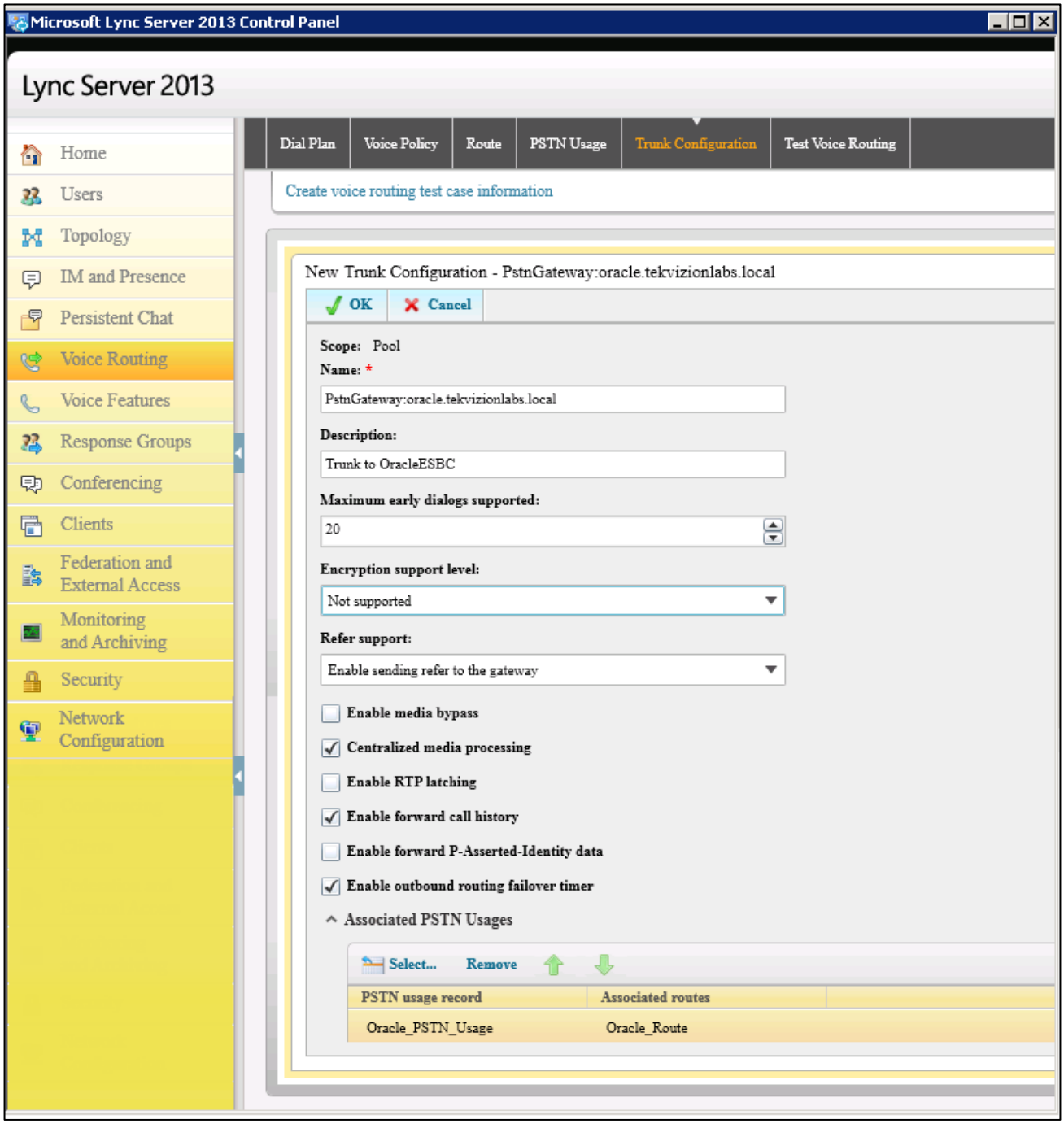


Figure 4: Trunk Configuration

Avaya (10.70.50.21)

SBC Configured on Session Manger

SIP Entity Configured on Session Manger for Oracle ESBC

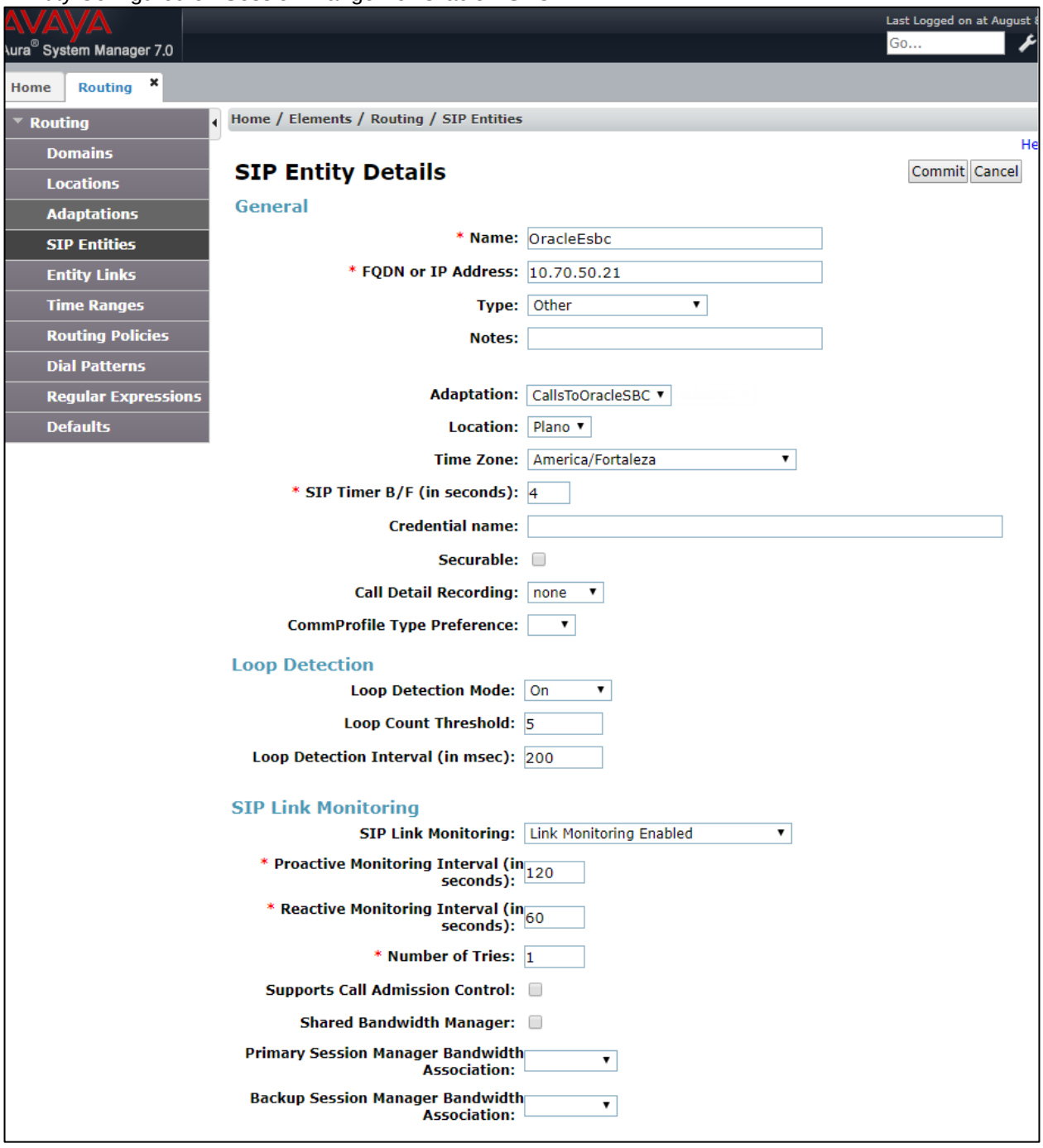


Figure 5: SIP Entity for OracleESBC

Entity Link configured on Session Manger for Oracle ESBC

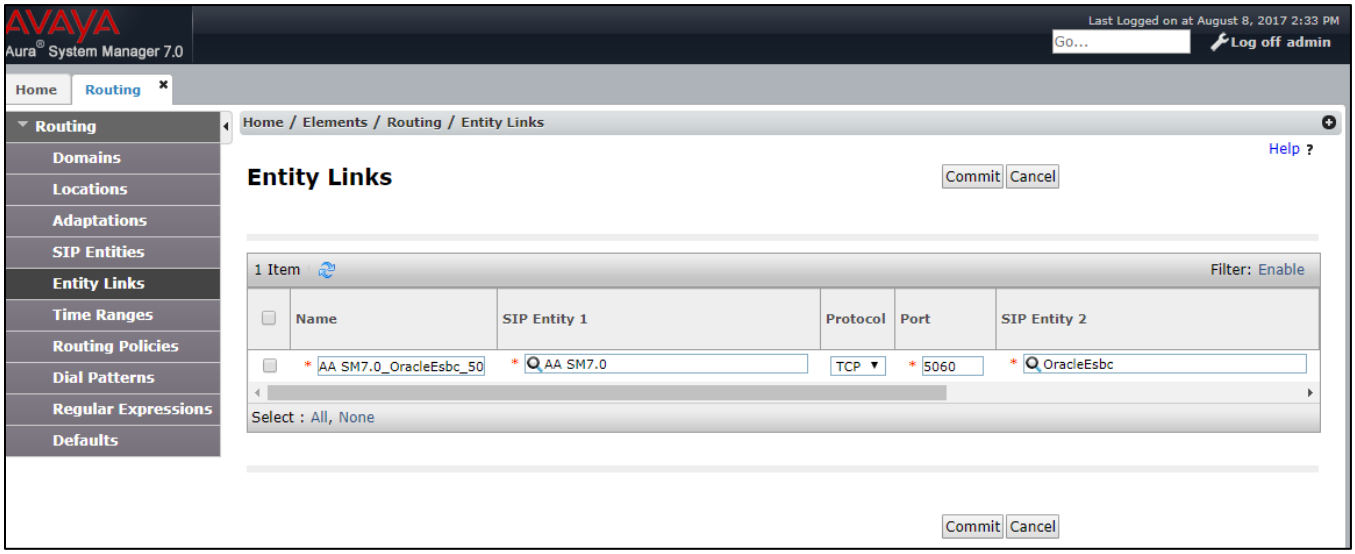


Figure 6: Entity Link to Oracle ESBC

Routing Policy

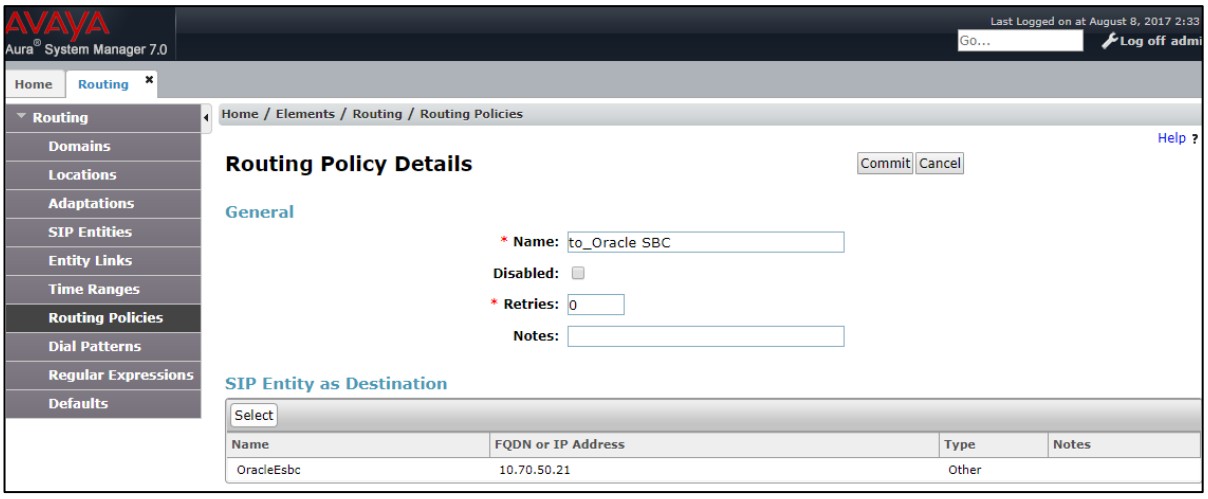


Figure 7: Routing Policy for Oracle ESBC

Dial Pattern

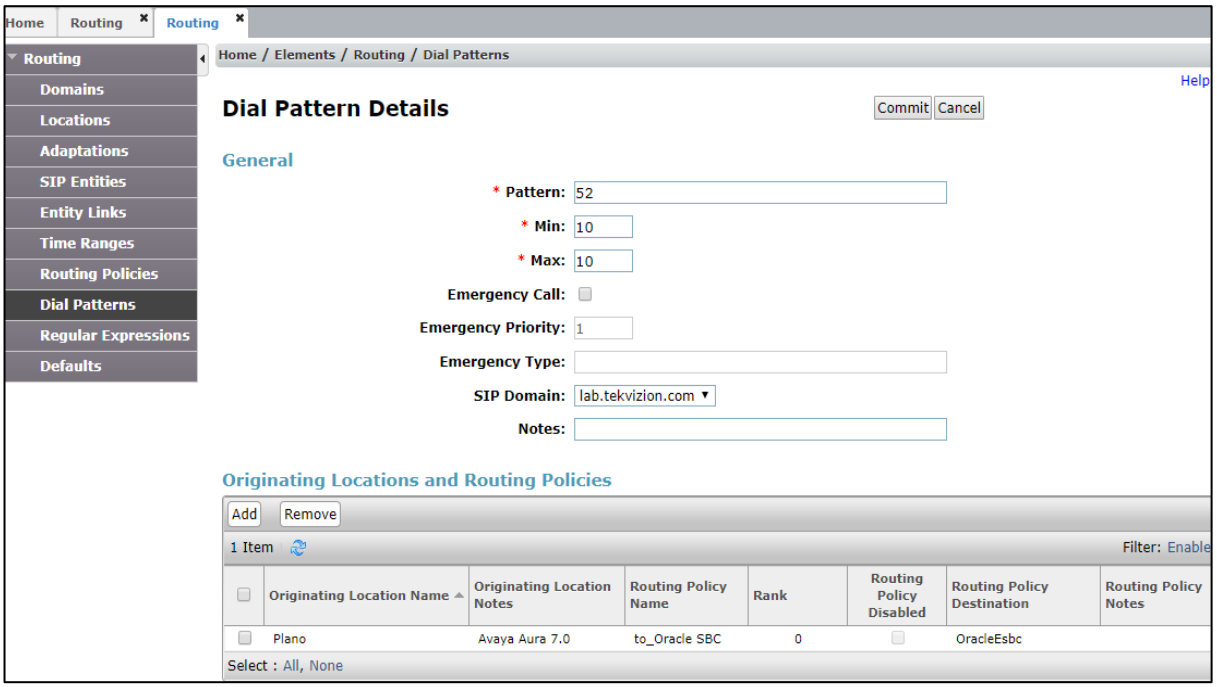


Figure 8: Dial Pattern for 10 Digit dialing

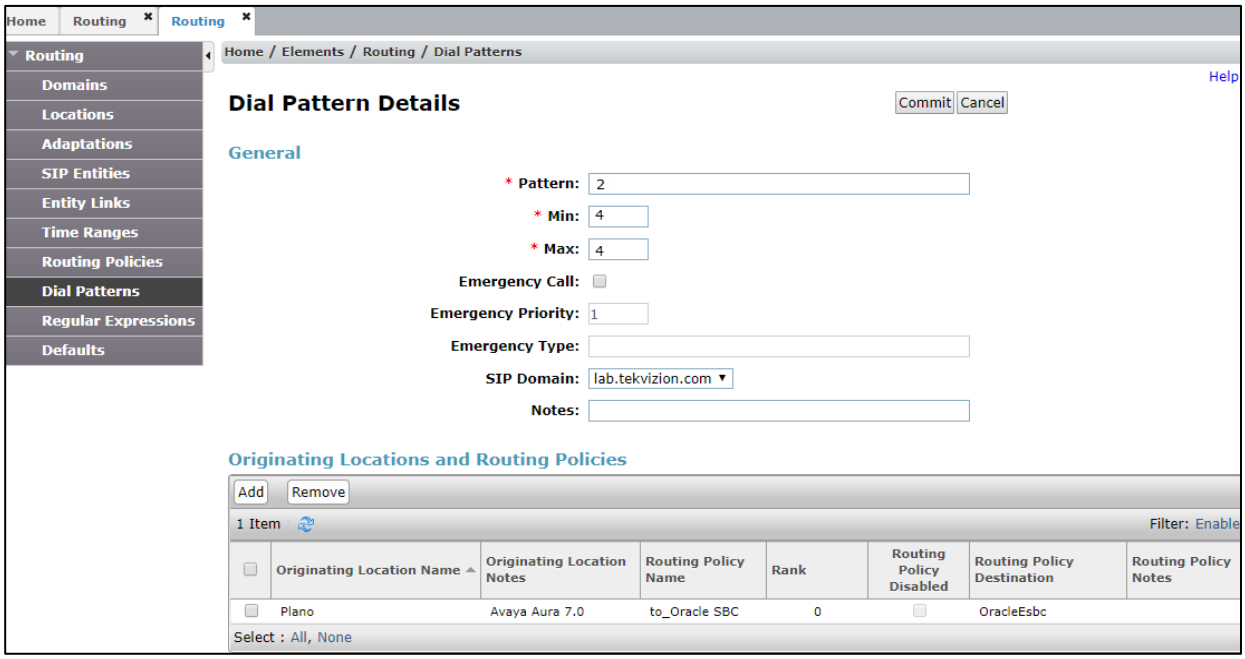
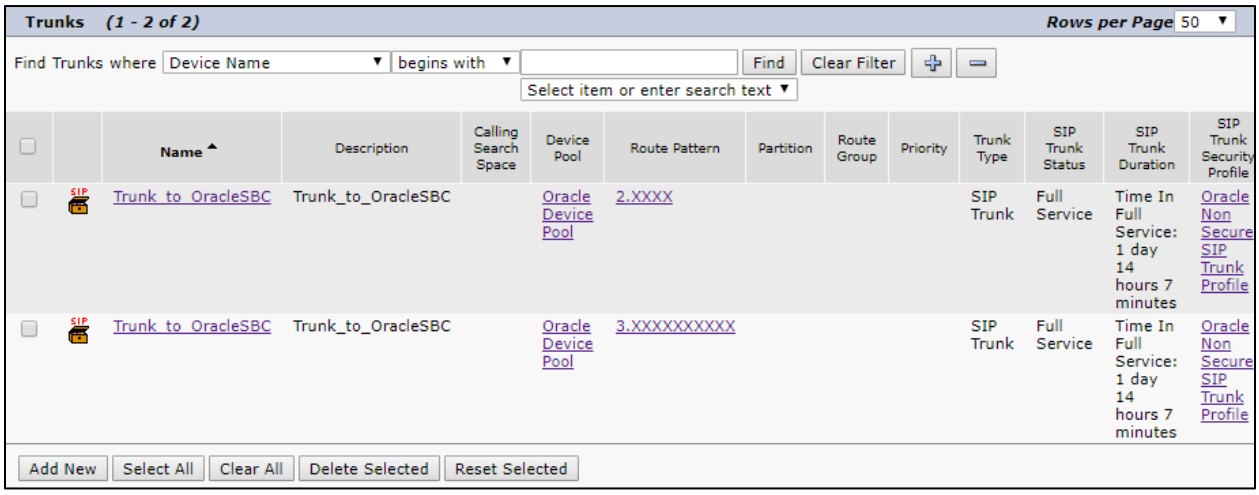


Figure 9: Dial Pattern for Extension dialing

Cisco UCM (10.70.50.22)

SIP Trunk List



Trunks (1 - 2 of 2) — Rows per Page 50

Find Trunks where Device Name | begins with | Find | Clear Filter | Select item or enter search text

	Name	Description	Calling Search Space	Device Pool	Route Pattern	Partition	Route Group	Priority	Trunk Type	SIP Trunk Status	SIP Trunk Duration	SIP Trunk Security Profile
	Trunk_to_OracleSBC	Trunk_to_OracleSBC		Oracle Device Pool	2.XXXX				SIP Trunk	Full Service	Time In Full Service: 1 day 14 hours 7 minutes	Oracle Non Secure SIP Trunk Profile
	Trunk_to_OracleSBC	Trunk_to_OracleSBC		Oracle Device Pool	3.XXXXXXXXXX				SIP Trunk	Full Service	Time In Full Service: 1 day 14 hours 7 minutes	Oracle Non Secure SIP Trunk Profile

Add New | Select All | Clear All | Delete Selected | Reset Selected

Figure 10: SIP Trunk List

SIP Trunk Configuration

SIP Trunk Status

Service Status: Full Service
Duration: Time In Full Service: 1 day 14 hours 24 minutes

Device Information

Product:	SIP Trunk
Device Protocol:	SIP
Trunk Service Type	None(Default)
Device Name*	Trunk_to_OracleSBC
Description	Trunk_to_OracleSBC
Device Pool*	Oracle Device Pool
Common Device Configuration	< None >
Call Classification*	Use System Default
Media Resource Group List	MRGL_Default
Location*	Hub_None
AAR Group	< None >
Tunneled Protocol*	None
QSIG Variant*	No Changes
ASN.1 ROSE OID Encoding*	No Changes
Packet Capture Mode*	None
Packet Capture Duration	0

Figure 11 : SIP Trunk to OracleESBC

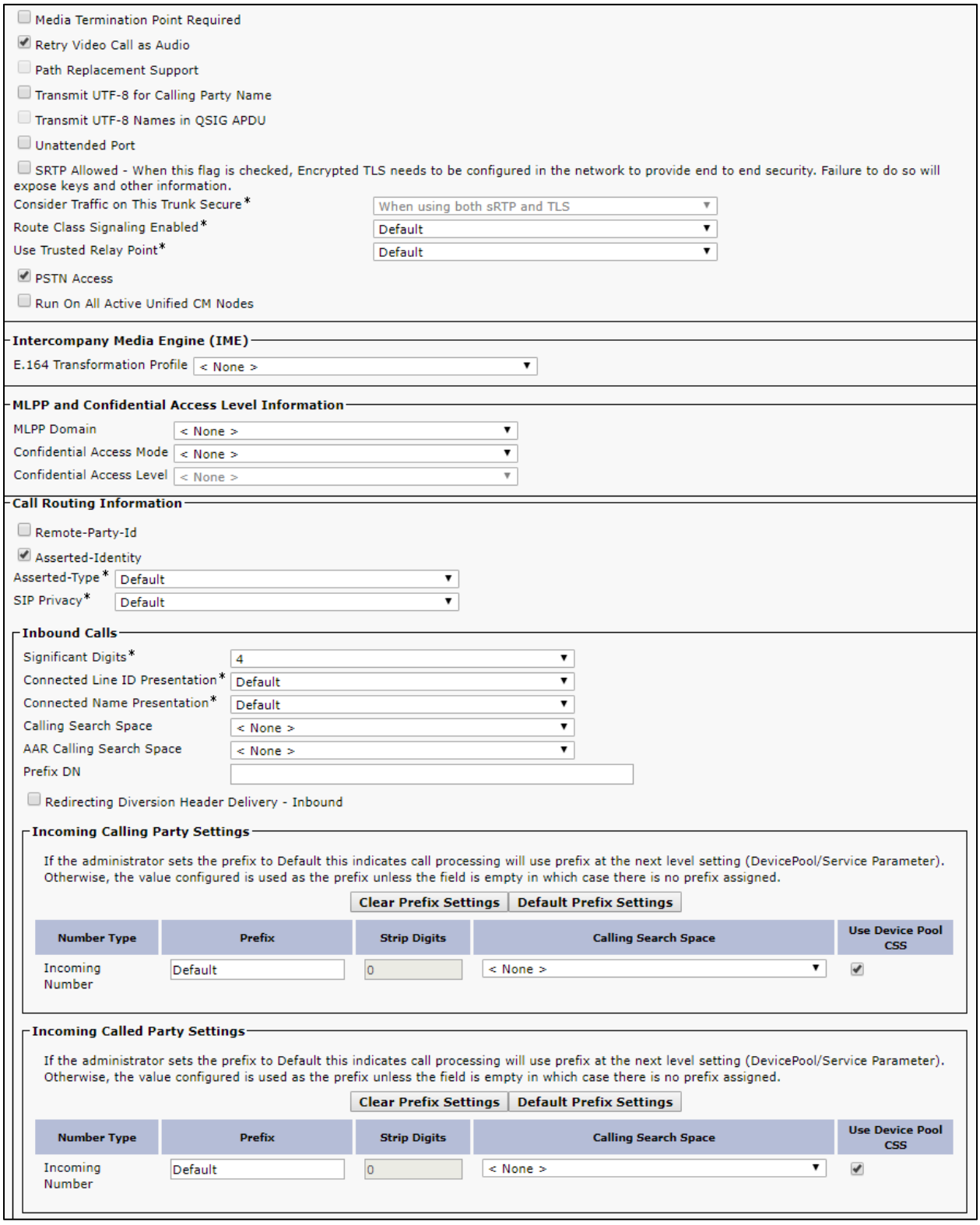


Figure 12: SIP Trunk to OracleESBC (Cont.)

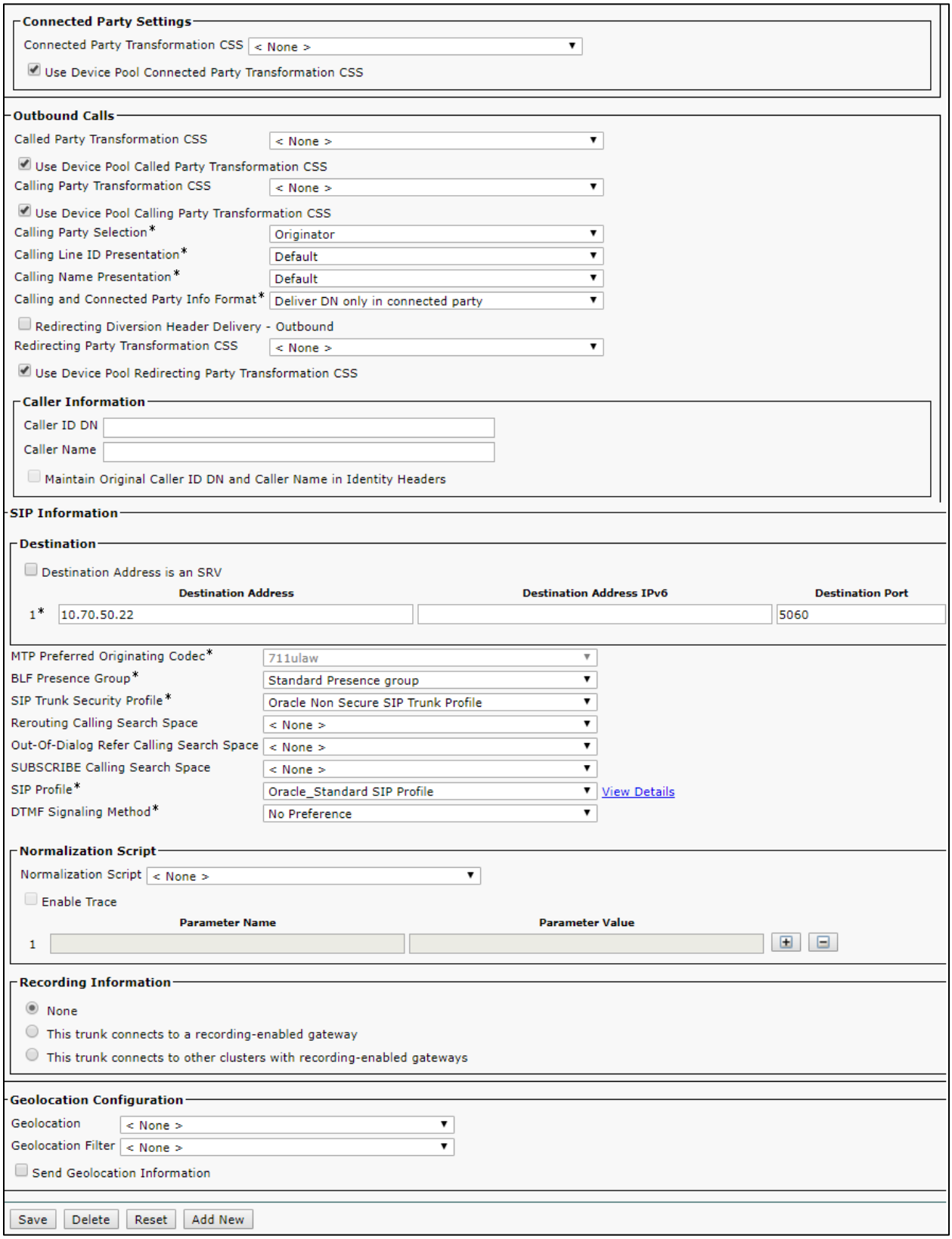


Figure 13 : SIP Trunk to OracleESBC (Cont.)

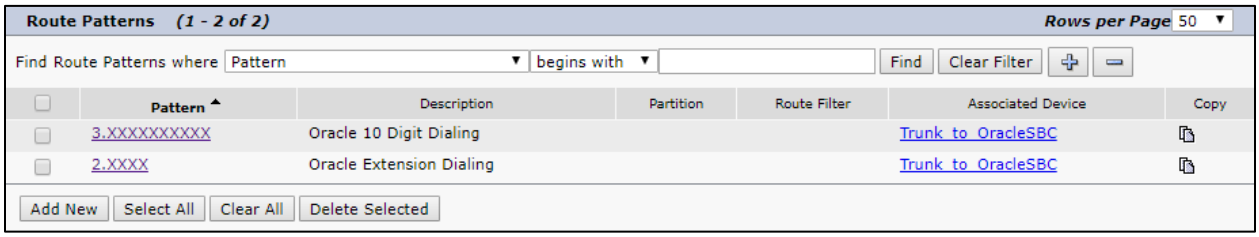


Figure 14: Route Patterns List

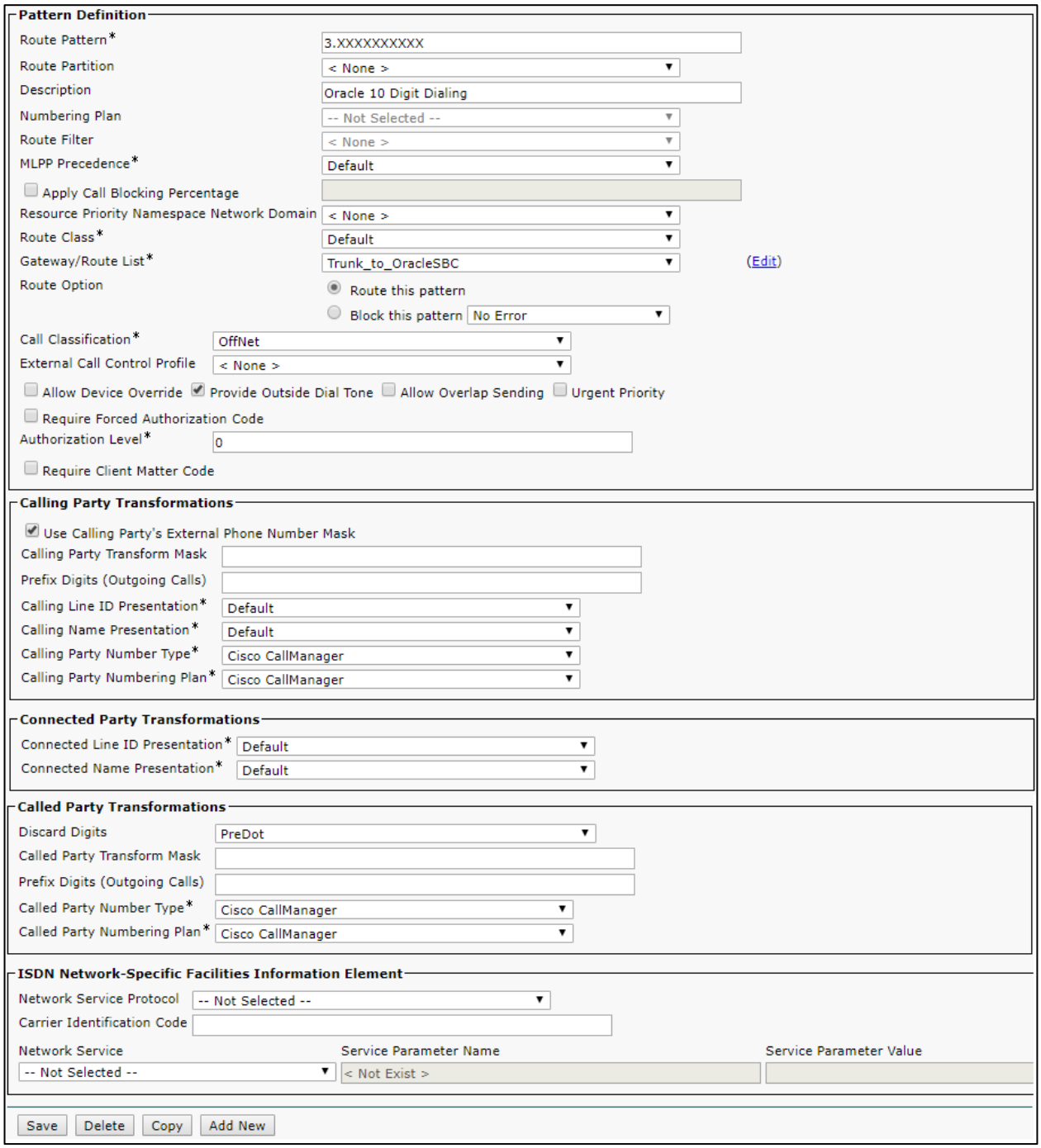


Figure 15: Route Pattern for 10 Digit Dialing

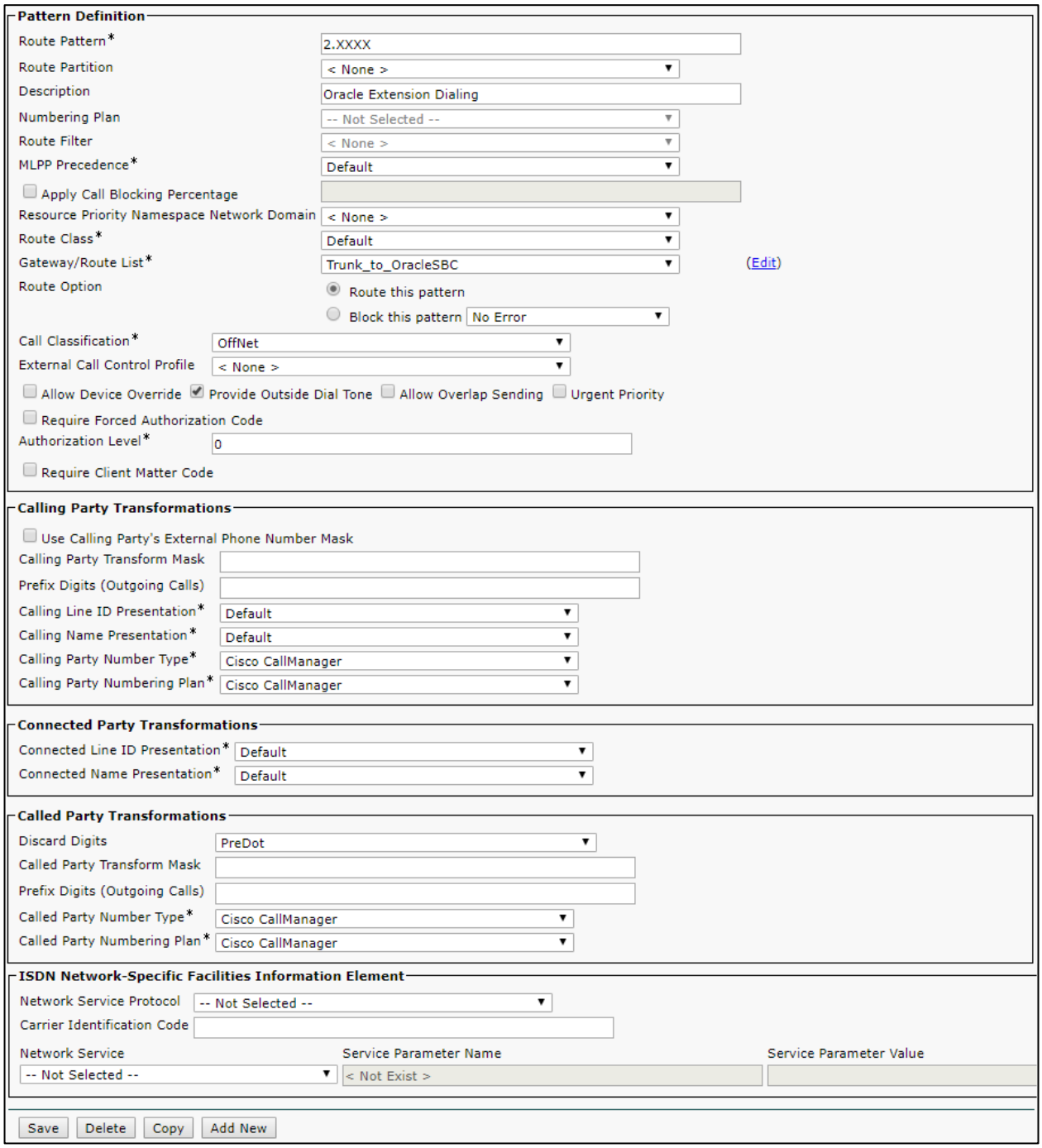


Figure 16: Route Pattern for Extension Dialing

Cloud Connecter Edition (10.64.4.149)

Cloud Connector first setup requires providing parameters such as SIP domains, IP addresses of virtual machines, configuration of REFER, and some other parameters in the INI file. The INI file is the main source of configuration information for Cloud Connector. During the install process, Cloud Connector installs the fresh set of Virtual machines and applies configuration settings from the INI file. Any parameters that are not present in INI are set to the default values.
Below is the snippet from INI file for Gateway Configuration.

```
;Parameters for gateway
;If only one Gateway is needed, remove entire [GateWay2] section. Don't keep it but leave values empty.
;If Gateway FQDN uses O365 Sip Domain in name for TLS purposes, be sure to set InternetDNSIPAddress to allow Edge to resolve these records
[Gateway1]
; Gateway FQDN
FQDN=oracle.tekvizionlabs.local
;Gateway IP address
IP=10.64.4.149
;Gateway Port
Port=5061
;Protocol for SIP traffic (TCP or TLS)
Protocol=TLS
;List of voice routes used by this gateway.
;Routes are defined in the next section.
VoiceRoutes=LocalRoute

;;;;;;;;;;;;;;;;;;; Parameters for hybrid voice routing ;;;;;;;;;;;;;;;;;;;
[HybridVoiceRoutes]
;Named voice route to be used by one or more gateways
LocalRoute=.*

;;;;;;;;;;;;;;;;;;; Parameters for TrunkConfiguration ;;;;;;;;;;;;;;;;;;;
[TrunkConfiguration]
;Whether Gateways support Refer. It is used for Call Transfer scenario.
;The value can be "true" or "false". Default value is "true".
;EnableReferSupport set to "true" means the Gateway(s) support Refer which can handle all the call transfer stuffs.
;EnableReferSupport set to "false" means the Gateway(s) don't support Refer. Then Mediation Server will handle all the call transfer stuffs.
EnableReferSupport=true

;Whether forward PAI from Mediation Server to Gateways
;The value can be "true" or "false". Default value is "true".
ForwardPAI=false
```

Test Plan & Results

Test Plan

The testing was done with varied permutations/combinations and was performed by tekVizion.

The test plan consisted of the following test cases. All tests passed.

External ID	Title	Status	Comments
Inbound / Outbound / Extension Dialing			
1	Avaya 7.0 calls Cisco UCM 11.5 via Extension	Pass	
2	Avaya 7.0 calls Cisco UCM 11.5 using 10 digit calling	Pass	
3	Avaya 7.0 calls Microsoft Lync 2013 via Extension	Pass	
4	Avaya 7.0 calls Microsoft Lync 2013 using 10 digit calling	Pass	
5	Avaya 7.0 calls Skype for Business Online using 10 digit calling	Pass	Early media is disabled at ESBC to fix the RBT issue.
6	Cisco UCM 11.5 calls Avaya 7.0 via Extension	Pass	
7	Cisco UCM 11.5 calls Avaya 7.0 using 10 digit calling	Pass	
8	Cisco UCM 11.5 calls Microsoft Lync 2013 via Extension	Pass	
9	Cisco UCM 11.5 calls Microsoft Lync 2013 using 10 digit calling	Pass	
10	Cisco UCM 11.5 calls Skype for Business Online using 10 digit calling	Pass	
11	Microsoft Lync 2013 calls Avaya 7.0 via Extension	Pass	
12	Microsoft Lync 2013 calls Avaya 7.0 using 10 digit calling	Pass	
13	Microsoft Lync 2013 calls Cisco UCM 11.5 via Extension	Pass	
14	Microsoft Lync 2013 calls Cisco UCM 11.5 using 10 digit calling	Pass	
15	Microsoft Lync 2013 calls Skype for Business Online using 10 digit calling	Pass	
16	Skype for Business Online calls Avaya 7.0 via Extension	Pass	

17	Skype for Business Online calls Avaya 7.0 using 10 digit calling	Pass	
18	Skype for Business Online calls Cisco UCM 11.5 via Extension	Pass	
19	Skype for Business Online calls Cisco UCM 11.5 using 10 digit calling	Pass	
20	Skype for Business Online calls Microsoft Lync 2013 via Extension	Pass	
21	Skype for Business Online calls Microsoft Lync 2013 using 10 digit calling	Pass	
Transfer Functionality			
Each Transfer test case is executed in the following ways: Semi-Attended & Consultative transfer, based on re-INVITE & REFER methods			
22	PSTN calls into Avaya 7.0 and transfers to Cisco 11.5 using 10 digit calling	Pass	
23	PSTN calls into Avaya 7.0 and transfers to Microsoft Lync 2013 using 10 digit calling	Pass	Executed transfer scenarios based on re-INVITE method.
24	PSTN calls into Avaya 7.0 and transfers to Cisco 11.5 via Extension	Pass	
25	PSTN calls into Avaya 7.0 and transfers to Microsoft Lync 2013 via Extension	Pass	Executed transfer scenarios based on re-INVITE method.
26	PSTN calls into Cisco UCM 11.5 and transfers to Avaya 7.0 using 10 digit calling	Pass	Executed transfer scenarios based on re-INVITE method.
27	PSTN calls into Avaya 7.0 and transfers to Skype for Business Online using 10 digit calling	Pass	Early media is disabled at ESBC to fix the RBT issue.
28	PSTN calls into Cisco UCM 11.5 and transfers to Avaya 7.0 via Extension	Pass	Same as TC 27
29	PSTN calls into Cisco UCM 11.5 and transfers to Microsoft Lync 2013 using 10 digit calling	Pass	Same as TC 27
30	PSTN calls into Cisco UCM 11.5 and transfers to Microsoft Lync 2013 via Extension	Pass	Same as TC 27

31	PSTN calls into Cisco UCM 11.5 and transfers to Skype for Business Online using 10 digit calling	Pass	Same as TC 27
32	PSTN calls into Cisco UCM 11.5 and transfers to Skype for Business Online via Extension	N/A	Inbound calls to SFB Online user with Extension is Not Applicable since SFB Online user cannot have both Tel URI and Extension configured at the same time.
33	PSTN calls into Microsoft Lync 2013 and transfers to Avaya 7.0 using 10 digit calling	Conditional Pass	Conditional Pass. Transfer functionality works fine. However, when Lync user initiates Semi-attended transfer based on REFER method, call originator (PSTN User) does not hear the Ring back Tone when the transfer is completed.*****
34	PSTN calls into Microsoft Lync 2013 and transfers to Avaya 7.0 via Extension	Conditional Pass	Same as TC 33
35	PSTN calls into Microsoft Lync 2013 and transfers to Cisco 11.5 using 10 digit calling	Conditional Pass	Same as TC 33
36	PSTN calls into Microsoft Lync 2013 and transfers to Skype for Business Online using 10 digit calling	Pass	Executed transfer scenarios based on re-INVITE method.
37	PSTN calls into Microsoft Lync 2013 and transfers to Cisco 11.5 via Extension	Conditional Pass	Same as TC 33
Call Hold / Resume			
38	Avaya 7.0 calls Cisco 11.5 via Extension and places the call on hold & reconnects	Pass	
39	Avaya 7.0 calls Skype for Business Online via Extension and places the call on hold & reconnects	Pass	This test case is executed by dialing 10 Digits of the SFB Online user, since SFB Online cannot user have 'Tel URI and Extension Configured at the same time'.
40	Avaya 7.0 calls Microsoft Lync 2013 via Extension and places the call on hold & reconnects	Pass	
41	Cisco UCM 11.5 calls Avaya 7.0 via Extension and places the call on hold & reconnects	Pass	
42	Cisco UCM 11.5 calls Microsoft Lync 2013 via Extension and places the call on hold & reconnects	Pass	
43	Cisco UCM 11.5 calls Skype for Business Online via Extension and places the call on hold & reconnects	Pass	This test case is executed by dialing 10 Digits of the SFB Online user, since SFB Online user cannot have 'Tel URI and Extension Configured at the same time'.

44	Microsoft Lync 2013 calls Avaya 7.0 via Extension and places the call on hold & reconnects	Pass	
45	Microsoft Lync 2013 calls Cisco UCM 11.5 via Extension and places the call on hold & reconnects	Pass	
46	Microsoft Lync 2013 calls Skype for Business Online via Extension and places the call on hold & reconnects	Pass	
47	Skype for Business Online calls Avaya 7.0 via Extension and places the call on hold & reconnects	Pass	
48	Skype for Business Online calls Cisco UCM 11.5 via Extension and places the call on hold & reconnects	Pass	
Serial Forking w/ LDAP Integration			
49	Avaya 7.0 calls a user (via 10 digit dial) which is configured on both Lync 2013 and SFB. Both Lync 2013 and SFB instances should ring in serially and either can be answered.	Pass	
50	Avaya 7.0 calls a user (via extension dial) which is configured on both Lync 2013 and SFB. Both Lync 2013 and SFB instances should ring in serially and either can be answered.	Pass	Extension dial for SFB Online user is NA, hence this test case is executed by converting Extension to 10 Digit DID for SFB Online user at E-SBC.
51	Cisco UCM 11.5 calls a user (via 10 digit dial) which is configured on both Lync 2013 and SFB. Both Lync 2013 and SFB instances should ring in serially and either can be answered.	Pass	
52	Cisco UCM 11.5 calls a user (via extension dial) which is configured on both Lync 2013 and SFB. Both Lync 2013 5 and SFB instances should ring in serially and either can be answered.	Pass	Extension dial for SFB Online user is NA, hence this test case is executed by converting Extension to 10 Digit DID for SFB Online user at E-SBC.
CCE Specific Test Cases			

53	Call forward always from online user to PSTN	Pass	Executed this test case by originating the call form Cisco UCM
54	Call forward always from online user to early media number	Pass	
55	Call Forward no answer from Online user to PSTN	Pass	
56	Call Forward no answer from Online user to Voicemail	Pass	
57	Simultaneous ring setup with Online user with another Online user	Pass	
58	Simultaneous ring setup on Online with PSTN	Pass	
59	Call from CCE user Early Media IVR number and test DTMF before 200 OK	Pass	
60	Call from CCE user to toll free number and test DTMF	Pass	
61	Anonymous call from Online user to PSTN	Pass	

Appendix A

Full SBC configuration

```
show running-config short
certificate-record
        name                                    LyncMed
        state                                   TX
        locality                                Plano
        common-name                             medserver1.lynclabsram.local
        digest-algor                            sha1
certificate-record
        name                                    LyncRoot
        state                                   TX
        locality                                Plano
        common-name                             lynclabsram-DC-CA
        digest-algor                            sha1
certificate-record
        name                                    SBCCCE2
        state                                   TX
        locality                                Plano
        common-name                             oracle.tekvizionlabs.local
        digest-algor                            sha1
certificate-record
        name                                    SBCCert
        state                                   TX
        locality                                Plano
        common-name                             oracle.tekvizionlabs.local
        digest-algor                            sha1
certificate-record
        name                                    SBCCertCCE
        state                                   TX
        locality                                Plano
        common-name                             oracle.tekvizionlabs.local
        digest-algor                            sha1
certificate-record
        name                                    cceRoot
        state                                   TX
        locality                                Plano
        common-name                             SfB CCE Root
        digest-algor                            sha1
certificate-record
        name                                    newCCERoot
        state                                   TX
        locality                                Plano
        common-name                             SfB CCE Root
        digest-algor                            sha1
certificate-record
        name                                    rootcert
        state                                   TX
        locality                                Plano
        common-name                             lynclabsram-DC-CA
        digest-algor                            sha1
codec-policy
        name                                    G711Only
        allow-codecs                            * G729:no
```

```
        add-codecs-on-egress                    PCMU PCMA telephone-event
codec-policy
        name                                    G729only
        allow-codecs                            * PCMA:no PCMU:no
        add-codecs-on-egress                    G729
codec-policy
        name                                    Xcode
        allow-codecs                            *
        add-codecs-on-egress                    CN
codec-policy
        name                                    toSFB
        allow-codecs                            *
        add-codecs-on-egress                    CN
filter-config
        name                                    all
host-route
        dest-network                            155.212.214.199
        netmask                                 255.255.255.0
        gateway                                 192.65.79.97
ldap-config
        name                                    ldapCfg
        ldap-servers                            172.16.31.91:389
        realm                                   inside
        username                                administrator@lynclabsram.local
        password                                ********
        ldap-search-base                        CN=Users,DC=lynclabsram,DC=local
        ldap-transactions
                route-mode                              attribute-order-only
                ldap-cfg-attributes
                        name                                    msRTCSIP-Line
                        next-hop                                med1.lynclabsram.local
                        realm                                   inside
                        extraction-regex                        (.*)
                        value-format                            tel:$0
                ldap-cfg-attributes
                        name                                    telephoneNumber
                        next-hop
mediationserver.tekvizionlabs.local
                        realm                                   outside
                        extraction-regex                        (.*)
                        value-format                            tel:$0
local-policy
        from-address                            *
        to-address                              25
                                                52600025
        source-realm                            *
        policy-attribute
                next-hop                                10.89.17.7
                realm                                   AvayaRealm
local-policy
        from-address                            *
        to-address                              26
                                                52700026
        source-realm                            *
        policy-attribute
                next-hop                                10.80.18.3
```

```
                realm                                   CUCMRealm
local-policy
        from-address                            *
        to-address                              27
                                                52800027
        source-realm                            *
        policy-attribute
                next-hop                                med1.lynclabsram.local
                realm                                   inside
local-policy
        from-address                            *
        to-address                              28
                                                52900028
        source-realm                            *
        policy-attribute
                next-hop                                mediationserver.tekvizionlabs.local
                realm                                   outside
local-policy
        from-address                            *
        to-address                              *
        source-realm                            AvayaRealm
                                                CUCMRealm
                                                inside
        state                                   disabled
        policy-attribute
                next-hop                                10.64.4.59
                realm                                   outside
local-policy
        from-address                            *
        to-address                              2142425
                                                800
                                                9725
        source-realm                            *
        description                             topstn
        policy-attribute
                next-hop                                10.64.1.72
                realm                                   PSTN
local-policy
        from-address                            *
        to-address                              2432
                                                2601
                                                5270002601
        source-realm                            *
        policy-attribute
                next-hop                                ldap:ldapCfg
                realm                                   inside
local-policy
        from-address                            *
        to-address                              med1.lynclabsram.local
        source-realm                            *
        policy-attribute
                next-hop                                med1.lynclabsram.local
                realm                                   inside
local-policy
        from-address                            *
        to-address                              mediationserver.tekvizionlabs.local
```

```
        source-realm                    *
        policy-attribute
                next-hop                        mediationserver.tekvizionlabs.local
                realm                           outside
local-policy
        from-address                    *
        to-address                      9876543210
        source-realm                    *
        policy-attribute
                next-hop                        172.16.29.71
                realm                           toSFB
local-policy
        from-address                    *
        to-address                      *
        source-realm                    outside
        policy-attribute
                next-hop                        med1.lynclabsram.local
                realm                           inside
                methods                         OPTIONS
media-manager
        initial-guard-timer             86400
        options                         xcode-gratuitous-rtcp-report-generation
media-sec-policy
        name                            RTP
media-sec-policy
        name                            SRTP
        inbound
                profile                         SRTP
                mode                            srtp
                protocol                        sdes
        outbound
                profile                         SRTP
                mode                            srtp
                protocol                        sdes
network-interface
        name                            s0p0
        description                     WAN
        ip-address                      10.64.4.149
        netmask                         255.255.0.0
        gateway                         10.64.1.1
        gw-heartbeat
                state                           enabled
        dns-ip-primary                  10.64.4.61
        dns-domain                      tekvizionlabs.local
        hip-ip-list                     10.64.4.149
                                        10.64.4.145
                                        10.64.4.147
        icmp-address                    10.64.4.149
                                        10.64.4.145
                                        10.64.4.147
network-interface
        name                            s0p1
        description                     LAN
        ip-address                      10.70.50.20
        netmask                         255.255.255.0
        gateway                         10.70.50.1
```

```
        dns-ip-primary                  172.16.31.91
        dns-domain                      lynclabsram.local
        hip-ip-list                     10.70.50.20
                                        10.70.50.21
                                        10.70.50.22
                                        10.70.50.23
        icmp-address                    10.70.50.20
                                        10.70.50.21
                                        10.70.50.22
                                        10.70.50.23
phy-interface
        name                            s0p0
        operation-type                  Media
phy-interface
        name                            s0p1
        operation-type                  Media
        port                            1
playback-config
        name                            transferrbt
        entry
                encoding                        PCMU
                filename                        US_ringbackPCMU.raw
realm-config
        identifier                      AvayaRealm
        network-interfaces              s0p1:0
        media-sec-policy                RTP
        early-media-allow               none
        codec-policy                    Xcode
        rtcp-policy                     rtcpGen
realm-config
        identifier                      CUCMRealm
        network-interfaces              s0p1:0
        media-sec-policy                RTP
        codec-policy                    G729only
        codec-manip-in-realm            enabled
        rtcp-policy                     rtcpGen
realm-config
        identifier                      PSTN
        network-interfaces              s0p0:0
        media-sec-policy                RTP
        codec-policy                    G711Only
        rtcp-policy                     rtcpGen
realm-config
        identifier                      inside
        network-interfaces              s0p1:0
        media-sec-policy                RTP
        spl-options                     comfort-noise-generate
        codec-policy                    G711Only
        rtcp-policy                     rtcpGen
realm-config
        identifier                      outside
        network-interfaces              s0p0:0
        media-sec-policy                SRTP
        spl-options                     comfort-noise-generate
        codec-policy                    G711Only
        rtcp-policy                     rtcpGen
```

```
realm-config
        identifier                              outside-rtp
        network-interfaces                      s0p0:0
realm-config
        identifier                              toSFB
        network-interfaces                      s0p1:0
        media-sec-policy                        RTP
        codec-policy                            Xcode
        rtcp-policy                             rtcpGen
response-map
        name                                    change183to180
        entries
                recv-code                               183
                xmit-code                               180
                reason                                  Ringing
rtcp-policy
        name                                    rtcpGen
        rtcp-generate                           all-calls
sdes-profile
        name                                    SRTP
        use-ingress-session-params              srtcp-encrypt
session-agent
        hostname                                10.64.1.72
        ip-address                              10.64.1.72
        transport-method                        StaticTCP
        realm-id                                PSTN
        description                             PSTN
        ping-method                             OPTIONS;hops=0
        ping-interval                           30
session-agent
        hostname                                10.80.18.3
        ip-address                              10.80.18.3
        transport-method                        StaticTCP
        realm-id                                CUCMRealm
        description                             CUCM
        ping-method                             OPTIONS;hops=0
        ping-interval                           30
session-agent
        hostname                                10.89.17.7
        ip-address                              10.89.17.7
        transport-method                        StaticTCP
        realm-id                                AvayaRealm
        description                             Avaya
        ping-method                             OPTIONS;hops=0
        ping-interval                           30
session-agent
        hostname                                172.16.29.71
        ip-address                              172.16.29.71
        transport-method                        StaticTCP
        realm-id                                toSFB
        ping-method                             OPTIONS
        ping-interval                           30
session-agent
        hostname                                med1.lynclabsram.local
        ip-address                              172.16.31.97
        port                                    5067
```

```
        transport-method                        StaticTLS
        realm-id                                inside
        ping-method                             OPTIONS;hops=0
        ping-interval                           30
        refer-call-transfer                     enabled
session-agent
        hostname                                mediationserver.tekvizionlabs.local
        ip-address                              10.64.4.59
        port                                    5067
        transport-method                        StaticTLS
        realm-id                                outside
        ping-method                             OPTIONS;hops=0
        ping-interval                           30
        in-translationid                        delplus1
        refer-call-transfer                     enabled
session-translation
        id                                      addPlus
        rules-calling                           addPlus1
        rules-called                            addPlus1
session-translation
        id                                      delplus1
        rules-calling                           delPlus1
        rules-called                            delPlus1
sip-config
        home-realm-id                           inside
        registrar-domain                        *
        registrar-host                          *
        registrar-port                          5060
        options                                 max-udp-length=0
sip-interface
        realm-id                                AvayaRealm
        sip-port
                address                                 10.70.50.21
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        out-manipulationid                      NAT_IP_Avaya
        response-map                            change183to180
sip-interface
        realm-id                                CUCMRealm
        sip-port
                address                                 10.70.50.22
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        secured-network                         enabled
        out-manipulationid                      NAT_IP
sip-interface
        realm-id                                PSTN
        sip-port
                address                                 10.64.4.145
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        spl-options                             playback-on-refer="transferrbt"
        out-manipulationid                      NAT_IP
sip-interface
        realm-id                                inside
        sip-port
```

```
                address                                 10.70.50.20
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        sip-port
                address                                 10.70.50.20
                port                                    5061
                transport-protocol                      TLS
                tls-profile                             LyncTLS
                allow-anonymous                         agents-only
        secured-network                         enabled
        spl-options                             playback-on-refer="transferrbt"
        in-manipulationid                       Stripsdp183
        out-manipulationid                      NatIpLync
sip-interface
        realm-id                                outside
        sip-port
                address                                 10.64.4.149
                transport-protocol                      TCP
                allow-anonymous                         agents-only
        sip-port
                address                                 10.64.4.149
                port                                    5061
                transport-protocol                      TLS
                tls-profile                             CCETLS
                allow-anonymous                         agents-only
        in-manipulationid                       Stripsdp183
        out-manipulationid                      NatIpCce
sip-interface
        realm-id                                outside-rtp
        sip-port
                address                                 10.64.4.147
                transport-protocol                      TCP
sip-interface
        realm-id                                toSFB
        sip-port
                address                                 10.70.50.23
                transport-protocol                      TCP
                allow-anonymous                         agents-only
sip-manipulation
        name                                    Changeinactosendonly
        description                             Change inactive to sendonly for pstn tran
        header-rule
                name                                    changeSDP
                header-name                             Content-Type
                action                                  manipulate
                msg-type                                request
                methods                                 INVITE
                element-rule
                        name                                    inacttosendonly
                        parameter-name                          application/sdp
                        type                                    mime
                        action                                  find-replace-all
                        comparison-type                         pattern-rule
                        match-value                             a=inactive
                        new-value                               a=sendonly
sip-manipulation
```

```
        name                                    NAT_IP
        header-rule
                name                                    From
                header-name                             From
                action                                  manipulate
                msg-type                                request
                element-rule
                        name                                    fromEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    To
                header-name                             To
                action                                  manipulate
                msg-type                                request
                element-rule
                        name                                    ToEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $REMOTE_IP
        header-rule
                name                                    RequestURI
                header-name                             request-uri
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    ruriEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $REMOTE_IP
        header-rule
                name                                    alterPAI
                header-name                             P-Asserted-Identity
                action                                  manipulate
                element-rule
                        name                                    alterPAIEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $LOCAL_IP
        header-rule
                name                                    msSource
                header-name                             ms-call-source
                action                                  delete
                methods                                 INVITE
sip-manipulation
        name                                    NAT_IP_Avaya
        header-rule
                name                                    From
                header-name                             From
                action                                  manipulate
                msg-type                                request
                element-rule
                        name                                    fromEr
                        type                                    uri-host
                        action                                  find-replace-all
```

```
                        new-value                               oracle.tekvizionlabs.local
                element-rule
                        name                                    store_user
                        type                                    uri-user
                        action                                  store
        header-rule
                name                                    To
                header-name                             To
                action                                  manipulate
                msg-type                                request
                element-rule
                        name                                    ToEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $REMOTE_IP
        header-rule
                name                                    RequestURI
                header-name                             request-uri
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    ruriEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $REMOTE_IP
        header-rule
                name                                    delPAI
                header-name                             P-Asserted-Identity
                action                                  delete
                msg-type                                request
                methods                                 INVITE
        header-rule
                name                                    msSource
                header-name                             ms-call-source
                action                                  delete
                methods                                 INVITE
        header-rule
                name                                    createPAI
                header-name                             Contact
                action                                  manipulate
                msg-type                                request
                methods                                 INVITE
                match-value
                element-rule
                        name                                    updateContact
                        type                                    uri-user
                        action                                  find-replace-all
                        new-value                               $From.$store_user.$0
        header-rule
                name                                    storeContact
                header-name                             Contact
                action                                  store
                comparison-type                         pattern-rule
                msg-type                                request
                methods                                 INVITE
        header-rule
```

```
                name                                    addPAI
                header-name                             P-Asserted-Identity
                action                                  add
                comparison-type                         boolean
                msg-type                                request
                methods                                 INVITE
                match-value                             $delPAI
                new-value                               $storeContact.$0
sip-manipulation
        name                                    NatIpCce
        header-rule
                name                                    From
                header-name                             From
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    fromEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    To
                header-name                             To
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    ToEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value
mediationserver.tekvizionlabs.local
        header-rule
                name                                    RequestURI
                header-name                             request-uri
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    ruriEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value
mediationserver.tekvizionlabs.local
        header-rule
                name                                    alterPAI
                header-name                             P-Asserted-Identity
                action                                  manipulate
                element-rule
                        name                                    alterPAIEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               $LOCAL_IP
        header-rule
                name                                    Contact
                header-name                             Contact
                action                                  manipulate
                methods                                 INVITE
```

```
                element-rule
                        name                                    contactEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    AddPlus1
                header-name                             referred-by
                action                                  manipulate
                element-rule
                        name                                    addplus1
                        type                                    uri-user
                        action                                  find-replace-all
                        new-value                               "+1"+$ORIGINAL
        header-rule
                name                                    alterreferby
                header-name                             From
                action                                  sip-manip
                msg-type                                request
                new-value                               alterreferby
        header-rule
                name                                    removePC
                header-name                             From
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    removePCEr
                        parameter-name                          phone-context
                        type                                    uri-user-param
                        action                                  delete-element
        header-rule
                name                                    from_user
                header-name                             from
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    fromEr
                        type                                    uri-user
                        action                                  find-replace-all
                        match-value                             ^(\d{10})
                        new-value                               "+1"+$ORIGINAL
        header-rule
                name                                    Plus1RURI
                header-name                             Request-URI
                action                                  manipulate
                element-rule
                        name                                    PlusRURIEr
                        type                                    uri-user
                        action                                  find-replace-all
                        match-value                             ^(\d{10})
                        new-value                               "+1"+$ORIGINAL
                element-rule
                        name                                    PlusRURI_store
                        type                                    uri-user
                        action                                  store
        header-rule
```

```
                name                                    Plus1To
                header-name                             To
                action                                  manipulate
                element-rule
                        name                                    PlusToEr
                        type                                    uri-user
                        action                                  find-replace-all
                        match-value                             ^(\d{10})
                        new-value                               "+1"+$ORIGINAL
                element-rule
                        name                                    copyRURI
                        type                                    uri-user
                        action                                  find-replace-all
                        match-value                             ^(\d{4})
                        new-value
$Plus1RURI.$PlusRURI_store.$0
sip-manipulation
        name                                    NatIpLync
        header-rule
                name                                    from
                header-name                             From
                action                                  sip-manip
                new-value                               NAT_IP
        header-rule
                name                                    alterPAI
                header-name                             P-Asserted-Identity
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    alterPAIEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    alterContact
                header-name                             Contact
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    alterContactEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
        header-rule
                name                                    To
                header-name                             To
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    toEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               med1.lynclabsram.local
        header-rule
                name                                    ruri
                header-name                             request-uri
```

```
                action                                  manipulate
                methods                                 INVITE
                element-rule
                        name                                    ruriEr
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               med1.lynclabsram.local
        header-rule
                name                                    alterReferredBy
                header-name                             Referred-By
                action                                  manipulate
                msg-type                                request
                methods                                 INVITE
                element-rule
                        name                                    alterRB
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
sip-manipulation
        name                                    Stripsdp183
        description                             For incoming 183 from Lync, strip SDP
        header-rule
                name                                    check183
                header-name                             @status-line
                action                                  store
                comparison-type                         pattern-rule
                element-rule
                        name                                    is183
                        type                                    status-code
                        action                                  store
                        comparison-type                         pattern-rule
                        match-value                             183
        header-rule
                name                                    delSDP
                header-name                             Content-Type
                action                                  manipulate
                comparison-type                         case-insensitive
                match-value                             $check183.$is183
                element-rule
                        name                                    del183SDP
                        parameter-name                          application/sdp
                        type                                    mime
                        action                                  delete-element
                        comparison-type                         boolean
        header-rule
                name                                    delContentType
                header-name                             Content-Type
                action                                  manipulate
                comparison-type                         boolean
                match-value                             $check183.$is183
                element-rule
                        name                                    delCT
                        parameter-name                          *
                        type                                    header-param
                        action                                  delete-header
        header-rule
```

```
                name                                    inactosendonly
                header-name                             From
                action                                  sip-manip
                msg-type                                request
                new-value                               Changeinactosendonly
sip-manipulation
        name                                    alter4xxOPTIONS
        header-rule
                name                                    alterRURI
                header-name                             Request-URI
                action                                  manipulate
                msg-type                                reply
                methods                                 OPTIONS
                element-rule
                        name                                    alterRURI_statusCode
                        type                                    status-code
                        action                                  find-replace-all
                        match-value                             483 || 404
                        new-value                               200
                element-rule
                        name                                    alterRURI_ReasonPhrase
                        type                                    reason-phrase
                        action                                  find-replace-all
                        match-value                             Too Many Hops || Not Found
                        new-value                               OK
sip-manipulation
        name                                    delReqNatIp
        header-rule
                name                                    delRequire
                header-name                             Require
                action                                  delete
                msg-type                                reply
                methods                                 INVITE
        header-rule
                name                                    nat
                header-name                             From
                action                                  sip-manip
                new-value                               NAT_IP
sip-manipulation
        name                                    alterreferby
        header-rule
                name                                    checkReferBy
                header-name                             REFERRED-BY
                action                                  manipulate
                element-rule
                        name                                    checkReferBy
                        type                                    uri-host
                        action                                  find-replace-all
                        new-value                               oracle.tekvizionlabs.local
sip-manipulation
        name                                    stripRR
        join-headers                            Record-Route
        header-rule
                name                                    delRR
                header-name                             Record-Route
                action                                  delete
```

```
sip-monitoring
        match-any-filter                        enabled
        monitoring-filters                      all
steering-pool
        ip-address                              10.64.4.145
        start-port                              49600
        end-port                                65535
        realm-id                                PSTN
steering-pool
        ip-address                              10.64.4.147
        start-port                              49600
        end-port                                65535
        realm-id                                outside-rtp
steering-pool
        ip-address                              10.64.4.149
        start-port                              49600
        end-port                                65535
        realm-id                                outside
steering-pool
        ip-address                              10.70.50.20
        start-port                              49562
        end-port                                65535
        realm-id                                inside
steering-pool
        ip-address                              10.70.50.21
        start-port                              49600
        end-port                                65535
        realm-id                                AvayaRealm
steering-pool
        ip-address                              10.70.50.22
        start-port                              49600
        end-port                                65535
        realm-id                                CUCMRealm
steering-pool
        ip-address                              10.70.50.23
        start-port                              49562
        end-port                                65535
        realm-id                                toSFB
system-config
        process-log-level                       DEBUG
        default-gateway                         192.65.79.97
tls-global
        session-caching                         enabled
tls-profile
        name                                    CCETLS
        end-entity-certificate                  SBCCCE2
        trusted-ca-certificates                 newCCERoot
        mutual-authenticate                     enabled
        tls-version                             tlsv12
tls-profile
        name                                    LyncTLS
        end-entity-certificate                  SBCCert
        trusted-ca-certificates                 rootcert
                                                LyncRoot
        mutual-authenticate                     enabled
        tls-version                             tlsv1
```

```
translation-rules
        id                                      addPlus1
        type                                    add
        add-string                              +1
translation-rules
        id                                      delPlus1
        type                                    delete
        delete-string                           +1
web-server-config
office365#
```

Troubleshooting Tools

If you find that you are not able to complete calls or have problems with the test cases, there are a few tools available for Windows Server, Lync/SFB Server, and the Oracle ECB and SBC like logging and tracing which may be of assistance. In this section we will provide a list of tools which you can use to aid in troubleshooting any issues you may encounter.

Microsoft Network Monitor (NetMon)

NetMon is a network protocol analyzer which is freely downloadable from Microsoft. It can be found at www.microsoft.com/downloads. NetMon could be installed on the Lync Server mediation server, the Lync Server Standard Edition server, or Enterprise Edition front end server.

Wireshark

Wireshark is also a network protocol analyzer which is freely downloadable from www.wireshark.org. Wireshark could be installed on the Lync/SFB Server mediation server, the Lync/SFB Server Standard Edition server, or MCS Enterprise Edition front end server.

Eventviewer

There are several locations in the event viewer where you can find valuable information to aid in troubleshooting issues with your deployment.

With the requirement that there is a completely functioning Lync and/or SFB Server with Enterprise Voice deployment in place, there are only a few areas in which one would use the Event Viewer for troubleshooting:

- The Enterprise Voice client;
- The Lync/SFB Server Front End server;
- A Lync/SFB Server Standard Edition Server; and
- A Lync/SFB Server Mediation Server.

On the Oracle ECB and E-SBC

The Oracle SBC and ECB provide a rich set of statistical counters available from the CLI, as well as log file output with configurable detail. The follow sections detail enabling, adjusting and accessing those interfaces.

Resetting the statistical counters, enabling logging and restarting the log files.

At the console:

```
oraclesbc1# reset sipd
oraclesbc1# notify sipd debug
oraclesbc1#
enabled SIP Debugging
oraclesbc1# notify all rotate-logs
```

Examining the log files

Note: You will FTP to the management interface of the ECB or SBC with the username user and user mode password (the default is "**acme**").

```
C:\Documents and Settings\user>ftp 192.168.5.24
Connected to 192.168.85.55.
220 oraclesbc1FTP server (VxWorks 6.4) ready.
```

```
User (192.168.85.55:(none)): user
331 Password required for user.
Password: acme
230 User user logged in.
ftp> cd /ramdrv/logs
250 CWD command successful.
ftp> get sipmsg.log
200 PORT command successful.
150 Opening ASCII mode data connection for '/ramdrv/logs/sipmsg.log' (3353
bytes).
226 Transfer complete.
ftp: 3447 bytes received in 0.00Seconds 3447000.00Kbytes/sec.
ftp> get log.sipd
200 PORT command successful.
150 Opening ASCII mode data connection for '/ramdrv/logs/log.sipd' (204681
bytes).
226 Transfer complete.
ftp: 206823 bytes received in 0.11Seconds 1897.46Kbytes/sec.
ftp> bye
221 Goodbye.
```

You may now examine the log files with the text editor of your choice.

Through the Web GUI

You can also check the display results of filtered SIP session data from the Oracle E-SBC and ECB, and provide traces in a common log format for local viewing or for exporting to your PC. Please check the "Monitor and Trace SIP Messages" section (page 140) of the E-SBC Web GUI User Guide available at http://docs.oracle.com/cd/E56581_01/index.htm. For the ECB, see the "Monitor and Trace" section (page 95) of the User's Guide available at http://docs.oracle.com/cd/E55725_01/index.htm.

Telnet

Since we are working within an architecture which uses bound TCP listening ports for functionality, the simplest form of troubleshooting can be seeing if the devices are listening on a particular port, as well as confirming that the there is nothing blocking them such as firewalls. Ensure that you have a TELNET client available on a workstation.

All devices tested in this document will listen on TCP port 5060 for SIP signaling. In our example we are listening on 5060 on the PSTN facing NIC. Tests may include:

- Client to pool server: **`telnet <servername> 5060`**
- Pool server to Mediation Server: **`telnet <servername> 5060`**

Cisco Real-Time Monitoring Tool (RTMT)

The Cisco Real-Time Monitoring Tool (RTMT) is a tool that can be downloaded from CUCM to a Windows or Linux computer. See https://supportforums.cisco.com/document/93281/using-rtmt-monitor-cisco-unity-connection-and-cucm for details.

Appendix B

Accessing the ACLI

Access to the ACLI is provided by:

- The serial console connection;
- TELNET, which is enabled by default but may be disabled; and
- SSH.

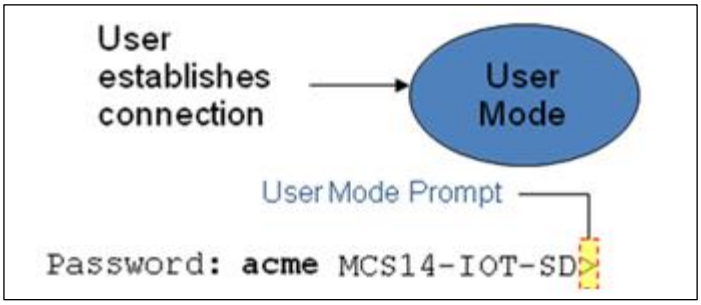
Initial connectivity will be through the serial console port. At a minimum, this is how to configure the management (eth0) interface on the SBC.

ACLI Basics

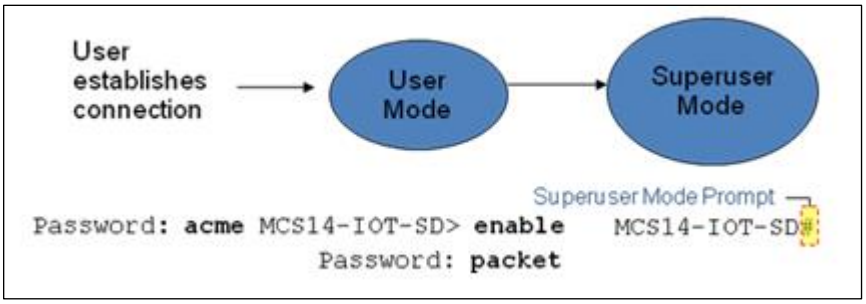
There are two password protected modes of operation within the ACLI, User mode and Superuser mode.

When you establish a connection to the SBC, the prompt for the User mode password appears. The default password is acme.

User mode consists of a restricted set of basic monitoring commands and is identified by the greater than sign (>) in the system prompt after the target name. You cannot perform configuration and maintenance from this mode.



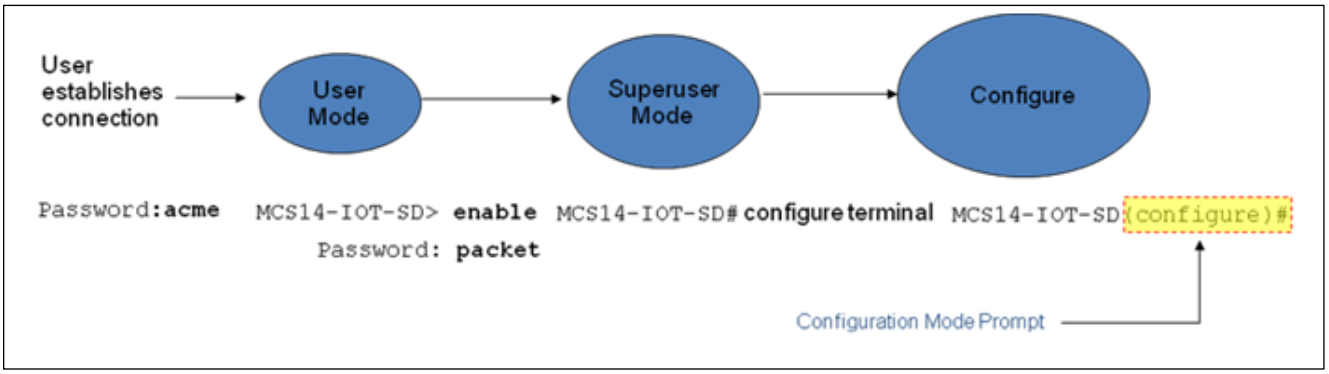
The Superuser mode allows for access to all system commands for operation, maintenance, and administration. This mode is identified by the pound sign (#) in the prompt after the target name. To enter the Superuser mode, issue the enable command in the User mode.



From the Superuser mode, you can perform monitoring and administrative tasks; however you cannot configure any elements. To return to User mode, issue the exit command.

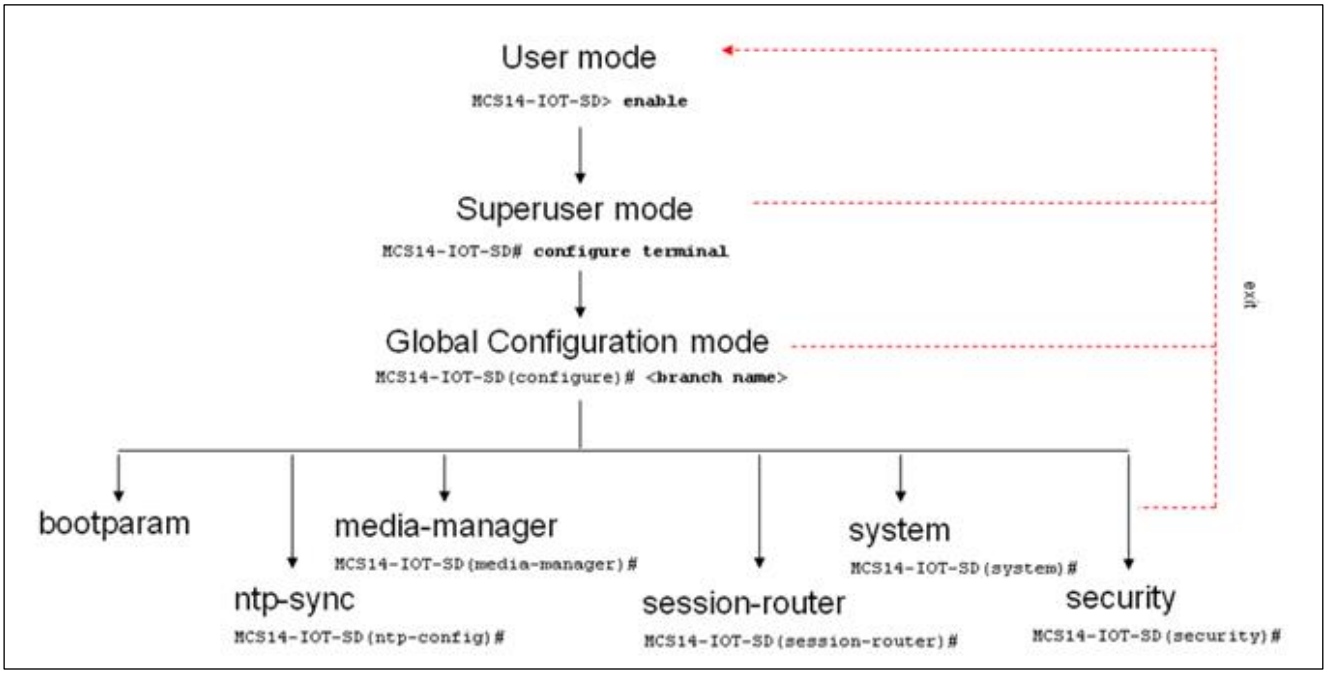
You must enter the Configuration mode to configure elements. For example, you can access the configuration branches and configuration elements for signaling and media configurations. To enter the Configuration mode, issue the **`configure terminal`** command in the Superuser mode.

Configuration mode is identified by the word configure in parenthesis followed by the pound sign (#) in the prompt after the target name, for example, **oraclesbc1(configure)#**. To return to the Superuser mode, issue the **`exit`** command.



In the configuration mode, there are six configuration branches:

- bootparam;
- ntp-sync;
- media-manager;
- session-router;
- system; and
- security.



The ntp-sync and bootparams branches are flat branches (i.e., they do not have elements inside the branches). The rest of the branches have several elements under each of the branches.

The bootparam branch provides access to SBC boot parameters.

The ntp-sync branch provides access to ntp server configuration commands for synchronizing the SBC time and date.

The security branch provides access to security configuration.

The system branch provides access to basic configuration elements as system-config, snmp-community, redundancy, physical interfaces, network interfaces, etc.

The session-router branch provides access to signaling and routing related elements, including H323-config, sip-config, iwf-config, local-policy, sip-manipulation, session-agent, etc.

The media-manager branch provides access to media-related elements, including realms, steering pools, dns-config, media-manager, and so forth.

You will use media-manager, session-router, and system branches for most of your working configuration.

Configuration Elements

The configuration branches contain the configuration elements. Each configurable object is referred to as an element. Each element consists of a number of configurable parameters.

Some elements are single-instance elements, meaning that there is only one of that type of the element - for example, the global system configuration and redundancy configuration.

Some elements are multiple-instance elements. There may be one or more of the elements of any given type. For example, physical and network interfaces.

Some elements (both single and multiple instance) have sub-elements. For example:

- SIP-ports - are children of the sip-interface element
- peers – are children of the redundancy element
- destinations – are children of the peer element

Creating an Element

1. To create a single-instance element, you go to the appropriate level in the ACLI path and enter its parameters. There is no need to specify a unique identifier property because a single-instance element is a global element and there is only one instance of this element.
2. When creating a multiple-instance element, you must specify a unique identifier for each instance of the element.
3. It is important to check the parameters of the element you are configuring before committing the changes. You do this by issuing the **`show`** command before issuing the **`done`** command. The parameters that you did not configure are filled with either default values or left empty.
4. On completion, you must issue the **`done`** command. The done command causes the configuration to be echoed to the screen and commits the changes to the volatile memory. It is a good idea to review this output to ensure that your configurations are correct.
5. Issue the **`exit`** command to exit the selected element.

Note that the configurations at this point are not permanently saved yet. If the SBC reboots, your configurations will be lost.

Editing an Element

The procedure of editing an element is similar to creating an element, except that you must select the element that you will edit before editing it.

1. Enter the element that you will edit at the correct level of the ACLI path.
2. Select the element that you will edit, and view it before editing it.
   The **`select`** command loads the element to the volatile memory for editing. The **`show`** command allows you to view the element to ensure that it is the right one that you want to edit.
3. Once you are sure that the element you selected is the right one for editing, edit the parameter one by one. The new value you provide will overwrite the old value.

4. It is important to check the properties of the element you are configuring before committing it to the volatile memory. You do this by issuing the **`show`** command before issuing the **`done`** command.
5. On completion, you must issue the **`done`** command.
6. Issue the **`exit`** command to exit the selected element.

Note that the configurations at this point are not permanently saved yet. If the SBC reboots, your configurations will be lost.

Deleting an Element

The **no** command deletes an element from the configuration in editing.

To delete a single-instance element,

1. Enter the **`no`** command from within the path for that specific element
2. Issue the **`exit`** command.

To delete a multiple-instance element,

1. Enter the **`no`** command from within the path for that particular element.
   The key field prompt, such as <name>:<sub-port-id>, appears.
2. Use the <Enter> key to display a list of the existing configured elements.
3. Enter the number corresponding to the element you wish to delete.
4. Issue the **`select`** command to view the list of elements to confirm that the element was removed.

Note that the configuration changes at this point are not permanently saved yet. If the SBC reboots, your configurations will be lost.

Configuration Versions

At any time, three versions of the configuration can exist on the SBC: the edited configuration, the saved configuration, and the running configuration.

- The **edited configuration** – this is the version that you are making changes to. This version of the configuration is stored in the SBC's volatile memory and will be lost on a reboot.
  To view the editing configuration, issue the **`show configuration`** command.
- The **saved configuration –** on issuing the **`save-config`** command, the edited configuration is copied into the non-volatile memory on the SBC and becomes the saved configuration. Because the saved configuration has not been activated yet, the changes in the configuration will not take effect. On reboot, the last activated configuration (i.e., the last running configuration) will be loaded, not the saved configuration.
- The **running configuration** is the saved then activated configuration. On issuing the **`activate-config`** command, the saved configuration is copied from the non-volatile memory to the volatile memory. The saved configuration is activated and becomes the running configuration. Although most of the configurations can take effect once being activated without reboot, some configurations require a reboot for the changes to take effect.
  To view the running configuration, issue command show **`running-config`**.

Saving the Configuration

The **`save-config`** command stores the edited configuration persistently.

Because the saved configuration has not been activated yet, changes in configuration will not take effect. On reboot, the last activated configuration (i.e., the last running configuration) will be loaded. At this stage, the saved configuration is different from the running configuration.

Because the saved configuration is stored in non-volatile memory, it can be accessed and activated at later time.

Upon issuing the **`save-config`** command, the SBC displays a reminder on screen stating that you must use the **`activate-config`** command if you want the configurations to be updated.

```
oraclesbc1 # save-config
Save-Config received, processing.
waiting 1200 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'.
oraclesbc1 #
```

Activating the Configuration

On issuing the **`activate-config`** command, the saved configuration is copied from the non-volatile memory to the volatile memory. The saved configuration is activated and becomes the running configuration.

Some configuration changes are service affecting when activated. For these configurations, the SBC warns that the change could have an impact on service with the configuration elements that will potentially be service affecting. You may decide whether or not to continue with applying these changes immediately or to apply them at a later time.

```
oraclesbc1# activate-config
Activate-Config received, processing.
waiting 120000 for request to finish
Request to 'ACTIVATE-CONFIG' has Finished,
Activate Complete
oraclesbc1#
```