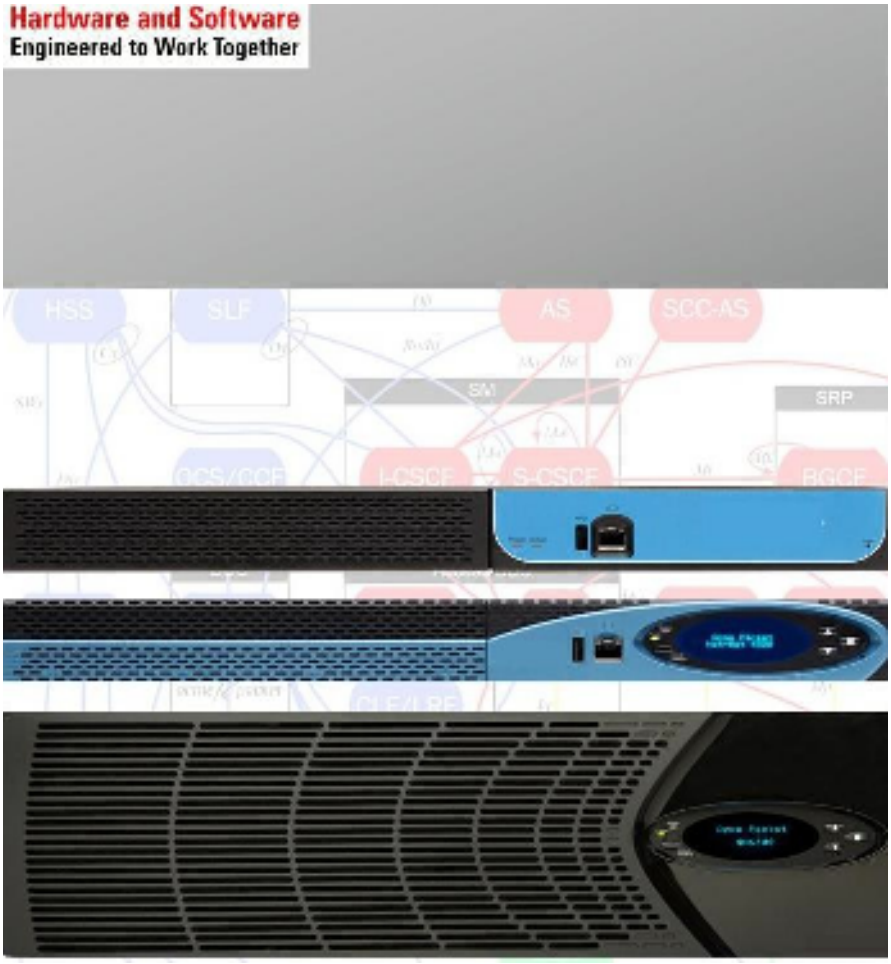

Oracle Enterprise Session Border Controller and Microsoft Lync 2013 with Telus Enterprise SIP Trunking R2

Technical Application Note

Disclaimer

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remain at the sole discretion of Oracle.

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Intended Audience

This document is intended for use by Oracle Systems Engineers, third party Systems Integrators, and end users of the Oracle Enterprise Session Border Controller (E-SBC). It assumes that the reader is familiar with basic operations of the Oracle Enterprise Session Border Controller.

Document Overview

Microsoft Lync offers the ability to connect to Internet telephony service providers (ITSP) using an IP-based SIP trunk. This reduces the cost and complexity of extending an enterprise's telephony system outside its network borders. Oracle Enterprise Session Border Controllers (E-SBCs) play an important role in SIP trunking as they are used by many ITSPs and some enterprises as part of their SIP trunking infrastructure.

This application note has been prepared as a means of ensuring that SIP trunking between Microsoft Lync, Oracle E-SBCs and IP Trunking services are configured in the optimal manner.

Introduction

Audience

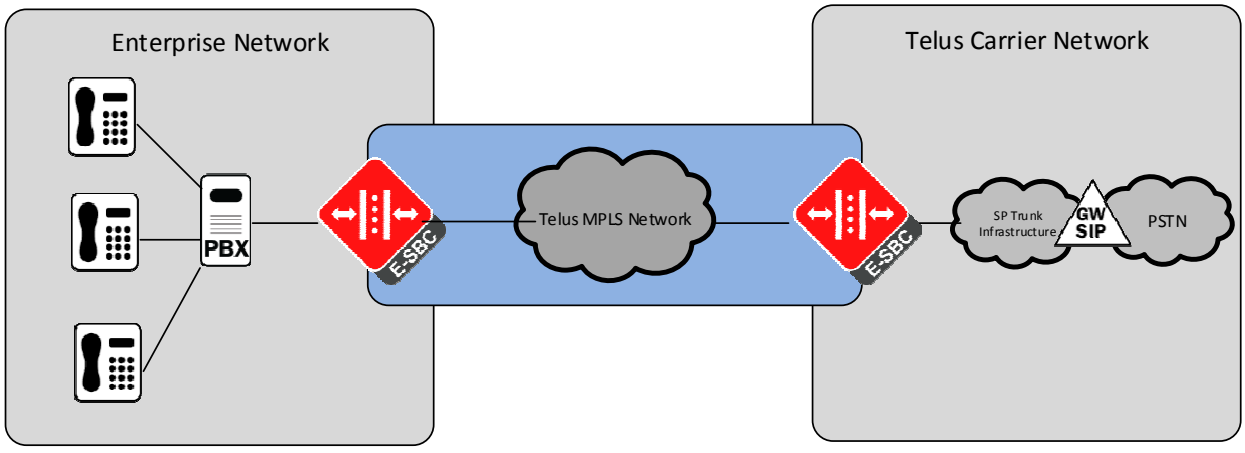
This is a technical document intended for telecommunications engineers with the purpose of configuring the Oracle Enterprise Session Border Controller and Microsoft Lync. There will be steps that require navigating the Command Line Interface (ACLI). Understanding the basic concepts of TCP/UDP, IP/Routing, SIP/RTP, TLS and SRTP are also necessary to complete the configuration and for troubleshooting, if necessary.

Requirements

- Microsoft Lync 2013 – cumulative update 5.0.8308.577
- Oracle Enterprise Session Border Controller is running ECZ720p2.64.bz. (Build 166) Note: the configuration running on the E-SBC is backward/forward compatible with any release in the 7.2.0 stream.

Architecture

The following reference architecture shows a logical view of the connectivity between CM and the E-SBC.



Lab Configuration

Following are the IP addresses used for the Interoperability tests. The IPs below are specific to lab setup at Telus, the IPs in production will be vastly different from network addresses listed below.

description	network-interface	realm	interface IP	Host Name	sip-port
SBC interfaces					
management	wancom0		192.168.1.22		
redundancy	wancom1		169.254.1.1		
redundancy	wancom2		169.254.2.1		
media/signalling	s0p0:0	inside	172.16.153.34	lync-acme-sbc.teluscpslynclab.net	5067
media/signalling	s1p0:0	outside	172.16.154.35		5067
Session-Agents					
Lync Mediation Server 1		inside	172.16.149.38	fe0101.teluscpslynclab.net	5066
Lync Mediation Server 2		inside	172.16.149.39	fe0102.teluscpslynclab.net	5066
Lync Mediation Server 3		inside	172.16.149.40	fe0103.teluscpslynclab.net	5066
Telus trunk		outside	10.27.56.7		5060

Configuring the Oracle Enterprise Session Border Controller

In this section we describe the steps for configuring an Oracle Enterprise Session Border Controller, formally known as an Acme Packet Net-Net Enterprise Session Director, for use with CM Server in a SIP trunking scenario.

In Scope

The following guide configuring the Oracle E-SBC assumes that this is a newly deployed device dedicated to a single customer. If a service provider currently has the E-SBC deployed then please see the ACLI Configuration Guide on http://docs.oracle.com/cd/E56581_01/index.htm for a better understanding of the Command Line Interface (CLI).

Note that Oracle offers several models of E-SBC. This document covers the setup for the E-SBC platform running ECZ7.2.0 or later. If instructions are needed for other Oracle E-SBC models, please contact your Oracle representative.

Out of Scope

- Configuration of Network management including SNMP and RADIUS

What will you need

- Hypervisor with console connectivity through the hypervisor
- Terminal emulation application such as PuTTY or HyperTerm
- Passwords for the User and Super user modes on the Oracle E-SBC
- IP address to be assigned to management interface (Wancom0) of the E-SBC - the Wancom0 management interface must be connected and configured to a management network separate from the service interfaces. Otherwise the E-SBC is subject to ARP overlap issues, loss of system access when the network is down, and compromising DDoS protection. Oracle does not support E-SBC configurations with management and media/service interfaces on the same subnet.
- IP address of CM external facing NIC
- IP addresses to be used for the E-SBC internal and external facing ports (Service Interfaces)
- IP address of the next hop gateway in the service provider network

Configuring the E-SBC

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

```
Password: acme
SBC1> enable
Password: packet
SBC1# configure terminal
SBC1 (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 E-SBC by going to

SBC1#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

```
SBC1#(configure)bootparam
'.' = clear field;  '-' = go to previous field;  q = quit
boot device             : eth0
processor number        : 0
host name               : acmesystem
file name               : /code/images/nnECZ720p2.64.bz --- >location
where the software is loaded on the SBC
inet on ethernet (e)    : 192.168.1.22:ffffff80 --- > This is the ip
address of the management interface of the SBC, type the IP address and
mask in hex
```

```
inet on backplane (b)    :
host inet (h)            :
gateway inet (g)         : 192.168.1.1 -> gateway address here
user (u)                 : vxftp
ftp password (pw) (blank = use rsh)      :
vxftp flags (f)          :
target name (tn)         : SBC1 -> ACLI prompt name & HA peer name
startup script (s)       :
other (o)                :
```

Configuring the E-SBC

The following section walks you through configuring the Oracle E-SBC. It is outside the scope of this document to include all of the configuration elements as it will differ in every deployment.

High Availability

For additional information on High Availability please see the enterprise SBC documentation for more information (http://www.oracle.com/technetwork/indexes/documentation/oracle-comms-acme-packet-2046907.html)

Interfaces wancom1 and 2 need to be added to facilitate HA communication between the two HA pairs.

```
network-interface
        name                                    wancom1
        sub-port-id                             0
        description                             HA_HEARTBEAT1
        hostname
        ip-address
        pri-utility-addr                        169.254.1.1
        sec-utility-addr                        169.254.1.2
        netmask                                 255.255.255.252
        gateway
        sec-gateway
        gw-heartbeat
                state                                   disabled
                heartbeat                               0
                retry-count                             0
                retry-timeout                           1
                health-score                            0
        dns-ip-primary
        dns-ip-backup1
        dns-ip-backup2
        dns-domain
        dns-timeout                             11
        hip-ip-list
        ftp-address
        icmp-address
        snmp-address
        telnet-address
        ssh-address
network-interface
        name                                    wancom2
        sub-port-id                             0
        description                             HA_HEARTBEAT2
        hostname
```

```
        ip-address
        pri-utility-addr                        169.254.2.1
        sec-utility-addr                        169.254.2.2
        netmask                                 255.255.255.252
        gateway
        sec-gateway
        gw-heartbeat
                state                                   disabled
                heartbeat                               0
                retry-count                             0
                retry-timeout                           1
                health-score                            0
        dns-ip-primary
        dns-ip-backup1
        dns-ip-backup2
        dns-domain
        dns-timeout                             11
        hip-ip-list
        ftp-address
        icmp-address
        snmp-address
        telnet-address
        ssh-address
```

```
redundancy-config
        becoming-standby-time                   360000
        peer
                name                                    SBC1
                type                                    Primary
                destination
                        address                                 169.254.1.1:9090
                        network-interface                       wancom1:0
                destination
                        address                                 169.254.2.1:9090
                        network-interface                       wancom2:0
        peer
                name                                    SBC2
                type                                    Secondary
                destination
                        address                                 169.254.1.2:9090
                        network-interface                       wancom1:0
                destination
                        address                                 169.254.2.2:9090
                        network-interface                       wancom2:0
```

Additionally primary and secondary interface IPs need to be added to the media/signaling network-interfaces

```
network-interface
        name                                    s0p0
        sub-port-id                             0
        description                             Outside/Untrusted
        hostname
        ip-address                              172.16.153.34
        pri-utility-addr                        172.16.153.2
        sec-utility-addr                        172.16.153.3
        netmask                                 255.255.255.0
        gateway                                 172.16.153.1
```

```
        sec-gateway
        gw-heartbeat
                state                                   disabled
                heartbeat                               0
                retry-count                             0
                retry-timeout                           1
                health-score                            0
        dns-ip-primary
        dns-ip-backup1
        dns-ip-backup2
        dns-domain
        dns-timeout                             11
        signaling-mtu                           0
        hip-ip-list
        ftp-address
        icmp-address
        snmp-address
        telnet-address
        ssh-address
network-interface
        name                                    s1p0
        sub-port-id                             0
        description                             Inside/Trusted
        hostname
        ip-address                              172.16.154.35
        pri-utility-addr                        172.16.154.2
        sec-utility-addr                        172.16.154.3
        netmask                                 255.255.255.0
        gateway                                 172.16.154.1
        sec-gateway
        gw-heartbeat
                state                                   disabled
                heartbeat                               0
                retry-count                             0
                retry-timeout                           1
                health-score                            0
        dns-ip-primary
        dns-ip-backup1
        dns-ip-backup2
        dns-domain
        dns-timeout                             11
        signaling-mtu                           0
        hip-ip-list
        ftp-address
        icmp-address
        snmp-address
        telnet-address
        ssh-address
```

Telus Trunk Authentication

Telus trunking release 2 requires both Registration of the trunk and Authentication challenges on SIP INVITE Methods. Telus will provide the information similar to the following:

- SIP User Name: user123456
- SIP Domain: ipnet4.com
- SIP Password: pass123456
- DID: 2223334444

There are 3 parts to the configuration.

- A surrogate agent is needed to register the trunk on behalf of the IPPBX.
- Surrogate registration requires **registration-caching** to be set to **enabled** on the **sip-interface** of **PBX realm.**
- Auth challenges to INVITEs are handled on the **session-agent** to the **IP-PBX** via **auth-attributes**.

```
surrogate-agent
        register-host                           ipinet4.com
        register-user                           user123456
        description
        realm-id                                inside
        state                                   enabled
        customer-host                           172.16.154.35
        customer-next-hop                       10.27.56.7
        register-contact-host                   ipinet4.com
        register-contact-user                   user123456
        password                                pass123456
        register-expires                        3600
        replace-contact                         disabled
        options                                 auth-info=refresh
                                                auth-
method="INVITE,CANCEL,ACK,BYE"
        route-to-registrar                      enabled
        aor-count                               1
        auth-user                               user123456
        max-register-attempts                   10
        register-retry-time                     300
        count-start                             1
        register-mode                           automatic
        triggered-inactivity-interval           30
        triggered-oos-response                  503
```

Reg-cache on the IPPBX sip-interface

```
sip-interface
        state                                   enabled
        realm-id                                inside
        description
        sip-port
                address                                 172.16.153.34
                port                                    5066
                transport-protocol                      TLS
                tls-profile                             Core
                allow-anonymous                         all
                multi-home-addrs
                ims-aka-profile
        carriers
…
        tcp-nat-interval                        90
        registration-caching                    enabled
```

IP-PBX session-agent configuration

```
session-agent
        hostname                                fe0101.teluscpslynclab.net
        ip-address                              172.16.149.38
        port                                    5067
        state                                   enabled
        app-protocol                            SIP
```

```
        app-type
        transport-method                        StaticTLS
…
        sip-isup-profile
        kpml-interworking                       inherit
        monitoring-filters
        auth-attributes
                auth-realm                              ipnet4.com
                username                                user123456
                password                                ********
                in-dialog-methods                       INVITE BYE ACK CANCEL
OPTIONS SUBSCRIBE PRACK NOTIFY UPDATE REFER
```

Routing via Local Policy

For outbound calls the local-policy determines which trunk to forward the call based on the NPA of the request-URI. This is configured in the local policy of the "To". For most configurations there will be only 1 inside and outside realm. For a single inside/outside realm configuration the local policy to and from would be set to "*". Redundant trunk configurations will use a session-agent group.

```
local-policy
        from-address                            *
        to-address                              *
        source-realm                            outside
        description
        activate-time
        deactivate-time
        state                                   enabled
        policy-priority                         none
        policy-attribute
                next-hop                                SAG:med-grp-1
                realm                                   inside
                action                                  none
                terminate-recursion                     disabled
                carrier
                start-time                              0000
                end-time                                2400
                days-of-week                            U-S
                cost                                    0
                state                                   enabled
                app-protocol                            SIP
                methods
                media-profiles
                lookup                                  single
                next-key
                eloc-str-lkup                           disabled
                eloc-str-match
local-policy
        from-address                            *
        to-address                              *
        source-realm                            inside
        description
        activate-time
        deactivate-time
        state                                   enabled
        policy-priority                         none
```

```
        policy-attribute
                next-hop                                SAG:med-grp-1
                realm                                   peer
                action                                  none
                terminate-recursion                     disabled
                carrier
                start-time                              0000
                end-time                                2400
                days-of-week                            U-S
                cost                                    0
                state                                   enabled
                app-protocol                            SIP
                methods
                media-profiles
                lookup                                  single
                next-key
                eloc-str-lkup                           disabled
                eloc-str-match
```

```
session-group
        group-name                              med-grp-1
        description                             Lync Mediation server group
        state                                   enabled
        app-protocol                            SIP
        strategy                                Hunt
        dest                                    fe0101.teluscpslynclab.net
                                                fe0102.teluscpslynclab.net
                                                fe0103.teluscpslynclab.net
        trunk-group
        sag-recursion                           disabled
        stop-sag-recurse                        401,407
```

Header manipulation rules required for the Telus Trunk

The HMRs update the host portion of the URI to the Telus trunk IP for Request-URI and To headers. The host portion of the URI is updated with the E-SBC outside sip-interface IP for From, P-Asserted-Identity and Contact so that the E-SBC presents its interface IP to the next hop.

```
    header-rule
                name                                    save PAI
                header-name                             P-Asserted-Identity
                action                                  store
                comparison-type                         case-sensitive
                msg-type                                any
                methods
                match-value
                new-value
        header-rule
                name                                    Updt PAI
                header-name                             P-Asserted-Identity
                action                                  add
                comparison-type                         boolean
                msg-type                                any
                methods                                 INVITE
                match-value                             !$save PAI
```

```
                new-value                                <sip:
2223334444@ipinet4.com;user=phone>
        header-rule
                name                                     Updt RURI
                header-name                              request-uri
                action                                   manipulate
                comparison-type                          case-sensitive
                msg-type                                 any
                methods
                match-value
                new-value
                element-rule
                        name
Udpt URI Host
                        parameter-name
                        type                                     uri-host
                        action                                   replace
                        match-val-type                           any
                        comparison-type                          case-
sensitive
                        match-value
                        new-value                                ipinet4.com
        header-rule
                name                                     Updt To
                header-name                              To
                action                                   manipulate
                comparison-type                          case-sensitive
                msg-type                                 any
                methods
                match-value
                new-value
                element-rule
                        name
UPdt URI host
                        parameter-name
                        type                                     uri-host
                        action                                   replace
                        match-val-type                           any
                        comparison-type                          case-
sensitive
                        match-value
                        new-value                                ipinet4.com
        header-rule
                name                                     Updt From
                header-name                              From
                action                                   manipulate
                comparison-type                          case-sensitive
                msg-type                                 any
                methods
                match-value
                new-value
                element-rule
                        name
Updt URI host
                        parameter-name
                        type                                     uri-host
                        action                                   replace
```

```
                        match-val-type                          any
                        comparison-type                         case-
sensitive
                        match-value
                        new-value                               ipinet4.com
        header-rule
                name                                    Updt Contact
                header-name                             Contact
                action                                  manipulate
                comparison-type                         case-sensitive
                msg-type                                any
                methods
                match-value
                new-value
                element-rule
                        name
Updt URI Host
                        parameter-name
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         case-
sensitive
                        match-value
                        new-value                               $LOCAL IP
                element-rule
                        name                                    Del MSOpaque
                        parameter-name                          ms-opaque
                        type                                    uri-param
                        action                                  delete-
element
                        match-val-type                          any
                        comparison-type                         case-
sensitive
                        match-value
                        new-value
```

Header manipulation rules to support privacy calling

Lync does not support privacy calling. The E-SBC can help support privacy calling through header manipulation rules. The Lync Administrator needs to support the appropriate *-code in the dial-plan. In the provided example *67 provides privacy. If the SBC detects *67 as a prefix in the request URI, the SBC will apply RFC3323 (A Privacy Mechanism for the Session Initiation Protocol).

```
        header-rule
                name                                    CheckPrivacy
                header-name                             request-uri
                action                                  store
                comparison-type                         case-sensitive
                msg-type                                any
                methods                                 INVITE
                match-value
                new-value
                element-rule
                        name                                    CheckStar67
                        parameter-name
                        type                                    uri-user
                        action                                  store
```

```
                        match-val-type                          any
                        comparison-type                         pattern-
rule
                        match-value                             \*67\d+
                        new-value
                header-rule
                        name                                    AddPrivacyHdr
                        header-name                             Privacy
                        action                                  add
                        comparison-type                         boolean
                        msg-type                                request
                        methods                                 INVITE
                        match-value
$CheckPrivacy.$CheckStar67
                        new-value                               id
                header-rule
                        name                                    updateRURI
                        header-name                             request-uri
                        action                                  manipulate
                        comparison-type                         pattern-rule
                        msg-type                                request
                        methods                                 INVITE
                        match-value
                        new-value
                        element-rule
                                name
updateRURIUser
                                parameter-name
                                type                                    uri-user
                                action                                  replace
                                match-val-type                          any
                                comparison-type                         pattern-
rule
                                match-value                             \*67(.*)
                                new-value                               $1
                header-rule
                        name                                    updateTO
                        header-name                             To
                        action                                  manipulate
                        comparison-type                         pattern-rule
                        msg-type                                request
                        methods                                 INVITE
                        match-value
                        new-value
                        element-rule
                                name                                    updateTOUsr
                                parameter-name
                                type                                    uri-user
                                action                                  replace
                                match-val-type                          any
                                comparison-type                         pattern-
rule
                                match-value                             \*67(.*)
                                new-value                               $1
                header-rule
                        name                                    StoreFromTag
                        header-name                             From
```

```
                action                                  store
                comparison-type                         case-sensitive
                msg-type                                request
                methods                                 INVITE
                match-value
                new-value
                element-rule
                        name                                    storeTag
                        parameter-name                          tag
                        type                                    header-
param
                        action                                  store
                        match-val-type                          any
                        comparison-type                         case-
sensitive
                        match-value
                        new-value
        header-rule
                name                                    ChgFromPrivacy
                header-name                             From
                action                                  manipulate
                comparison-type                         boolean
                msg-type                                request
                methods                                 INVITE
                match-value
$CheckPrivacy.$CheckStar67
                new-value                               "\"Anonymous\"
<sip:anonymous@anonymous.invalid>; tag="+$StoreFromTag.$storeTag.$0
```

SRTP Configuration

SRTP provides encrypted audio streams to/from Lync to the Oracle Enterprise Session Boarder Controller. Telus Trunking does not support SRTP. For more information regarding SRTP configuration procedures please review the Enterprise Session Border Controller Configuration Guide.

```
sdes-profile
        name                                    sdes1
        crypto-list                             AES_CM_128_HMAC_SHA1_80
                                                AES_CM_128_HMAC_SHA1_32
        srtp-auth                               enabled
        srtp-encrypt                            enabled
        srtcp-encrypt                           enabled
        mki                                     disabled
        egress-offer-format                     simultaneous-best-effort
        use-ingress-session-params
        options
        key
        salt
```

```
media-sec-policy
        name                                    rtponly
        pass-through                            disabled
        options
        inbound
                profile
                mode                                    rtp
```

```
                protocol                                none
        outbound
                profile
                mode                                    rtp
                protocol                                none
```

```
media-sec-policy
        name                                    sdespolicy
        pass-through                            disabled
        options
        inbound
                profile                                 sdes1
                mode                                    srtp
                protocol                                sdes
        outbound
                profile                                 sdes1
                mode                                    srtp
                protocol                                sdes
```

```
realm-config
        identifier                              inside
        description
        addr-prefix                             0.0.0.0
        network-interfaces                      s0p0:0
        mm-in-realm                             disabled
        mm-in-network                           enabled
        mm-same-ip                              enabled
        mm-in-system                            enabled
…
        media-policy
        media-sec-policy                        sdespolicy
        srtp-msm-passthrough                    disabled
```

```
realm-config
        identifier                              outside
        description
        addr-prefix                             0.0.0.0
        network-interfaces                      s0p1:0
        mm-in-realm                             disabled
        mm-in-network                           enabled
        mm-same-ip                              enabled
        mm-in-system                            enabled
…
        media-policy
        media-sec-policy                        rtponly
        srtp-msm-passthrough                    disabled
```

TLS Configuration

TLS provides encrypted SIP signaling between the Oracle Communications E-SBC and Lync 2013. TLS requires the exchange of certificates. The Lync administrator will need to provide the local domain controller root certificate. Likewise the CSR created on the E-SBC will need to be signed by the domain controller certificate authority that the mediation servers are associated with. The signed certificate will then need to be imported back into the SBC. For more information regarding TLS configuration procedures please review the Enterprise Session Border Controller Configuration Guide.

```
certificate-record
        name                                    ESBCCert1
        country                                 US
        state                                   MA
        locality                                Burlington
        organization                            Engineering
        unit
        common-name                             lync-acme-
sbc.teluscpslynclab.net
        key-size                                2048
        alternate-name
        trusted                                 enabled
        key-usage-list                          digitalSignature
                                                keyEncipherment
        extended-key-usage-list                 serverAuth
        options
```

```
certificate-record
        name                                    MediationRoot
        country                                 US
        state                                   MA
        locality                                Burlington
        organization                            Engineering
        unit
        common-name                             teluscpslynclab-DC1-LYNCLAB-CA-1
        key-size                                2048
        alternate-name
        trusted                                 enabled
        key-usage-list                          digitalSignature
                                                keyEncipherment
        extended-key-usage-list                 serverAuth
        options
```

```
tls-profile
        name                                    Core
        end-entity-certificate                  ESBCCert1
        trusted-ca-certificates                 MediationRoot
        cipher-list                             ALL
        verify-depth                            10
        mutual-authenticate                     enabled
        tls-version                             compatibility
        options
        cert-status-check                       disabled
        cert-status-profile-list
        ignore-dead-responder                   disabled
        allow-self-signed-cert                  disabled
```

```
sip-interface
        state                                   enabled
        realm-id                                inside
        description
        sip-port
                address                                 172.16.153.34
                port                                    5066
                transport-protocol                      TLS
                tls-profile                             Core
```

```
                allow-anonymous                         agents-only
                multi-home-addrs
                ims-aka-profile
```

```
session-agent
        hostname                                fe0101.teluscpslynclab.net
        ip-address                              172.16.149.38
        port                                    5067
        state                                   enabled
        app-protocol                            SIP
        app-type
        transport-method                        StaticTLS
…
```

Webserver Configuration

A webserver is available on all Enterprise versions of Oracle E-SBCs. The Webserver can be used to provide tracing, configuration and dashboard info. For tracing info, 2 parts must be configured. 1) The webserver must be enabled. 2) Tracing filters must be applied.

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

```
sip-monitoring
        match-any-filter                        disabled
        state                                   enabled
        short-session-duration                  0
        monitoring-filters                      *
        trigger-window                          30
```

Test Plan

Caveats and out of scope items: Fax was not tested because the Lab CM did not have an analog card to test these capability there for Fax is considered out of scope for this testing.

Following is the test plan executed against this setup and results have been documented below.

Test Number	**Test Details**	**Pass/Fail/NA - Not Applicable**	Test results (Comments)
Basic originated and terminated calls			
TELUS_TC1	Call to following number from PBX: 647-837-0597 Toronto Local 780-429-7423 Edmonton Local 613-683-0932 Ottawa Local 514-788-7663 Montreal Local 604-681-0262 Vancouver Local 403-532-8075 Calgary Local 1-877-353-9586 Toll Free North America When hearing the prompt, press 1234# to interrupt the prompt. Should hear "invalid access code" prompt to confirm the DTMF tone detection. Note that you may need to dial 1 as it could be a LD call.	Pass	
TELUS_TC2	Call to the following test line - 9056352304. After the call is answered, you will hear a "confirmation tone" and you could disconnect the call. Note that you may need to dial 1 as it could be a LD call.	Pass	
Test with PSTN line			
Basic inbound/outbound call			
TELUS_TC3	Call from PSTN phone to IP PBX phone 1. Confirm 2-way voice 2. Confirm the proper calling number is shown 3. Confirm the proper call display name is shown	Pass	
TELUS_TC4	Call from IP PBX phone to PSTN phone 1. Confirm 2-way voice 2. Confirm the proper calling number is shown 3. Confirm the proper call display name is shown	Pass	
Basic inbound/outbound call with privacy			
TELUS_TC5	Call from PSTN phone to IP PBX phone, prefix the IP PBX phone number with *63 1. Confirm 2-way voice 2. Confirm the proper calling number is not shown 3. Confirm the proper call display name is not shown	Pass	

TELUS_TC6	Call from IP PBX phone to PSTN phone, when dialling from the IP PBX phone, use the prefix if applicable to temporary suppress the call display 1. Confirm 2-way voice 2. Confirm the proper calling number is not shown 3. Confirm the proper call display name is not shown	Pass	
Hold and resume			
TELUS_TC7	Call from PSTN to IP PBX - after the call setup the PBX phone puts the call on-hold or (MOH), waits 30 seconds, resumes. Confirm audio both way after resume.	Pass	
TELUS_TC8	Call from IP PBX to PSTN - after the call setup, use PSTN phone to put the call on-hold, wait 30 seconds, resume. Confirm audio both way after resume.	Pass	
Call Transfer (Blind transfer)			
TELUS_TC9	IP PBX phone 1 calls IP PBX phone 2 IP PBX phone 2 performs a blind transfer to PSTN phone Confirm audio both way after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC10	PSTN phone calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to IP PBX phone 2 Confirm audio both way after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC11	PSTN phone calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to another PSTN Confirm both way audio. Repeat the same test using SIP REFER	Pass	
TELUS_TC12	PSTN phone calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to Telus mobile client Confirm both way audios Repeat the same test using SIP REFER	Pass	
Call Transfer (Consult transfer)			
TELUS_TC13	IP PBX phone 1 calls IP PBX phone 2 IP PBX phone 2 performs a consult transfer to PSTN phone Confirm audio both way after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC14	PSTN phone calls IP PBX phone 1 IP PBX phone 1 performs a consult transfer to IP PBX phone 2 Confirm audio both way after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC15	PSTN phone calls IP PBX phone 1 IP PBX phone 1 performs a consult transfer to another PSTN Confirm both way audio. Repeat the same test using SIP REFER	Pass	

TELUS_TC16	PSTN phone calls IP PBX phone 1 IP PBX phone 1 performs a consult transfer to Telus mobile client Confirm both way audios Repeat the same test using SIP REFER	Pass	
Call Forwarding Unconditional			
TELUS_TC17	Configure IP PBX phone 1 to CFU to PSTN phone IP PBX phone 2 calls phone 1 and should CFU to PSTN phone 1. Confirm 2-way voice 2. Confirm phone 1 number and display at PSTN phone	Pass	
TELUS_TC18	Configure IP PBX phone 1 to CFU to PSTN phone from PSTN calls phone 1 and should CFU to PSTN phone 1. Confirm 2-way voice 2. Confirm phone 1 number and display at PSTN phone	Pass	
TELUS_TC19	Configure IP PBX phone 1 to CFU to telus mobile client PSTN phone calls phone 1 to trigger the call forwarding 1. Confirm audio prompt 2, confirm the phone 1 number and display Mobile client	Pass	
Call Forwarding Busy			
TELUS_TC20	Configure IP PBX phone 1 to CFB to PSTN phone IP PBX phone 2 calls phone 1 and should CFB toPSTN phone 1. Confirm 2-way voice 2. Confirm phone 1 number and display at PSTN phone	Pass	
TELUS_TC21	Configure IP PBX phone 1 to CFB to PSTN phone from PSTN calls phone 1 and should CFB to PSTN phone 1. Confirm 2-way voice 2. Confirm phone 1 number and display at PSTN phone	Pass	
TELUS_TC19	Configure IP PBX phone 1 to CFU to Telus Mobile client PSTN phone calls phone 1 to trigger the call forwarding 1. Confirm audio prompt 2. Press 1234# to interrupt the prompt	Pass	
Call Forwarding Don't Answer			
TELUS_TC22	Configure IP PBX phone 1 to CFDA to PSTN phone IP PBX phone 2 calls phone 1 and should CFDA toPSTN phone 1. Confirm 2-way voice 2. Confirm phone 1 number and display at PSTN phone	Pass	
TELUS_TC23	Configure IP PBX phone 1 to CFDA to PSTN phone from PSTN calls phone 1 and should CFDA to PSTN phone 1. Confirm 2-way voice 2. Confirm phone 1 number and display at PSTN phone	Pass	

TELUS_TC19	Configure IP PBX phone 1 to CFU to Telus Mobile client PSTN phone calls phone 1 to trigger the call forwarding 1. Confirm audio prompt 2. confirm phone 1 number and display on mobile client	Pass	
Voicemail			
TELUS_TC24	IP PBX phone 1 calls PSTN phone, Don't answer the call in the PSTN phone; after 4 ring, voicemail kick in Record a message Follow the prompt to play back the message Follow the prompt to cancel the recording then hang up.	Pass	
Conference call			
TELUS_TC25	PSTN phone calls IP PBX phone 1 IP PBX phone 1 performs a conference call with IP PBX phone 2 Confirm audio among the parties	Pass	
TELUS_TC26	PSTN phone calls IP PBX phone 1 IP PBX phone 1 performs a conference call with 1-877-353-9586 Confirm audio with PSTN phone and IP PBX phone	Pass	
Long calls - minimum recommendation			
TELUS_TC28	long duration call: 2 hours - to PSTN phone	Pass	
TELUS_TC29	long duration call on hold: Call to PSTN, PBX places call on hold for 20 min, resume call, verify 2 way audio	Pass	
TELUS_TC27	IP PBX phone 1 calls PSTN phone IP PBX phone 1 performs a conference call to Telus Mobile client Confirm audio with PSTN phone and IP PBX phone	Pass	
FAX			
TELUS_TC30	Repeat the test by setup the call with both G.711 and G.729. Outbound (from IP PBX to PSTN) T.38 testing , set up the call with G711, PBX re-invite with T38. verified the fax passed with T.38.	Not Supported	No native support for fax with Lync
TELUS_TC31	Inbound (from PSTN to IP PBX) T.38 testing	Not Supported	No native support for fax with Lync
TELUS_TC32	Repeat the test by setup the call with both G.711 and G.729. Outbound (from IP PBX to PSTN) FAX G.711 pass-through testing,test G711 fax pass through.	Not Supported	No native support for fax with Lync
TELUS_TC33	Inbound (from PSTN to IP PBX) FAX G.711 pass-through testing	Not Supported	No native support for fax with Lync
Test with TELUS VoIP Account			
Basic inbound/outbound call			

TELUS_TC27	Repeat the test by both G.711 and G.729. Call from TELUS VoIP client to IP PBX phone, 1. Confirm 2-way voice 2. Confirm the proper calling number is shown 3. Confirm the proper call display name is shown	Pass	
TELUS_TC28	Repeat the test by setup the call with both G.711 and G.729. Call from IP PBX phone to TELUS VoIP client, 1. Confirm 2-way voice 2. Confirm the proper calling number is shown 3. Confirm the proper call display name is shown	Pass	
Basic inbound/outbound call with privacy			
TELUS_TC29	Call from TELUS VoIP client to IP PBX phone with privacy 1. CConfirm 2-way voice 2. Confirm the proper calling number is not shown 3. Confirm the proper call display name is not shown	Pass	
TELUS_TC30	Call from IP PBX phone to TELUS VoIP client, when dialling from the IP PBX phone, use the prefix if applicable to temporary suppress the call display 1. Confirm 2-way voice 2. Confirm the proper calling number is not shown 3. Confirm the proper call display name is not shown	Pass	
Hold and resume			
TELUS_TC31	Call from TELUS VoIP to IP PBX - after the call setup the PBX phone puts the call on-hold or (MOH), waits 30 seconds, resumes. Confirm audio both way after resume.	Pass	
TELUS_TC32	Call from IP PBX to TELUS VoIP - after the call setup, use TELUS VoIP to put the call on-hold or (MOH), waits 30 seconds, resumes. Confirm 2-way voice after resume.	Pass	
Call Transfer (Blind transfer)			
TELUS_TC33	IP PBX phone 1 calls IP PBX phone 2 IP PBX phone 2 performs a blind transfer to TELUS VoIP client Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC34	TELUS VoIP client calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to PSTN Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC35	TELUS VoIP client calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to Telus mobile client Repeat the same test using SIP REFER	Pass	
Call Transfer (Consult transfer)			

TELUS_TC36	IP PBX phone 1 calls IP PBX phone 2 IP PBX phone 2 performs a consult transfer to TELUS VoIP client Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC37	TELUS VoIP client calls IP PBX phone 1 IP PBX phone 1 performs a consult transfer to PSTN Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC38	TELUS VoIP client calls IP PBX phone 1 IP PBX phone 1 performs a consult transfer to Telus mobile client Repeat the same test using SIP REFER	Pass	
Call Forwarding Unconditional			
TELUS_TC39	Configure IP PBX phone 1 to CFU to TELUS VoIP client IP PBX phone 2 calls phone 1 and should CFU toTELUS VoIP client 1. Confirm 2-way voice 2. Confirm phone 1 number and display at TELUS VoIP client	Pass	
TELUS_TC40	Configure IP PBX phone 1 to CFU to 1-877-353-9586 TELUS VoIP client calls phone 1 to trigger the call forwarding 1. Confirm 2-way voice 2. Press 1234# to interrupt the prompt	Pass	
TELUS_TC38	TELUS VoIP client calls IP PBX phone 1 IP PBX phone 1 performs a consult transfer to Telus mobile client Repeat the same test using SIP REFER	Pass	
Voicemail			
TELUS_TC41	Repeat for both G.711 and G.729. IP PBX phone 1 calls TELUS VoIP client, Don't answer the call in the TELUS VoIP client; after 4 ring, voicemail kick in Record a message Follow the prompt to play back the message Follow the prompt to cancel the recording then hang up	Pass	
Conference call			
TELUS_TC42	TELUS VoIP client calls IP PBX phone 1 IP PBX phone 1 performs a conference call with IP PBX phone 2 Confirm audio among the parties	Pass	
TELUS_TC44	IP PBX phone 1 calls TELUS VoIP client BVOIP performs a conference call to 1-877-353-9586 Confirm audio with VoIP client and IP PBX phone	Pass	
Test with TELUS mobile			
Basic inbound/outbound call			

TELUS_TC45	Call from TELUS mobile client to IP PBX phone 1. Confirm 2-way voice 2. Confirm the proper calling number is shown 3. Confirm the proper call display name is shown	Pass	
TELUS_TC46	Repeat the test by setup the call with both G.711 and G.729. Call from IP PBX phone to TELUS mobile client 1. Confirm 2-way voice 2. Confirm the proper calling number is shown 3. Confirm the proper call display name is shown	Pass	
Basic inbound/outbound call with privacy			
TELUS_TC47	Call from TELUS mobile client to IP PBX phone with privacy enabled. 1. Confirm 2-way voice 2. Confirm the proper calling number is not shown 3. Confirm the proper call display name is not shown	Pass	
TELUS_TC48	Call from IP PBX phone to TELUS mobile client, when dialling from the IP PBX phone, use the prefix if applicable to temporary suppress the call display 1. Confirm 2-way voice 2. Confirm the proper calling number is not shown 3. Confirm the proper call display name is not shown	NA	
Hold and resume			
TELUS_TC49	Call from TELUS mobile to IP PBX - after the call setup the PBX phone puts the call on-hold or (MOH), waits 30 seconds, resumes. Confirm audio both way after resume.	Pass	
TELUS_TC50	Call from IP PBX to TELUS mobile - after the call setup, use TELUS mobile to put the call on-hold or (MOH), waits 30 seconds, resumes. Confirm 2-way voice after resume.	Pass	
Call Transfer (Blind transfer)			
TELUS_TC51	IP PBX phone 1 calls IP PBX phone 2 IP PBX phone 2 performs a blind transfer to telus mobile client Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC52	TELUS mobile client calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to IP PBX phone 2 Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC53	TELUS mobile client calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to 1-877-353-9586 Confirm the prompt and interrupt the prompt with 1234# Repeat the same test using SIP REFER	Pass	

TELUS_TC52	TELUS mobile client calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to Telus mobile client Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
Call Transfer (Consult transfer)			
TELUS_TC54	IP PBX phone 1 calls IP PBX phone 2 IP PBX phone 2 performs a consult transfer to Telus mobile client Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC55	TELUS mobile client calls IP PBX phone 1 IP PBX phone 1 performs a consult transfer to IP PBX phone 2 Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
TELUS_TC56	TELUS mobile client calls IP PBX phone 1 IP PBX phone 1 performs a consult transfer to 1-877-353-9586 Confirm the prompt and interrupt the prompt with 1234# Repeat the same test using SIP REFER	Pass	
TELUS_TC52	TELUS mobile client calls IP PBX phone 1 IP PBX phone 1 performs a blind transfer to another Telys Mobile client Confirm 2-way voice after the transfer Repeat the same test using SIP REFER	Pass	
Call Forwarding Don't Answer			
TELUS_TC58	Configure a Mobile Phone to Forward calls to a PSTN when Dont Answer. Mobile Phone to CFNA to TELUS PSTN Number IP PBX phone 1 calls Mobile Phone and should CFNA toTELUS PSTN Number 1. Confirm 2-way voice 2. Confirm phone 1 number and display at PSTN number	Pass	
Call Forwarding Unconditional			
TELUS_TC59	Configure IP PBX phone 1 to CFU to TELUS mobile client IP PBX phone 2 calls phone 1 and should CFU toTELUS mobile client 1. Confirm 2-way voice 2. Confirm phone 1 number and display at TELUS mobile client	Pass	
Voicemail			
TELUS_TC61	Repeat the test by setup the call with G.711 and G.729. IP PBX phone 1 calls TELUS mobile client Don't answer the call in the TELUS mobile client; after 4 ring, voicemail kick in Record a message Follow the prompt to play back the message Follow the prompt to cancel the recording then hang up	Pass	

Conference call			
TELUS_TC62	TELUS mobile client calls IP PBX phone 1 IP PBX phone 1 performs a conference call with IP PBX phone 2 Confirm audio among the parties	Pass	

DTMF			
TELUS_TC65	From PBX dial 4036929600 (conference bridge) When hearing the prompt, enter valid Telus conference code. Follow prompts and verify connected to conference bridge. Verify that pressed keys are recognized and successfully accessed conference bridge. Verify by calling to conference bridge from PSTN. Test Inband DTMF by programming PBX end point	Pass	
TELUS_TC66	From PBX dial 1-877-353-9586 When hearing the prompt, enter valid Telus conference code. Follow prompts and verify connected to conference bridge. Verify that pressed keys are recognized and successfully accessed conference bridge. Verify by calling to conference bridge from PSTN. Test RFC2833 by programming PBX endpoint	Pass	
Automatic Blocking			
TELUS_TC72	Automatic Blocking Feature to be setup for the SIP PBX in the switch. Call from SIP PBX to a Bell Land Line Number. 1. Confirm 2-way voice 2. Confirm the proper calling number (IPTR2 DID or Alternate Number from SIP PBX) is not shown 3. Confirm that SIP PBX is not sending out Name in the call.	NA	

Troubleshooting Tools

Wireshark

Wireshark is also a network protocol analyzer which is freely downloadable from www.wireshark.org.

On the Oracle E-SBC

The Oracle E-SBC provides a rich set of statistical counters available from the ACLI, 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 E-SBC Console:

```
SBC1# reset sipd
SBC1# notify sipd debug
SBC1#
enabled SIP Debugging
SBC1# notify all rotate-logs
```

Examining the log files

Note: You will FTP to the management interface of the E-SBC with the username user and user mode password (the default is "**acme**"

```
C:\Documents and Settings\user>ftp 192.168.1.22
Connected to 192.168.85.55.
220 SBC1 server (VxWorks 6.4) ready. User
(192.168.1.22:(none)): user
331 Password required for user.
Password: acme
230 User user logged in.
ftp> cd /opt/logs
250 CWD command successful.
ftp> get sipmsg.log
200 PORT command successful.
150 Opening ASCII mode data connection for '/opt/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 '/opt/logs/log.sipd' (204681
bytes).
226 Transfer complete.
ftp: 206823 bytes received in 0.11Seconds 1897.46Kbytes/sec
```

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 Enterprise Session Border Controller, and provides traces in a common log format for local viewing or for exporting to your PC. Please check the “Monitor and Trace” section (page 145) of the Web GUI User Guide available at http://docs.oracle.com/cd/E56581_01/index.htm

Appendix A

Full E-SBC Configuration

```
certificate-record
        name                                    ESBCCert1
        country                                 US
        state                                   MA
        locality                                Burlington
        organization                            Engineering
        unit
        common-name                             lync-acme-
sbc.teluscpslynclab.net
        key-size                                2048
        alternate-name
        trusted                                 enabled
        key-usage-list                          digitalSignature
                                                keyEncipherment
        extended-key-usage-list                 serverAuth
        options
certificate-record
        name                                    MediationRoot
        country                                 US
        state                                   MA
        locality                                Burlington
        organization                            Engineering
        unit
        common-name                             teluscpslynclab-DC1-LYNCLAB-CA-
1
        key-size                                2048
        alternate-name
        trusted                                 enabled
        key-usage-list                          digitalSignature
                                                keyEncipherment
        extended-key-usage-list                 serverAuth
        options
local-policy
        from-address                            *
        to-address                              *
        source-realm                            inside
        description
        activate-time
        deactivate-time
        state                                   enabled
        policy-priority                         none
        policy-attribute
                next-hop                                10.27.56.7
```

```
                realm                                   outside
                action                                  none
                terminate-recursion                     disabled
                carrier
                start-time                              0000
                end-time                                2400
                days-of-week                            U-S
                cost                                    0
                state                                   enabled
                app-protocol
                methods
                media-profiles
                lookup                                  single
                next-key
                eloc-str-lkup                           disabled
                eloc-str-match
local-policy
        from-address                            *
        to-address                              *
        source-realm                            outside
        description
        activate-time
        deactivate-time
        state                                   enabled
        policy-priority                         none
        policy-attribute
                next-hop                                SAG:med-grp-1
                realm                                   inside
                action                                  replace-uri
                terminate-recursion                     disabled
                carrier
                start-time                              0000
                end-time                                2400
                days-of-week                            U-S
                cost                                    0
                state                                   enabled
                app-protocol                            SIP
                methods
                media-profiles
                lookup                                  single
                next-key
                eloc-str-lkup                           disabled
                eloc-str-match
local-policy
        from-address                            *
        to-address                              fe0101.teluscpslynclab.net
        source-realm                            outside
        description
        activate-time
        deactivate-time
        state                                   enabled
        policy-priority                         none
        policy-attribute
                next-hop
fe0101.teluscpslynclab.net
                realm                                   inside
```

```
                action                                  replace-uri
                terminate-recursion                     disabled
                carrier
                start-time                              0000
                end-time                                2400
                days-of-week                            U-S
                cost                                    0
                state                                   enabled
                app-protocol
                methods
                media-profiles
                lookup                                  single
                next-key
                eloc-str-lkup                           disabled
                eloc-str-match
local-policy
        from-address                            *
        to-address                              fe0102.teluscpslynclab.net
        source-realm                            outside
        description
        activate-time
        deactivate-time
        state                                   enabled
        policy-priority                         none
        policy-attribute
                next-hop
fe0102.teluscpslynclab.net
                realm                                   inside
                action                                  replace-uri
                terminate-recursion                     disabled
                carrier
                start-time                              0000
                end-time                                2400
                days-of-week                            U-S
                cost                                    0
                state                                   enabled
                app-protocol
                methods
                media-profiles
                lookup                                  single
                next-key
                eloc-str-lkup                           disabled
                eloc-str-match
local-policy
        from-address                            *
        to-address                              fe0103.teluscpslynclab.net
        source-realm                            outside
        description
        activate-time
        deactivate-time
        state                                   enabled
        policy-priority                         none
        policy-attribute
                next-hop
fe0103.teluscpslynclab.net
                realm                                   inside
                action                                  replace-uri
```

```
                terminate-recursion                     disabled
                carrier
                start-time                              0000
                end-time                                2400
                days-of-week                            U-S
                cost                                    0
                state                                   enabled
                app-protocol
                methods
                media-profiles
                lookup                                  single
                next-key
                eloc-str-lkup                           disabled
                eloc-str-match
media-manager
        state                                   enabled
        latching                                enabled
        flow-time-limit                         86400
        initial-guard-timer                     300
        subsq-guard-timer                       300
        tcp-flow-time-limit                     86400
        tcp-initial-guard-timer                 300
        tcp-subsq-guard-timer                   300
        tcp-number-of-ports-per-flow            2
        hnt-rtcp                                disabled
        algd-log-level                          NOTICE
        mbcd-log-level                          NOTICE
        options
        red-flow-port                           1985
        red-mgcp-port                           1986
        red-max-trans                           10000
        red-sync-start-time                     5000
        red-sync-comp-time                      1000
        media-policing                          enabled
        max-untrusted-packet-rate               50000
        max-trusted-packet-rate                 50000
        max-arp-packet-rate                     1000
        tolerance-window                        30
        trap-on-demote-to-deny                  disabled
        trap-on-demote-to-untrusted             disabled
        syslog-on-demote-to-deny                disabled
        syslog-on-demote-to-untrusted           disabled
        rtcp-rate-limit                         0
        anonymous-sdp                           disabled
        rfc2833-timestamp                       disabled
        default-2833-duration                   100
        rfc2833-end-pkts-only-for-non-sig       enabled
        translate-non-rfc2833-event             disabled
        media-supervision-traps                 disabled
        dnsalg-server-failover                  disabled
        syslog-on-call-reject                   disabled
media-sec-policy
        name                                    rtponly
        pass-through                            disabled
        options
        inbound
```

```
                profile
                mode                                    rtp
                protocol                                none
        outbound
                profile
                mode                                    rtp
                protocol                                none
media-sec-policy
        name                                    sdespolicy
        pass-through                            disabled
        options
        inbound
                profile                                 sdes1
                mode                                    srtp
                protocol                                sdes
        outbound
                profile                                 sdes1
                mode                                    srtp
                protocol                                sdes
network-interface
        name                                    s0p0
        sub-port-id                             0
        description                             Outside/Untrusted
        hostname
        ip-address                              172.16.153.34
        pri-utility-addr                        172.16.153.2
        sec-utility-addr                        172.16.153.3
        netmask                                 255.255.255.0
        gateway                                 172.16.153.1
        sec-gateway
        gw-heartbeat
                state                                   disabled
                heartbeat                               0
                retry-count                             0
                retry-timeout                           1
                health-score                            0
        dns-ip-primary
        dns-ip-backup1
        dns-ip-backup2
        dns-domain
        dns-timeout                             11
        signaling-mtu                           0
        hip-ip-list
        ftp-address
        icmp-address
        snmp-address
        telnet-address
        ssh-address
network-interface
        name                                    s1p0
        sub-port-id                             0
        description                             Inside/Trusted
        hostname
        ip-address                              172.16.154.35
        pri-utility-addr                        172.16.154.2
        sec-utility-addr                        172.16.154.3
```

```
        netmask                                 255.255.255.0
        gateway                                 172.16.154.1
        sec-gateway
        gw-heartbeat
                state                                   disabled
                heartbeat                               0
                retry-count                             0
                retry-timeout                           1
                health-score                            0
        dns-ip-primary
        dns-ip-backup1
        dns-ip-backup2
        dns-domain
        dns-timeout                             11
        signaling-mtu                           0
        hip-ip-list
        ftp-address
        icmp-address
        snmp-address
        telnet-address
        ssh-address
network-interface
        name                                    wancom1
        sub-port-id                             0
        description                             HA HEARTBEAT1
        hostname
        ip-address
        pri-utility-addr                        169.254.1.1
        sec-utility-addr                        169.254.1.2
        netmask                                 255.255.255.252
        gateway
        sec-gateway
        gw-heartbeat
                state                                   disabled
                heartbeat                               0
                retry-count                             0
                retry-timeout                           1
                health-score                            0
        dns-ip-primary
        dns-ip-backup1
        dns-ip-backup2
        dns-domain
        dns-timeout                             11
        hip-ip-list
        ftp-address
        icmp-address
        snmp-address
        telnet-address
        ssh-address
network-interface
        name                                    wancom2
        sub-port-id                             0
        description                             HA HEARTBEAT2
        hostname
        ip-address
        pri-utility-addr                        169.254.2.1
```

```
        sec-utility-addr                        169.254.2.2
        netmask                                 255.255.255.252
        gateway
        sec-gateway
        gw-heartbeat
                state                                   disabled
                heartbeat                               0
                retry-count                             0
                retry-timeout                           1
                health-score                            0
        dns-ip-primary
        dns-ip-backup1
        dns-ip-backup2
        dns-domain
        dns-timeout                             11
        hip-ip-list
        ftp-address
        icmp-address
        snmp-address
        telnet-address
        ssh-address
        server
phy-interface
        name                                    s0p0
        operation-type                          Media
        port                                    0
        slot                                    0
        virtual-mac
        admin-state                             enabled
        auto-negotiation                        enabled
        duplex-mode                             FULL
        speed                                   100
        wancom-health-score                     50
        overload-protection                     disabled
phy-interface
        name                                    s1p0
        operation-type                          Media
        port                                    0
        slot                                    1
        virtual-mac
        admin-state                             enabled
        auto-negotiation                        enabled
        duplex-mode                             FULL
        speed                                   100
        wancom-health-score                     50
        overload-protection                     disabled
realm-config
        identifier                              inside
        description
        addr-prefix                             0.0.0.0
        network-interfaces                      s0p0:0
        mm-in-realm                             disabled
        mm-in-network                           enabled
        mm-same-ip                              enabled
        mm-in-system                            enabled
        bw-cac-non-mm                           disabled
```

```
msm-release                          disabled
qos-enable                           disabled
max-bandwidth                        0
fallback-bandwidth                   0
max-priority-bandwidth               0
max-latency                          0
max-jitter                           0
max-packet-loss                      0
observ-window-size                   0
parent-realm
dns-realm
media-policy
media-sec-policy                     sdespolicy
srtp-msm-passthrough                 disabled
class-profile
in-translationid
out-translationid
in-manipulationid
out-manipulationid
average-rate-limit                   0
access-control-trust-level           none
invalid-signal-threshold             0
maximum-signal-threshold             0
untrusted-signal-threshold           0
nat-trust-threshold                  0
max-endpoints-per-nat                0
nat-invalid-message-threshold        0
wait-time-for-invalid-register       0
deny-period                          30
cac-failure-threshold                0
untrust-cac-failure-threshold        0
ext-policy-svr
diam-e2-address-realm
subscription-id-type                 END USER NONE
symmetric-latching                   disabled
pai-strip                            disabled
trunk-context
device-id
early-media-allow
enforcement-profile
additional-prefixes
restricted-latching                  none
restriction-mask                     32
user-cac-mode                        none
user-cac-bandwidth                   0
user-cac-sessions                    0
icmp-detect-multiplier               0
icmp-advertisement-interval          0
icmp-target-ip
monthly-minutes                      0
options
spl-options
accounting-enable                    enabled
net-management-control               disabled
delay-media-update                   disabled
refer-call-transfer                  disabled
```

```
        refer-notify-provisional              none
        dyn-refer-term                        disabled
        codec-policy
        codec-manip-in-realm                  disabled
        codec-manip-in-network                enabled
        rtcp-policy
        constraint-name
        session-recording-server
        session-recording-required            disabled
        manipulation-string
        manipulation-pattern
        stun-enable                           disabled
        stun-server-ip                        0.0.0.0
        stun-server-port                      3478
        stun-changed-ip                       0.0.0.0
        stun-changed-port                     3479
        sip-profile
        sip-isup-profile
        match-media-profiles
        qos-constraint
        block-rtcp                            disabled
        hide-egress-media-update              disabled
        tcp-media-profile
        monitoring-filters
        node-functionality
        default-location-string
        alt-family-realm
        pref-addr-type                        none
realm-config
        identifier                            outside
        description
        addr-prefix                           0.0.0.0
        network-interfaces                    s0p1:0
        mm-in-realm                           disabled
        mm-in-network                         enabled
        mm-same-ip                            enabled
        mm-in-system                          enabled
        bw-cac-non-mm                         disabled
        msm-release                           disabled
        qos-enable                            disabled
        max-bandwidth                         0
        fallback-bandwidth                    0
        max-priority-bandwidth                0
        max-latency                           0
        max-jitter                            0
        max-packet-loss                       0
        observ-window-size                    0
        parent-realm
        dns-realm
        media-policy
        media-sec-policy                      rtponly
        srtp-msm-passthrough                  disabled
        class-profile
        in-translationid
        out-translationid
        in-manipulationid
```

```
out-manipulationid
average-rate-limit                      0
access-control-trust-level              none
invalid-signal-threshold                0
maximum-signal-threshold                0
untrusted-signal-threshold              0
nat-trust-threshold                     0
max-endpoints-per-nat                   0
nat-invalid-message-threshold           0
wait-time-for-invalid-register          0
deny-period                             30
cac-failure-threshold                   0
untrust-cac-failure-threshold           0
ext-policy-svr
diam-e2-address-realm
subscription-id-type                    END USER NONE
symmetric-latching                      disabled
pai-strip                               disabled
trunk-context
device-id
early-media-allow
enforcement-profile
additional-prefixes
restricted-latching                     none
restriction-mask                        32
user-cac-mode                           none
user-cac-bandwidth                      0
user-cac-sessions                       0
icmp-detect-multiplier                  0
icmp-advertisement-interval             0
icmp-target-ip
monthly-minutes                         0
options
spl-options
accounting-enable                       enabled
net-management-control                  disabled
delay-media-update                      disabled
refer-call-transfer                     disabled
refer-notify-provisional                none
dyn-refer-term                          disabled
codec-policy
codec-manip-in-realm                    disabled
codec-manip-in-network                  enabled
rtcp-policy
constraint-name
session-recording-server
session-recording-required              disabled
manipulation-string
manipulation-pattern
stun-enable                             disabled
stun-server-ip                          0.0.0.0
stun-server-port                        3478
stun-changed-ip                         0.0.0.0
stun-changed-port                       3479
sip-profile
sip-isup-profile
```

```
        match-media-profiles
        qos-constraint
        block-rtcp                              disabled
        hide-egress-media-update                disabled
        tcp-media-profile
        monitoring-filters
        node-functionality
        default-location-string
        alt-family-realm
        pref-addr-type                          none
        last-modified-by                        admin@192.168.20.104
        last-modified-date                      2015-07-24 02:16:49
sdes-profile
        name                                    sdes1
        crypto-list                             AES CM 128 HMAC SHA1 80
                                                AES CM 128 HMAC SHA1 32
        srtp-auth                               enabled
        srtp-encrypt                            enabled
        srtcp-encrypt                           enabled
        mki                                     disabled
        egress-offer-format                     simultaneous-best-effort
        use-ingress-session-params
        options
        key
        salt
session-agent
        hostname                                10.27.56.7
        ip-address                              10.27.56.7
        port                                    5060
        state                                   enabled
        app-protocol                            SIP
        app-type
        transport-method                        UDP
        realm-id                                outside
        egress-realm-id
        description
        carriers
        allow-next-hop-lp                       enabled
        constraints                             disabled
        max-sessions                            0
        max-inbound-sessions                    0
        max-outbound-sessions                   0
        max-burst-rate                          0
        max-inbound-burst-rate                  0
        max-outbound-burst-rate                 0
        max-sustain-rate                        0
        max-inbound-sustain-rate                0
        max-outbound-sustain-rate               0
        min-seizures                            5
        min-asr                                 0
        time-to-resume                          0
        ttr-no-response                         0
        in-service-period                       0
        burst-rate-window                       0
        sustain-rate-window                     0
        req-uri-carrier-mode                    None
```

```
        proxy-mode
        redirect-action
        loose-routing                           enabled
        send-media-session                      enabled
        response-map
        ping-method                             OPTIONS
        ping-interval                           90
        ping-send-mode                          keep-alive
        ping-all-addresses                      disabled
        ping-in-service-response-codes
        out-service-response-codes
        load-balance-dns-query                  hunt
        options
        spl-options
        media-profiles
        in-translationid
        out-translationid
        trust-me                                disabled
        request-uri-headers
        stop-recurse
        local-response-map
        ping-to-user-part
        ping-from-user-part
        in-manipulationid
        out-manipulationid                      To Telus
        manipulation-string
        manipulation-pattern
        p-asserted-id
        trunk-group
        max-register-sustain-rate               0
        early-media-allow
        invalidate-registrations                disabled
        rfc2833-mode                            none
        rfc2833-payload                         0
        codec-policy
        enforcement-profile
        refer-call-transfer                     disabled
        refer-notify-provisional                none
        reuse-connections                       NONE
        tcp-keepalive                           none
        tcp-reconn-interval                     0
        max-register-burst-rate                 0
        register-burst-window                   0
        sip-profile
        sip-isup-profile
        kpml-interworking                       inherit
        monitoring-filters
        session-recording-server
        session-recording-required              disabled
session-agent
        hostname                                fe0101.teluscpslynclab.net
        ip-address                              172.16.149.38
        port                                    5067
        state                                   enabled
        app-protocol                            SIP
        app-type
```

```
        transport-method                        StaticTLS
        realm-id                                inside
        egress-realm-id
        description
        carriers
        allow-next-hop-lp                       enabled
        constraints                             disabled
        max-sessions                            0
        max-inbound-sessions                    0
        max-outbound-sessions                   0
        max-burst-rate                          0
        max-inbound-burst-rate                  0
        max-outbound-burst-rate                 0
        max-sustain-rate                        0
        max-inbound-sustain-rate                0
        max-outbound-sustain-rate               0
        min-seizures                            5
        min-asr                                 0
        time-to-resume                          0
        ttr-no-response                         0
        in-service-period                       0
        burst-rate-window                       0
        sustain-rate-window                     0
        req-uri-carrier-mode                    None
        proxy-mode
        redirect-action
        loose-routing                           enabled
        send-media-session                      enabled
        response-map
        ping-method
        ping-interval                           60
        ping-send-mode                          keep-alive
        ping-all-addresses                      disabled
        ping-in-service-response-codes
        out-service-response-codes
        load-balance-dns-query                  hunt
        options
        spl-options
        media-profiles
        in-translationid
        out-translationid
        trust-me                                disabled
        request-uri-headers
        stop-recurse
        local-response-map
        ping-to-user-part
        ping-from-user-part
        in-manipulationid
        out-manipulationid
        manipulation-string
        manipulation-pattern
        p-asserted-id
        trunk-group
        max-register-sustain-rate               0
        early-media-allow
        invalidate-registrations                disabled
```

```
        rfc2833-mode                          none
        rfc2833-payload                       0
        codec-policy
        enforcement-profile
        refer-call-transfer                   enabled
        refer-notify-provisional              none
        reuse-connections                     NONE
        tcp-keepalive                         none
        tcp-reconn-interval                   0
        max-register-burst-rate               0
        register-burst-window                 0
        sip-profile
        sip-isup-profile
        kpml-interworking                     inherit
        monitoring-filters
        auth-attributes
                auth-realm                            Realm
                username                              user123456
                password                              ********
                in-dialog-methods                     INVITE
        session-recording-server
        session-recording-required            disabled
session-agent
        hostname                              fe0102.teluscpslynclab.net
        ip-address                            172.16.149.39
        port                                  5067
        state                                 enabled
        app-protocol                          SIP
        app-type
        transport-method                      StaticTLS
        realm-id                              inside
        egress-realm-id
        description
        carriers
        allow-next-hop-lp                     enabled
        constraints                           disabled
        max-sessions                          0
        max-inbound-sessions                  0
        max-outbound-sessions                 0
        max-burst-rate                        0
        max-inbound-burst-rate                0
        max-outbound-burst-rate               0
        max-sustain-rate                      0
        max-inbound-sustain-rate              0
        max-outbound-sustain-rate             0
        min-seizures                          5
        min-asr                               0
        time-to-resume                        0
        ttr-no-response                       0
        in-service-period                     0
        burst-rate-window                     0
        sustain-rate-window                   0
        req-uri-carrier-mode                  None
        proxy-mode
        redirect-action
        loose-routing                         enabled
```

```
        send-media-session                      enabled
        response-map
        ping-method
        ping-interval                           60
        ping-send-mode                          keep-alive
        ping-all-addresses                      disabled
        ping-in-service-response-codes
        out-service-response-codes
        load-balance-dns-query                  hunt
        options
        spl-options
        media-profiles
        in-translationid
        out-translationid
        trust-me                                disabled
        request-uri-headers
        stop-recurse
        local-response-map
        ping-to-user-part
        ping-from-user-part
        in-manipulationid
        out-manipulationid
        manipulation-string
        manipulation-pattern
        p-asserted-id
        trunk-group
        max-register-sustain-rate               0
        early-media-allow
        invalidate-registrations                disabled
        rfc2833-mode                            none
        rfc2833-payload                         0
        codec-policy
        enforcement-profile
        refer-call-transfer                     enabled
        refer-notify-provisional                none
        reuse-connections                       NONE
        tcp-keepalive                           none
        tcp-reconn-interval                     0
        max-register-burst-rate                 0
        register-burst-window                   0
        sip-profile
        sip-isup-profile
        kpml-interworking                       inherit
        monitoring-filters
        auth-attributes
                auth-realm                              Realm
                username                                user123456
                password                                ********
                in-dialog-methods                       INVITE
        session-recording-server
        session-recording-required              disabled
session-agent
        hostname                                fe0103.teluscpslynclab.net
        ip-address                              172.16.149.40
        port                                    5067
        state                                   enabled
```

```
app-protocol                          SIP
app-type
transport-method                      StaticTLS
realm-id                              inside
egress-realm-id
description
carriers
allow-next-hop-lp                     enabled
constraints                           disabled
max-sessions                          0
max-inbound-sessions                  0
max-outbound-sessions                 0
max-burst-rate                        0
max-inbound-burst-rate                0
max-outbound-burst-rate               0
max-sustain-rate                      0
max-inbound-sustain-rate              0
max-outbound-sustain-rate             0
min-seizures                          5
min-asr                               0
time-to-resume                        0
ttr-no-response                       0
in-service-period                     0
burst-rate-window                     0
sustain-rate-window                   0
req-uri-carrier-mode                  None
proxy-mode
redirect-action
loose-routing                         enabled
send-media-session                    enabled
response-map
ping-method
ping-interval                         60
ping-send-mode                        keep-alive
ping-all-addresses                    disabled
ping-in-service-response-codes
out-service-response-codes
load-balance-dns-query                hunt
options
spl-options
media-profiles
in-translationid
out-translationid
trust-me                              disabled
request-uri-headers
stop-recurse
local-response-map
ping-to-user-part
ping-from-user-part
in-manipulationid
out-manipulationid
manipulation-string
manipulation-pattern
p-asserted-id
trunk-group
max-register-sustain-rate             0
```

```
        early-media-allow
        invalidate-registrations                disabled
        rfc2833-mode                            none
        rfc2833-payload                         0
        codec-policy
        enforcement-profile
        refer-call-transfer                     enabled
        refer-notify-provisional                none
        reuse-connections                       NONE
        tcp-keepalive                           none
        tcp-reconn-interval                     0
        max-register-burst-rate                 0
        register-burst-window                   0
        sip-profile
        sip-isup-profile
        kpml-interworking                       inherit
        monitoring-filters
        auth-attributes
                auth-realm                              Realm
                username                                user123456
                password                                ********
                in-dialog-methods                       INVITE
        session-recording-server
        session-recording-required              disabled
session-group
        group-name                              med-grp-1
        description                             Lync Mediation server group
        state                                   enabled
        app-protocol                            SIP
        strategy                                Hunt
        dest                                    fe0101.teluscpslynclab.net
                                                fe0102.teluscpslynclab.net
                                                fe0103.teluscpslynclab.net
        trunk-group
        sag-recursion                           disabled
        stop-sag-recurse                        401,407
        last-modified-by                        admin@172.21.0.93
        last-modified-date                      2015-05-14 19:51:34
sip-config
        state                                   enabled
        operation-mode                          dialog
        dialog-transparency                     enabled
        home-realm-id                           inside
        egress-realm-id
        auto-realm-id
        nat-mode                                None
        registrar-domain                        *
        registrar-host                          *
        registrar-port                          0
        register-service-route                  always
        init-timer                              500
        max-timer                               4000
        trans-expire                            32
        initial-inv-trans-expire                0
        invite-expire                           180
        inactive-dynamic-conn                   32
```

```
        enforcement-profile
        pac-method
        pac-interval                        10
        pac-strategy                        PropDist
        pac-load-weight                     1
        pac-session-weight                  1
        pac-route-weight                    1
        pac-callid-lifetime                 600
        pac-user-lifetime                   3600
        red-sip-port                        1988
        red-max-trans                       10000
        red-sync-start-time                 5000
        red-sync-comp-time                  1000
        options                             max-udp-length=0
        add-reason-header                   disabled
        sip-message-len                     4096
        enum-sag-match                      disabled
        extra-method-stats                  disabled
        extra-enum-stats                    disabled
        rph-feature                         disabled
        nsep-user-sessions-rate             0
        nsep-sa-sessions-rate               0
        registration-cache-limit            0
        register-use-to-for-lp              disabled
        refer-src-routing                   disabled
        add-ucid-header                     disabled
        proxy-sub-events
        allow-pani-for-trusted-only         disabled
        atcf-stn-sr
        atcf-psi-dn
        atcf-route-to-sccas                 disabled
        eatf-stn-sr
        pass-gruu-contact                   disabled
        sag-lookup-on-redirect              disabled
        set-disconnect-time-on-bye          disabled
        msrp-delayed-bye-timer              15
        transcoding-realm
        transcoding-agents
        create-dynamic-sa                   disabled
        node-functionality                  P-CSCF
        last-modified-by                    admin@172.21.0.93
        last-modified-date                  2015-05-29 20:46:50
sip-interface
        state                               enabled
        realm-id                            inside
        description
        sip-port
                address                             172.16.153.34
                port                                5066
                transport-protocol                  TLS
                tls-profile                         Core
                allow-anonymous                     agents-only
                multi-home-addrs
                ims-aka-profile
        carriers
        trans-expire                        0
```

```
        initial-inv-trans-expire                0
        invite-expire                           0
        max-redirect-contacts                   0
        proxy-mode
        redirect-action
        contact-mode                            none
        nat-traversal                           none
        nat-interval                            30
        tcp-nat-interval                        90
        registration-caching                    enabled
        min-reg-expire                          300
        registration-interval                   3600
        route-to-registrar                      disabled
        secured-network                         disabled
        teluri-scheme                           disabled
        uri-fqdn-domain
        options
        spl-options
        trust-mode                              all
        max-nat-interval                        3600
        nat-int-increment                       10
        nat-test-increment                      30
        sip-dynamic-hnt                         disabled
        stop-recurse                            401,407
        port-map-start                          0
        port-map-end                            0
        in-manipulationid
        out-manipulationid
        sip-ims-feature                         disabled
        sip-atcf-feature                        disabled
        subscribe-reg-event                     disabled
        operator-identifier
        anonymous-priority                      none
        max-incoming-conns                      0
        per-src-ip-max-incoming-conns           0
        inactive-conn-timeout                   0
        untrusted-conn-timeout                  0
        network-id
        ext-policy-server
        ldap-policy-server
        default-location-string
        term-tgrp-mode                          none
        charging-vector-mode                    pass
        charging-function-address-mode          pass
        ccf-address
        ecf-address
        implicit-service-route                  disabled
        rfc2833-payload                         101
        rfc2833-mode                            transparent
        constraint-name
        response-map
        local-response-map
        ims-aka-feature                         disabled
        enforcement-profile
        route-unauthorized-calls
        tcp-keepalive                           none
```

```
        add-sdp-invite                          disabled
        add-sdp-profiles
        manipulation-string
        manipulation-pattern
        sip-profile
        sip-isup-profile
        tcp-conn-dereg                          0
        tunnel-name
        register-keep-alive                     none
        kpml-interworking                       disabled
        msrp-delay-egress-bye                   disabled
        send-380-response
        pcscf-restoration
        session-timer-profile
        session-recording-server
        session-recording-required              disabled
        service-tag
sip-interface
        state                                   enabled
        realm-id                                outside
        description
        sip-port
                address                                 172.16.154.35
                port                                    5060
                transport-protocol                      UDP
                tls-profile
                allow-anonymous                         all
                multi-home-addrs
                ims-aka-profile
        sip-port
                address                                 172.16.154.35
                port                                    5061
                transport-protocol                      TLS
                tls-profile                             Outside
                allow-anonymous                         agents-only
                multi-home-addrs
                ims-aka-profile
        carriers
        trans-expire                            0
        initial-inv-trans-expire                0
        invite-expire                           0
        max-redirect-contacts                   0
        proxy-mode
        redirect-action
        contact-mode                            none
        nat-traversal                           none
        nat-interval                            30
        tcp-nat-interval                        90
        registration-caching                    disabled
        min-reg-expire                          300
        registration-interval                   3600
        route-to-registrar                      disabled
        secured-network                         disabled
        teluri-scheme                           disabled
        uri-fqdn-domain
        options
```

```
        spl-options
        trust-mode                          all
        max-nat-interval                    3600
        nat-int-increment                   10
        nat-test-increment                  30
        sip-dynamic-hnt                     disabled
        stop-recurse                        401,407
        port-map-start                      0
        port-map-end                        0
        in-manipulationid
        out-manipulationid
        sip-ims-feature                     disabled
        sip-atcf-feature                    disabled
        subscribe-reg-event                 disabled
        operator-identifier
        anonymous-priority                  none
        max-incoming-conns                  0
        per-src-ip-max-incoming-conns       0
        inactive-conn-timeout               0
        untrusted-conn-timeout              0
        network-id
        ext-policy-server
        ldap-policy-server
        default-location-string
        term-tgrp-mode                      none
        charging-vector-mode                pass
        charging-function-address-mode      pass
        ccf-address
        ecf-address
        implicit-service-route              disabled
        rfc2833-payload                     101
        rfc2833-mode                        transparent
        constraint-name
        response-map
        local-response-map
        ims-aka-feature                     disabled
        enforcement-profile
        route-unauthorized-calls
        tcp-keepalive                       none
        add-sdp-invite                      disabled
        add-sdp-profiles
        manipulation-string
        manipulation-pattern
        sip-profile
        sip-isup-profile
        tcp-conn-dereg                      0
        tunnel-name
        register-keep-alive                 none
        kpml-interworking                   disabled
        msrp-delay-egress-bye               disabled
        send-380-response
        pcscf-restoration
        session-timer-profile
        session-recording-server
        session-recording-required          disabled
        service-tag
```

```
sip-manipulation
        name                                    To Telus
        description
        split-headers
        join-headers
        header-rule
                name                                    save PAI
                header-name                             P-Asserted-Identity
                action                                  store
                comparison-type                         case-sensitive
                msg-type                                any
                methods
                match-value
                new-value
        header-rule
                name                                    Updt PAI
                header-name                             P-Asserted-Identity
                action                                  add
                comparison-type                         boolean
                msg-type                                any
                methods                                 INVITE
                match-value                             !$save PAI
                new-value
<sip:2223334444@ipinet4.com;user=phone>
        header-rule
                name                                    Updt RURI
                header-name                             request-uri
                action                                  manipulate
                comparison-type                         case-sensitive
                msg-type                                any
                methods
                match-value
                new-value
                element-rule
                        name                                    Udpt URI Host
                        parameter-name
                        type                                    uri-host
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         case-sensitive
                        match-value
                        new-value                               ipinet4.com
        header-rule
                name                                    Updt To
                header-name                             To
                action                                  manipulate
                comparison-type                         case-sensitive
                msg-type                                any
                methods
                match-value
                new-value
                element-rule
                        name                                    UPdt URI host
                        parameter-name
                        type                                    uri-host
                        action                                  replace
```

```
                match-val-type                          any
                comparison-type                         case-sensitive
                match-value
                new-value                               ipinet4.com
        header-rule
                name                                    Updt From
                header-name                             From
                action                                  manipulate
                comparison-type                         case-sensitive
                msg-type                                any
                methods
                match-value
                new-value
                element-rule
                        name                            Updt URI host
                        parameter-name
                        type                            uri-host
                        action                          replace
                        match-val-type                  any
                        comparison-type                 case-sensitive
                        match-value
                        new-value                       ipinet4.com
        header-rule
                name                                    Updt Contact
                header-name                             Contact
                action                                  manipulate
                comparison-type                         case-sensitive
                msg-type                                any
                methods
                match-value
                new-value
                element-rule
                        name                            Updt URI Host
                        parameter-name
                        type                            uri-host
                        action                          replace
                        match-val-type                  any
                        comparison-type                 case-sensitive
                        match-value
                        new-value                       $LOCAL IP
                element-rule
                        name                            Del MSOpaque
                        parameter-name                  ms-opaque
                        type                            uri-param
                        action                          delete-element
                        match-val-type                  any
                        comparison-type                 case-sensitive
                        match-value
                        new-value
        header-rule
                name                                    CheckPrivacy
                header-name                             request-uri
                action                                  store
                comparison-type                         case-sensitive
                msg-type                                any
                methods                                 INVITE
```

```
                match-value
                new-value
                element-rule
                        name                                    CheckStar67
                        parameter-name
                        type                                    uri-user
                        action                                  store
                        match-val-type                          any
                        comparison-type                         pattern-rule
                        match-value                             \*67\d+
                        new-value
        header-rule
                name                                    AddPrivacyHdr
                header-name                             Privacy
                action                                  add
                comparison-type                         boolean
                msg-type                                request
                methods                                 INVITE
                match-value
$CheckPrivacy.$CheckStar67
                new-value                               id
        header-rule
                name                                    updateRURI
                header-name                             request-uri
                action                                  manipulate
                comparison-type                         pattern-rule
                msg-type                                request
                methods                                 INVITE
                match-value
                new-value
                element-rule
                        name                                    updateRURIUser
                        parameter-name
                        type                                    uri-user
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         pattern-rule
                        match-value                             \*67(.*)
                        new-value                               $1
        header-rule
                name                                    updateTO
                header-name                             To
                action                                  manipulate
                comparison-type                         pattern-rule
                msg-type                                request
                methods                                 INVITE
                match-value
                new-value
                element-rule
                        name                                    updateTOUsr
                        parameter-name
                        type                                    uri-user
                        action                                  replace
                        match-val-type                          any
                        comparison-type                         pattern-rule
                        match-value                             \*67(.*)
```

```
                        new-value                               $1
        header-rule
                name                                    StoreFromTag
                header-name                             From
                action                                  store
                comparison-type                         case-sensitive
                msg-type                                request
                methods                                 INVITE
                match-value
                new-value
                element-rule
                        name                                    storeTag
                        parameter-name                          tag
                        type                                    header-param
                        action                                  store
                        match-val-type                          any
                        comparison-type                         case-sensitive
                        match-value
                        new-value
        header-rule
                name                                    ChgFromPrivacy
                header-name                             From
                action                                  manipulate
                comparison-type                         boolean
                msg-type                                request
                methods                                 INVITE
                match-value
$CheckPrivacy.$CheckStar67
                new-value                               "\"Anonymous\"
<sip:anonymous@anonymous.invalid>; tag="+$StoreFromTag.$storeTag.$0
sip-monitoring
        match-any-filter                        disabled
        state                                   enabled
        short-session-duration                  0
        monitoring-filters                      *
        trigger-window                          30
steering-pool
        ip-address                              172.16.153.34
        start-port                              40000
        end-port                                60000
        realm-id                                inside
        network-interface
steering-pool
        ip-address                              172.16.154.35
        start-port                              49152
        end-port                                57500
        realm-id                                outside
        network-interface
surrogate-agent
        register-host                           ipinet4.com
        register-user                           user123456
        description
        realm-id                                inside
        state                                   enabled
        customer-host                           172.16.154.35
        customer-next-hop                       10.27.154.35
        register-contact-host                   ipinet4.com
```

```
        register-contact-user                   user123456
        password                                pass123456
        register-expires                        300
        replace-contact                         disabled
        options
        route-to-registrar                      enabled
        aor-count                               1
        auth-user                               user123456
        max-register-attempts                   10
        register-retry-time                     30
        count-start                             1
        register-mode                           automatic
        triggered-inactivity-interval           30
        triggered-oos-response                  503
system-config
        hostname
        description
        location
        mib-system-contact
        mib-system-name
        mib-system-location
        snmp-enabled                            enabled
        enable-snmp-auth-traps                  disabled
        enable-snmp-syslog-notify               disabled
        enable-snmp-monitor-traps               disabled
        enable-env-monitor-traps                disabled
        snmp-syslog-his-table-length            1
        snmp-syslog-level                       WARNING
        system-log-level                        WARNING
        process-log-level                       NOTICE
        process-log-ip-address                  0.0.0.0
        process-log-port                        0
        collect
                sample-interval                         5
                push-interval                           15
                boot-state                              disabled
                start-time                              now
                end-time                                never
                red-collect-state                       disabled
                red-max-trans                           1000
                red-sync-start-time                     5000
                red-sync-comp-time                      1000
                push-success-trap-state                 disabled
        comm-monitor
                state                                   disabled
                sbc-grp-id                              0
                tls-profile
                qos-enable                              enabled
        call-trace                              disabled
        internal-trace                          disabled
        log-filter                              all
        default-gateway                         172.16.0.254
        restart                                 enabled
        exceptions
        telnet-timeout                          0
        console-timeout                         0
```

```
        remote-control                          enabled
        cli-audit-trail                         enabled
        link-redundancy-state                   disabled
        source-routing                          disabled
        cli-more                                disabled
        terminal-height                         24
        debug-timeout                           0
        trap-event-lifetime                     0
        ids-syslog-facility                     -1
        options
        default-v6-gateway                      ::
        ipv6-signaling-mtu                      1500
        ipv4-signaling-mtu                      1500
        cleanup-time-of-day                     00:00
        snmp-engine-id-suffix
        snmp-agent-mode                         v1v2
tls-profile
        name                                    Core
        end-entity-certificate                  ESBCCert1
        trusted-ca-certificates                 MediationRoot
        cipher-list                             ALL
        verify-depth                            10
        mutual-authenticate                     disabled
        tls-version                             compatibility
        options
        cert-status-check                       disabled
        cert-status-profile-list
        ignore-dead-responder                   disabled
        allow-self-signed-cert                  disabled
        last-modified-by                        admin@192.168.20.105
        last-modified-date                      2015-07-29 18:45:51
tls-profile
        name                                    Outside
        end-entity-certificate                  ESBCCert1
        trusted-ca-certificates                 ESBCCert1
        cipher-list                             ALL
        verify-depth                            10
        mutual-authenticate                     disabled
        tls-version                             compatibility
        options
        cert-status-check                       disabled
        cert-status-profile-list
        ignore-dead-responder                   disabled
        allow-self-signed-cert                  disabled
web-server-config
        state                                   enabled
        inactivity-timeout                      5
        http-state                              enabled
        http-port                               80
        https-state                             disabled
        https-port                              443
        tls-profile
```

Appendix B

Accessing the ACLI

Access to the ACLI is provided by:

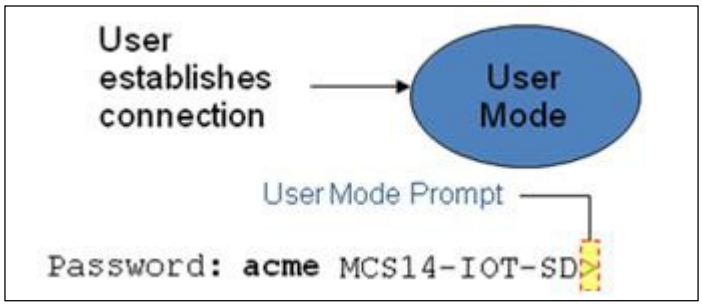
- The serial console connection;
- TELNET, which is enabled by default but may be disabled; and
- SSH, this must be explicitly configured.

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

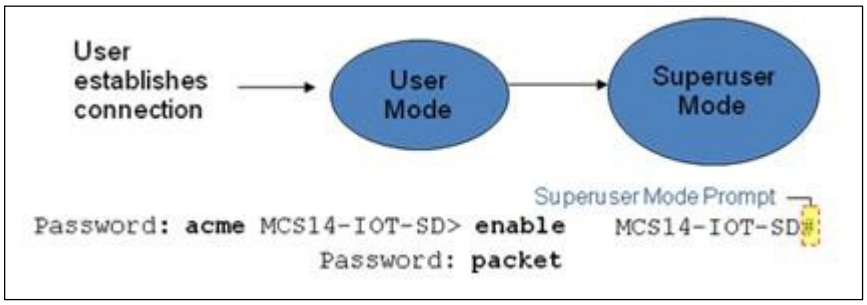
ACLI Basics

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

When you establish a connection to the E-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.



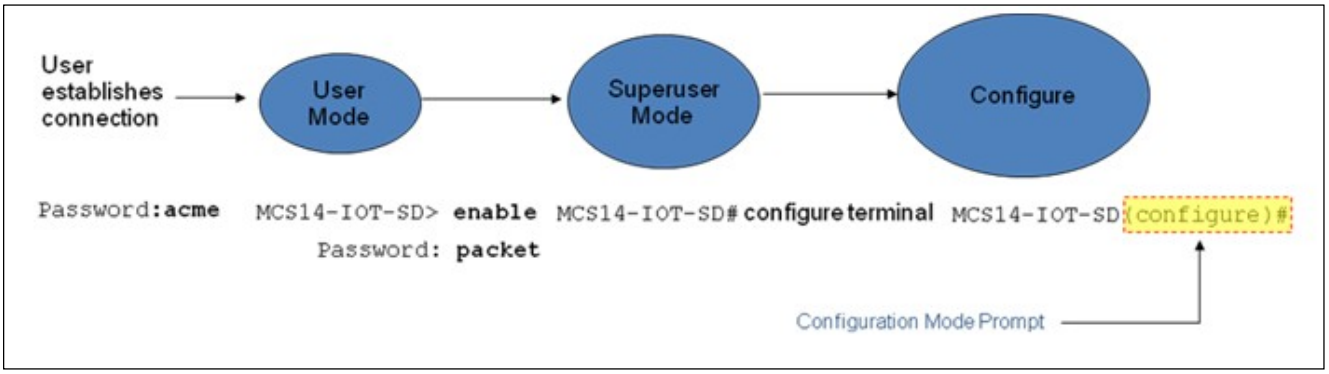
The Superuser mode allows for access to all system commands for operation, maintenance, and administration. This mode is identified by the pound sign (#) in the prompt after the target name. To enter the Superuser mode, issue the enable command in the User mode.



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.

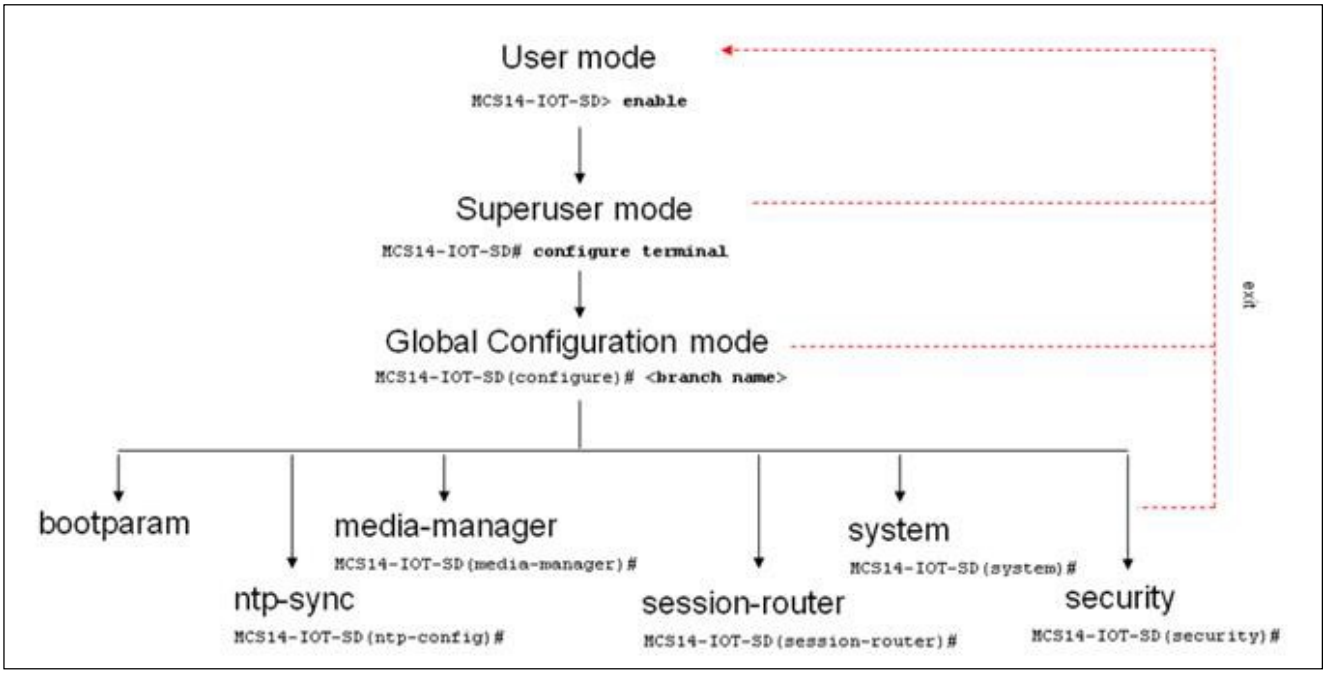
You must enter the Configuration mode to configure elements. For example, you can access the configuration branches and configuration elements for signaling and media configurations. To enter the Configuration mode, issue the **`configure terminal`** command in the Superuser mode.

Configuration mode is identified by the word configure in parenthesis followed by the pound sign (#) in the prompt after the target name, for example, **`SBC1`** **(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 E-SBC boot parameters. Key boot parameters include:

- boot device – The global management port, usually eth0
- file name – The boot path and the image file.
- inet on ethernet – The IP address and subnet mask (in hex) of the management port of the SD.
- host inet –The IP address of external server where image file resides.
- user and ftp password – Used to boot from the external FTP server.
- gateway inet – The gateway IP address for reaching the external server, if the server is located in a different network.

```
'.' = clear field;  '-' = go to previous field;  q = quit
boot device             : eth0
processor number        : 0
host name               :
file name               : /tffs0/nnSCX620.gz
inet on ethernet (e)    : 10.0.3.11:ffff0000
inet on backplane (b)   :
host inet (h)           : 10.0.3.100
gateway inet (g)        : 10.0.0.1
```

The ntp-sync branch provides access to ntp server configuration commands for synchronizing the E-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 E-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 E-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 E-SBC reboots, your configurations will be lost.

Configuration Versions

At any time, three versions of the configuration can exist on the E-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 E-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 E-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 E-SBC displays a reminder on screen stating that you must use the **`activate-config`** command if you want the configurations to be updated.

```
SBC1 # 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'.
SBC
```

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 E-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.

```
SBC1# activate-config Activate-Config
received, processing. waiting 120000 for
request to finish Request to 'ACTIVATE-
CONFIG' has Finished, Activate Complete
SBC1#
```

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