Oracle® Communications Subscriber Load Balancer

Essentials Guide

Release 7.3.10

December 2018

Oracle Communications Subscriber Load Balancer Essentials Guide, Release 7.3.10

Contents

About this guide

Version SCZ7.3.10 provides an updated release of the Oracle Communications Subscriber-Aware Load Balancer (SLB). This guide describes that release.

This guide is written for network administrators and architects, and provides information about the SLB configuration. For information on configuration and operation of Session Border Controller (SBC), Unified Session Manager (USM), and Core Session Manager (CSM) as SLB cluster members, refer to the Release Notes for those products' release versions.

Related Documentation

The following table describes the documentation set for this release.

Document Name	Document Description
Oracle Acme Packet 6100 Hardware Installation and Maintenance Guide	Contains information about the components, installation, and maintenance of the Acme Packet 6100.
Oracle Acme Packet 6300 Hardware Installation and Maintenance Guide	Contains information about the components, installation, and maintenance of the Acme Packet 6300.
Oracle Acme Packet 4500 Hardware Installation and Maintenance Guide	Contains information about the components, installation, and maintenance of the Acme Packet 4500.
Oracle Acme Packet 4600 Hardware Installation and Maintenance Guide	Contains information about the components, installation, and maintenance of the Acme Packet 4600.
Release Notes	Contains information about the current documentation set release, including new features and management changes.
ACLI Configuration Guide	Contains information about the administration and software configuration of the SBC.
ACLI Reference Guide	Contains explanations of how to use the ACLI, as an alphabetical listings and descriptions of all ACLI commands and configuration parameters.
Maintenance and Troubleshooting Guide	Contains information about SBC logs, performance announcements, system management, inventory management, upgrades, working with configurations, and managing backups and archives.

Document Name	Document Description
MIB Reference Guide	Contains information about Management Information Base (MIBs), Acme Packet's enterprise MIBs, general trap information, including specific details about standard traps and enterprise traps, Simple Network Management Protocol (SNMP) GET query information (including standard and enterprise SNMP GET query names, object identifier names, numbers, and descriptions, as well as examples of scalar and table objects.
Accounting Guide	Contains information about the SBC's accounting support, including details about RADIUS accounting.
HDR Resource Guide	Contains information about the SBC's Historical Data Recording (HDR) feature. This guide includes HDR configuration and system-wide statistical information.
Administrative Security Essentials	Contains information about the SBC's support for its Administrative Security license.
Security Guide	Contains information about security considerations and best practices from a network and application security perspective for the Oracle Communications Session Border Controller family of products.

Revision History

Date	Description
September 2017	• Initial Release
October 2017	• Corrects client list name based on latest convention
May 2018	• Adds reboots required during port-based balancing configuration • Removes the traffic-policy parameter from the SLB tunnel configuration procedure
September 2018	• Corrects product names and abbreviations • Adds ramifications when user changes service-port configuration in real time
December 2018	• Adds OCSBC media interface known issue on duplicate IPs.

1
Introduction and Overview

As service providers deploy larger and larger SIP access networks, scalability problems are presenting unique challenges, particularly from an operational standpoint. Deployments that scale beyond the number of users serviceable by a single Session Border Controller (SBC) – as well as deployments that use a geographically redundant SBC for catastrophic fail over purposes – encounter edge reachability problems. In general there are two coarse techniques that carriers use today to support end-point populations that exceed one OCSLB's capacity: they either use a DNS-based distribution mechanism, or they will pre-provision endpoint to point to specific SBCs (manually load balancing them). Each of these solutions has its drawbacks. End users – many of them familiar with load balancing equipment deployed to scale protocols such as HTTP or SMTP – have expressed interest in a device that will perform dedicated load balancing for their SIP endpoint.

The Subscriber-Aware Load Balancer (SLB) addresses the need for scaling a network edge to millions of endpoint. Designed as a standalone system, the network architect can deploy an Acme Packet 6100, capable of supporting up to ten million endpoints (where an endpoint is defined as a unique source and destination IP address), the SLB aggregates signaling from large endpoint populations to reduce the edge reachability problem by an order of magnitude.

The network architect reduces this problem by deploying clusters of SBCs or Oracle Communications Unified Session Managers (USM) supported by the SLB. These SBCs can be operating as either Physical Network Functions (PNFs) and Virtual Network Functions (VNFs). The SLB supports clusters of homogenous or heterogenous groups of PNFs and/or VNFs.

Functional Overview

The Oracle Communications Subscriber-Aware Load Balancer (OCSLB) is a discrete network element that processes all SIP end-point signaling traffic entering the service provider network. The SLB is not necessarily the first network device to receive signaling traffic, as, depending on network topology, additional network components (for example, routers, network address translators, and so on) can lie between the end-point and the OCSLB.

Upon receipt of a SIP packet from an unknown source, the OCSLB uses a provisioned policy to select an appropriate next-hop Oracle Communications Session Border Controller (OCSBC) for traffic originated by that end-point. Subsequent packets from the same end-point are forwarded to the same OCSBC. The first packet, the one used to make the route decision, and all subsequent packets sent through the OCSLB to the next-hop OCSBC are encapsulated within an IP-in-IP format as defined in RFC 2003, IP Encapsulation within IP.

SBCs that participate in the load balancing-enabled deployment are enhanced by several capabilities. First, the OCSBC supports RFC 2003 tunnel for both packet transmission and reception. Second, the OCSBC periodically transmits health and performance data to the OCSLB; such information is evaluated and entered into the OCSLB's route determination algorithm. Lastly, the OCSBC participates in any OCSLB-initiated rebalance operation, as described in the Rebalancing section. A group of OCSBCs, with the above-listed capabilities, that receive signaling traffic from the OCSLB, is referred to as a cluster.

The IP-in-IP encapsulation technique provides OCSLB transparency to the terminating OCSBC. That is, when an OCSBC receives an encapsulated packet via the OCSLB, it can

discard the outer encapsulation leaving behind an identical packet as transmitted originally by the end-point. Visibility into the actual packet transmitted by the end-point is necessary to provide certain services in the OCSBC (for example, hosted NAT traversal, session-agent matching, and so on). A secondary goal achieved by using this encapsulation technique is that it provides a disassociation function between an OCSBC's connected network and its SIP reachability. That is, an OCSBC can be assigned any IP address it wants from a network topology standpoint, yet still process SIP packets as though it were logically situated elsewhere at Layer 5. In a larger sense, the physicality of the OCSBC is no longer important; like-configured, logically identical OCSBCs can be spread all over the globe.

Balancing and Rebalancing

The Oracle Communications Subscriber-Aware Load Balancer (OCSLB performs two primary functions as the front-end to a Oracle Communications Session Border Controller (OCSBC) cluster: balancing traffic and rebalancing traffic. There are several key distinctions, which are described in the following two sections.

Balancing

Balancing is defined as the distribution of new endpoints (a combination of unique source and destination IP address pairs) among the members of the cluster. The SLB balances traffic based upon its configured policies (refer to Load Balancer Policy Configuration for policy description and details), or, in the absence of configured policies, with a default round-robin procedure. Load balancer policies provide a flexible means of directing traffic to appropriate groups of SBCs. As initial packets arrive at the SLB from unknown (previously unseen) endpoints, they are passed to a resident software process that consults its policy engine to determine an appropriate destination (clustered SBC) for each endpoint. Regardless of the distribution algorithm, policy-based or round-robin, the SLB chooses an SBC from among all equally weighted candidates, giving preference to those with the lowest current occupancy rate, defined as the number of endpoints already present on that system relative to its maximum endpoint capacity.

Even though each clustered SBC regularly reports CPU data to the SLB, the SBC's CPU utilization is not factored into the preference of one SBC over another. Rather, an SBC whose CPU utilization rate, determined using a per-thread CPU load check of the busiest call-related threads (SIP and MBCD), exceeds its load limit threshold (by default, 90%) is excluded from the list of candidates. For example, assuming that both SBCs are licensed for the same number of sessions, an SBC with a CPU load of 89% and a current occupancy of 10,000 endpoint will have equal footing with an SBC with a CPU load of 10% and a current occupancy of 10,000 endpoint. But an SBC with a CPU load of 90% and an occupancy of 0 endpoint will never receive new assignments from the SLB, until its CPU utilization rate falls below the 90% threshold.

SBC Memory Thresholds for Load Balancing

When load-balancing traffic, the Subscriber Aware Load Balancer (SLB) skips Session Border Controllers (SBCs) that report overloaded memory or CPU. CPU utilization is measured on a per-thread basis, referring to each SIP and MBCD thread for their resource utilization. Configuring the applicable SBC memory utilization threshold requires that the user consider multiple SBC settings, explained below.

An SBC's memory utilization threshold is the percentage of overall system memory utilization that, when exceeded, triggers the SBC to set its overload flag. The SBC then tells the SLB it is overloaded via the standard update process. The SBC sets this same flag when CPU utilization

exceeds its overload threshold. When memory and CPU utilization fall below their thresholds, the SBC clears the overload flag.

The **memory-utilization-threshold** in the **system-config** allows the user to explicitly set the memory utilization threshold used for load balancing. During operation, the SBC refers to this and two other settings to determine when it notifies the SLB that it is in a memory overload condition. These settings include any user-configured critical memory alarm value and the **system-config** > **heap-threshold**'s option setting. The operational process, which effectively determines the lowest of these settings, is as follows:

1. The SBC refers to its **memory-utilization-threshold** setting. If set, use that value for the steps below.
2. The SBC refers to its alarm configuration. If there is a critical memory alarm value lower than the **memory-utilization-threshold**, the system sets the **memory-utilization-threshold** to that alarm's setting.
3. The SBC refers to its **heap-threshold** setting. If lower than the **memory-utilization-threshold** and the alarm setting, the system sets the **memory-utilization-threshold** to the **heap-threshold**'s setting.
4. If the **memory-utilization-threshold** value is lower than the alarm and **heap-threshold**, the SBC uses its value.

If none of these values are set explicitly, the SBC uses the **heap-threshold** default of 90%.

Values for the system-config's **memory-utilization-threshold** option range from 1% to 100%. The syntax below shows the option set to 75%.

```
ORACLE(system-config)#options +memory-utilization-threshold 75
```

The user can display the SBC's running configuration to see these settings.

Rebalancing

Rebalancing, as opposed to balancing, is taking some number of existing endpoints from functioning OCSBCs and redistributing these existing endpoints between current cluster members. Rebalancing can be automatically scheduled when a new OCSBC joins an existing cluster, or immediately invoked with the Acme Packet Command Line Interface (ACLI). When an OCSBC exits a cluster, whatever the reason, all of its endpoints are invalidated on the Oracle Communications Subscriber-Aware Load Balancer (OCSLB) and those endpoints are essentially balanced when they revisit the OCSLB.

A new OCSBC joins an existing cluster by initiating the establishment of an IP-in-IP tunnel between itself and the SLB. During an initial handshake the OCSBC designates which SLB service port or ports it is prepared to support. If there are existing OCSBCs supporting these designated service ports, the SLB instructs some or all of these OCSBCs to divest themselves of a specified number of endpoints. The OCSLB calculates the number of divested endpoints based upon the overall occupancy of that service relative to the OCSLB’s contribution to that occupancy. Existing cluster members not advertising support for service ports designated by the new cluster member are excluded from the rebalance queue.

The SLB sequences through eligible cluster members one at a time, using a proprietary protocol to request nomination and removal of eligible endpoints. The OCSBC replies with a CCP response that lists candidate endpoints. The OCSLB removes existing forwarding rules associated with those endpoints, and repeats the CCP request/response process until the cluster member divests itself of the specified number of endpoints.

When the divested endpoints re-engage with the OCSLB (upon their next scheduled registration refresh, for example), the OCSLB lacks a forwarding rule that maps them to a specific OCSBC. Consequently, the message is passed up to the software processes running on the OCSLB's host, which chooses a new OCSBC destination for that endpoint – presumably, the new cluster member that has the most available capacity.

The cluster member, after being requested to nominate endpoints for rebalancing, uses several criteria for choosing the most attractive candidates. As part of its standard SIP processing performed by SBCs, the cluster member is aware of the expiry times for all of the entries in its SIP registration cache. Therefore, the cluster member can predict with a high degree of accuracy when any given endpoint will be signaling back into the cluster. As the forwarding rules on the cluster member are triggered by endpoint messages, the cluster member considers an endpoint whose registration entry is due to expire shortly an attractive candidate for rebalance. Note, however, that in many cases it is not prudent to nominate endpoints whose SIP registration cache entries are due to expire immediately, as this can cause a race condition between the CCP response and the SIP REGISTER message from the endpoint to the SIP registration function. To avoid this potential dilemma, cluster members are equipped with the ability to skip ahead to candidates whose expiry is not immediate.

Further, each cluster member categorizes the endpoints stored in its cache based upon a priority value that is determined via the OCSLB's distribution policy (see Distribution Policy Configuration for more details). It nominates endpoints from its lowest priority buckets first.

Finally, the OCSLB does not rebalance an active SIP endpoint — an endpoint engaged in a phone conversation.

After removing endpoints from the first cluster member, the OCSLB moves to the next cluster member in the rebalance queue and uses the same CPP request/response exchange to remove additional endpoints. The same procedure repeats for additional cluster members until the OCSLB attains the target number of divested endpoints.

IPv4 IPv6 Dual Stack

While major carriers are proceeding toward a pure IPv6 network for next generation services, current practicalities require the continued support of IPv4 handsets and other devices. As a result, the Oracle Communications Subscriber-Aware Load Balancer provides support for single non-channelized physical interfaces that support both IPv4 and IPv6 ingress and egress on the same network interface.

Support for the dual stack interface requires no new additional configuration elements, and is provided by the proper configuration of the following elements in the *ACLI Configuration Guide*:

Configuration Element	**Section containing configuration element in the *ACLI Configuration Guide* documentation**
Physical Interfaces	(Platform) Physical Interfaces: OCSLB in the System Configuration chapter.
IPv4 Network Interfaces	IPv4 Address Configuration in the System Configuration chapter.
IPv6 Network Interfaces	Configuring Network Interfaces: OCSLB, Licensing, Globally Enabling IPv6, IPv6 Address Configuration, IPv6 Default Gateway, and Network Interfaces and IPv6 in the System Configuration chapter. 0)
IPv4 & IPv6 SIP Interfaces	SIP Interfaces in the SIP Signaling Services chapter.
IPv4 & IPv6 Realms	Realm Configuration in the Realms and Nested Realms chapter.

OCSLB Cluster Member Graceful Shutdown

When it becomes necessary to temporarily remove an Oracle Communications Session Border Controller (OCSBC) from active service, and make it available only for administrative purposes, the user issues a **set-system-state offline** ACLI command. The OCSBC begins a graceful shutdown. The shutdown is graceful in that active calls and registrations are not affected, but new calls and registrations are rejected except as discussed below. When the user issues the command, the OCSBC goes into **becoming offline** mode. Once there are no active SIP sessions and no active SIP registrations in the system, the OCSBC transitions to **offline** mode. If the OCSBC is a member of an Oracle Communications Subscriber-Aware Load Balancer (OCSLB) Cluster, the offline status is communicated to the OCSLB when the user issues the **set-system-state offline** command, and the OCSLB excludes the offline OCSBC in future endpoint (re)balancing algorithms.

A version of this OCSBC graceful shutdown procedure exists in OCSBC releases previous to S-CZ7.3.0, but the procedure is enhanced for this and future releases. Previous versions only looked at active SIP sessions (calls), without monitoring active SIP registrations, and did not attempt to manipulate the period of time that active calls and registrations lingered on the OCSBC. The problem with this approach was that in the interval between setting the OCSBC to **offline** mode, and the subscriber registrations expiring, any inactive subscriber was essentially unreachable. With some carriers setting registration expiry timers to an hour or more (or 30 minutes in between registration refresh), this may have resulted in significant periods of unreachability. With this release, the new **sip-config** parameter **retry-after-upon-offline** is used to minimize the amount of time active calls and registrations keep the OCSBC from going completely offline.

The OCSBC side of this graceful shutdown procedure is followed with or without the OCSBC being a member of an OCSLB cluster. The graceful shutdown procedure is limited only to SIP calls and registrations.

High-level Procedure for Graceful OCSBC Shutdown

In its simplest form, this is the graceful shutdown procedure. Details and exceptions to this procedure when there are active calls or registrations are discussed in later paragraphs. The first six actions are performed whether or not the OCSBC is part of an Oracle Communications Subscriber-Aware Load Balancer (OCSLB) Cluster

- The OCSBC receives the **set-system-state offline** command.
- The OCSBC transitions to **becoming offline** mode.
- The OCSBC accepts calls and subscribes from registered endpoints.
- The OCSBC rejects calls from non-registered endpoints.
- The OCSBC rejects new registrations with a **503 Service Unavailable** error message.
- The OCSBC checks the number SIP INVITE based sessions and number of SIP registrations. When both counts are 0, the OCSBC transitions to the **offline** state.

> **Note:**
>
> Previous versions only looked at active SIP sessions (calls), without monitoring active SIP registrations.

If the OCSBC is part of an OCSLB Cluster:

- The OCSLB client on the OCSBC changes its cluster status to **shutdown** state.
- The OCSBC informs the OCSLB that it is offline.
- The OCSLB ceases to forward new end-points to the OCSBC and puts the OCSBC in a shutdown state.
- OCSLB continues to forward all messages for existing registered endpoints to the offline OCSBC.
- The OCSBC continues to send heartbeat updates the OCSLB as before.

Detailed Description of Graceful Shutdowns with Active SIP Calls or Registrations

This is the procedure when active SIP calls or registrations are on an OCSBC.

When the system receives the **set-system-state offline** command, it transitions to **becoming offline** mode. It begins checking the number of SIP-INVITE-based sessions and the number of SIP registrations, and continues to check them when sessions complete or registrations expire while it is in **becoming offline** mode. When both counts reach zero, the system transitions to **offline mode**. If the system is a member of a Oracle Communications Subscriber-Aware Load Balancer (OCSLB) Cluster, the OCSLB client on the OCSBC changes its cluster status to the **shutdown** state, and informs the SLB that it is **offline**. The OCSLB ceases to forward new end-points to the OCSBC and lists the OCSBC in a **shutdown** state on the SLB. The OCSBC continues to send heartbeat updates to the OCSLB as before.

Active calls continue normally when the OCSBC is in **becoming offline** mode. If SIP refresh registrations arrive for endpoints that have active calls, they are accepted. However, the expiry of these endpoints is reduced to the configurable **retry-after-upon-offline** timer value (in seconds) defined under **sip-config** on the OCSBC. This timer should be configured to be a much lower time interval than originally requested by the refresh registrations, so that endpoints refresh sooner and thus the registrations expire as closely as possible to when the active call ends. If the new timer value configured in **retry-after-upon-offline** is greater than the existing registration requested refresh value, or if its value is ‘0’ (unconfigured), the original registration refresh request is honored.

Refresh registrations for endpoints that do not have any active calls are rejected with a configurable response code defined in the **sip-config reg-reject-response-upon-offline** parameter. The default for this parameter is the **503 Service Unavailable** message. It includes a **Retry-After** header with a configurable timer set in **retry-after-upon-offline**. If the value of the configuration is 0 (unconfigured), the header is not included in the rejection message. Once these refreshes are rejected, OCSBC immediately removes such endpoints from its registration cache. It is a force remove. De-registrations are forwarded to the core. There is no local response. Removals are communicated to the OCSLB.

Any new calls that arrive for endpoints that currently have registration entries are not rejected. The same **retry-after-upon-offline** action is performed.

Any other SIP methods (like SUBSCRIBE or MESSAGE) intended for this endpoint is handled normally and are not rejected. Priority calls are processed as usual by the OCSBC, regardless of whether an active registration is present in the OCSBC as long as the OCSBC is in **becoming offline** state. When the OCSBC transitions to the **offline** state, even priority calls are rejected. If the priority calls cannot be forwarded to the endpoint, a **380 Alternative Service** response may be sent, depending on the OCSBC's configuration. However, when the OCSBC achieves offline mode, even priority calls are rejected. New non-priority calls coming for endpoints that

are not currently registered are rejected with the **503 Service Unavailable** error message, as has always been done.

The OCSBC sends the endpoint removal requests to the OCSLB so that the OCSLB removes them from its endpoint table. If a REGISTER message comes in with multiple contacts, it's possible that one of the contacts has an active call while others do not. In that scenario, the contact without active call has the Expires value in the Contact header changed to 0 and is forwarded to the core. When the response arrives from the core, the Contact with active call has its Expires parameter modified to the **retry-after-upon-offline** value or the UA expires value, whichever is lower. Any contact with no active calls is removed from the cache.

Eventually, all SIP calls end, and all registrations expire. The OCSBC transitions to the **offline** system state. The OCSBC continues to send heartbeat updates to the OCSLB.

At any time after the issuance of the **set-system-state offline** command, a **set-system-state online** command may be issued. If the OCSBC is in **becoming offline** mode, the process is aborted and the OCSBC again becomes **online**. The OCSBC state is forwarded to the OCSLB, and the OCSBC once again participates in the OCSLB's (re)balancing process.

Georedundant High Availability (HA)

Refer to the High Availability chapter in the *Oracle Communications Session Border Controller ACLI Configuration Guide* for complete information and instructions on HA configuration.

You can locate the two nodes that make up a HA pair in different locations from one another. This is known as georedundancy, which increases fault tolerance. A georedundant pair must adhere to rigid network operating conditions to ensure that all state and call data is shared between the systems, and that failovers happen quickly without losing calls.

The following network constraints are required for georedundant operation:

- A pair of dedicated fiber routes between sites is required. Each route must have non-blocking bandwidth sufficient to connect wancom1 and wancom2 ports (i.e., 1Gbps per port)
- Inter-site round-trip time (RTT) must be less than 20 ms. 5 ms or less is ideal. Georedundant operation must be built upon a properly engineered layer-2 WAN (eg. MPLS or Metro Ethernet) that connects active and standby HA pair members.
- Simultaneous packet loss across the inter-site link pair must be 0%. Loss of consecutive heartbeats could potentially result in split-brain behaviors.
- Security (privacy and data-integrity) must be provided by the network itself.

As with local HA nodes, management traffic (e.g. SSH, SFTP, SNMP, etc.) must be confined to the wancom0 management interface. HA node peers must have their wancom0 IP addresses on the same subnet. All Oracle Communications Subscriber-Aware Load Balancer configuration, including host routes and the system-config's **default-gateway**, is shared between the HA pair so it is not possible to have two different management interface default-gateways. This implies the requirement of an L2-switched connection between the 2 wancom0 management interfaces.

2

Subscriber-Aware Load Balancer Configuration

SLB Configuration

This section explains how to configure functionality specific to the Oracle Communications Subscriber-Aware Load Balancer (OCSLB); it does not include configuration steps for functions that it shares in common with its corresponding Oracle Communications Session Border Controllers (OCSBCs) (for example, system-config, phy-interface, network-interface, and so on). For information about general OCSLB configuration, refer to the appropriate documentation as listed in About This Guide.

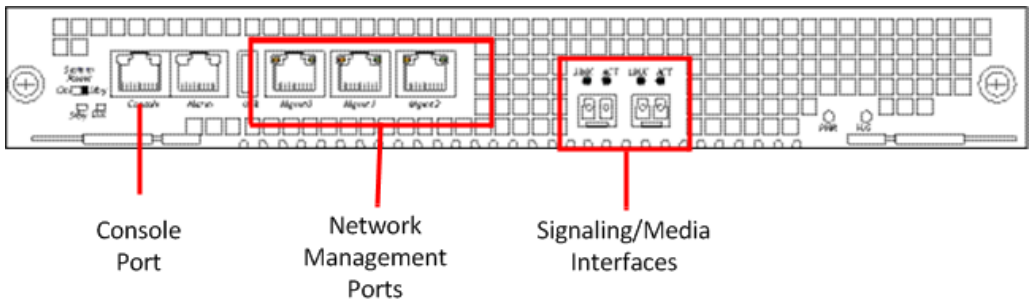
OCSLB configuration is quite simple; aside from basic network connectivity, the service interfaces, and the distribution policy, much of the configuration is learned dynamically from the OCSBCs that comprise the cluster.

Acme Packet 6100 Physical Interfaces

The Acme Packet 6100 supports a single network interface unit (NIU) that contains all external interfaces, including console, alarm, network management and media interfaces. There is currently one type of NIU available, which defines the supported cabling and speed.

The graphic below shows the NIU front panel, which includes all ports and their labeling. This labeling is an important point of reference when you set up the **phy-interface** configuration element.

Figure 2-1 Acme Packet 6100 - Rear View



The Acme Packet 6100 NIU includes the following ports (from left to right).

- Console—Provides serial access for administrative and maintenance purposes.
- Alarm—Dry contact alarm port.
- USB—For use only by Oracle personnel.
- Mgmt0 to Mgmt2—The system uses these 10/100/1000 Base-T Ethernet ports for device management functions. The first interface, Mgmt 0, is for ssh access to the ACLI. The

other two interfaces are used for state replication for High Availability (HA). For HA, connect these interfaces directly using a crossover cable.

- SFP+ ports—The system uses these 2 x 10GbE ports for signaling and media traffic.

The table below lists the labeling of each interface on the NIU, as well as the applicable **operation-type** and **port** parameters in the **phy-interface** configuration element. Note that the media interfaces are not uniquely labeled with the chassis silkscreen. The table distinguishes between these using "left" and "right", with the perspective being the user looking at the NIU panel.

NIU Label	Operation-type	Slot	Port
Mgmt 0	Maintenance	0	0
Mgmt 1	Maintenance	0	1
Mgmt 2	Maintenance	0	2
USB	NA	NA	NA
NA (left)	Media	0	0
NA (right)	Media	0	1

Provisioning Entitlements

Provisioning entitlements for the Subscriber-Aware Load Balancer (SLB) is performed by using the **setup entitlements** command.

The **setup entitlements** command is used to configure the total number of endpoints that the SLB has been licensed to manage. The input must be entered in increments of 20,000 endpoints.

A new Acme Packet 6100 platform with no entitlements will boot up for the first time as an SLB product type with 0 endpoints configured. The sample configuration session below shows the steps to finish the configuration of entitlements for the SLB:

```
ORACLE#setup entitlements

------------------------------------------------------------
Entitlements for Subscriber-Aware Load Balancer
Last Modified: Never
------------------------------------------------------------
 1 : LB Endpoint Capacity            : 0

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

  LB Endpoint Capacity (0-10000000)   : 5000000

Enter 1 to modify, d' to display, 's' to save, 'q' to exit. [s]: s
SAVE SUCCEEDED
ural# show entitlements
Provisioned Entitlements:
-------------------------
Subscriber-Aware Load Balancer Base    : enabled
LB Endpoint Capacity                   : 5000000

Keyed (Licensed) Entitlements
-----------------------------
```

After initial configuration using **setup entitlements**, the configuration can be confirmed at any time using **show entitlements**.

SLB Tunnel Configuration

The Oracle Communications Subscriber-Aware Load Balancer (OCSLB) sends and receives signaling messages to and from clustered OCSBCs through an IP-in-IP tunnel. The OCSLB requires one tunnel per interface.

Use the following procedure to perform required OCSLB-side tunnel configuration. Completion of tunnel configuration is accomplished on the clustered OCSBCs as described in OCSBC Tunnel Configuration.

1. From superuser mode, use the following ACLI command sequence to access tunnel-config configuration mode. While in this mode, you partially configure the tunnel-config configuration element.

```
ORACLE# configure terminal
ORACLE(configure)# system
ORACLE(system)# network-interface
ORACLE(network-interface)# tunnel-config
ORACLE(tunnel-config)# ?
local-ip-address     tunnel local IP address
port                 local & remote control ports
protocol             tunnel control transport protocol
tls-profile          tunnel control TLS profile
select               select tunnel to edit
no                   delete tunnel
show                 show tunnel
done                 write tunnel information
quit                 quit out of configuration mode
exit                 return to previous menu
ORACLE(tunnel-config)#
```

2. Use the **local-ip-address** parameter to specify the IP address at the OCSLB end of the tunnel.

   As the terminus for all tunnels from the clustered OCSBCs — and never the tunnel originator — only the local address is configured on the OCSLB.

   > **Note:**
   >
   > This address also supports the exchange of CCP messages.

```
ORACLE(tunnel-config)# local-ip-address 182.16.204.210
ORACLE(tunnel-config)#
```

3. Use the **port** parameter to specify the port used to send and receive CCP messages.

```
ORACLE(tunnel-config)# port 4444
ORACLE(tunnel-config)#
```

4. Use the **protocol** parameter to specify the transport protocol used in support of cluster control messages.

   The only protocol supported for this release is UDP.

```
ORACLE(tunnel-config)# protocol UDP
ORACLE(tunnel-config)#
```

5. Use **done**, **exit**, and **verify-config** to complete configuration of this tunnel-config configuration element.

6. Repeat Steps 1 through 6 to configure additional tunnel-config configuration elements.

Sample SLB Tunnel Configuration

The following formatted extract from **show running-config** ACLI output shows a sample tunnel configuration.

```
tunnel-config
local-ip-address     182.16.204.210
port                 4444
protocol             UDP
tls-profile
last-modified-by     admin@console
last-modified-date   2013-11-07 18:49:04
```

Cluster Configuration

The cluster-config configuration element manages basic SLB interaction with clustered SBCs — it contains a set of global parameters that define the management of the RFC 2003 IP-in-IP tunnels that connect the SLB to clustered SBCs, and the details of rebalance operations. In addition, cluster-config provides for the creation of a list of service interfaces (signaling addresses) that are advertised to endpoints comprising the user access population.

Use the following procedure to perform required cluster-config configuration.

1. From superuser mode, use the following ACLI command sequence to access cluster-config configuration mode. While in this mode, you configure the cluster-config configuration element.

```
ORACLE# configure terminal
ORACLE(configure)# session-router
ORACLE(session-router)# cluster-config
ORACLE(cluster-config)# ?

state                          cluster control state
log-level                      configure log level
auto-rebalance                 Auto-rebalance cluster on new SD availability
source-rebalance-threshold     Percentage of advertised registration capacity
dest-rebalance-threshold       Percentage of advertised registration capacity
dest-rebalance-max             Percentage of advertised registration capacity
tunnel-check-interval          How often an SD's tunnels are checked
tunnel-fail-interval           Time for which no messages have been received
rebalance-request-delay        Delay between subsequent rebalance requests
session-multiplier             ratio of users (endpoints to sessions)
atom-limit-divisor             ratio of atoms (e.g. contacts to endpoints)
rebalance-skip-ahead           Skip endpoints refreshing sooner than
rebalance-max-refresh          Skip endpoints refreshing later than
ignore-tgt-svcs-on-rebalance   When selecting source SDs during rebalancing
rebalance-del-app-entries      Delete Application endpoint Data
inactive-sd-limit              Duration no SD control messages received
                               (seconds)
red-port                       redundant mgcp sync port
red-max-trans                  max redundant transactions to keep
red-sync-start-time            redundant sync start timeout
red-sync-comp-time             redundant sync complete timeout
service-ports                  configure service ports
select                         select cluster config
no                             delete cluster config
show                           show cluster config
```

```
done                            save cluster config information
exit                            return to previous menu
```

2. Use the **state** parameter to enable or disable the SLB software.

   The default setting, enabled, enables SLB functionality; disabled renders the SLB inoperable.

   ```
   ORACLE(cluster-config)# state enabled
   ORACLE(cluster-config)#
   ```

3. Use the **log-level** parameter to specify the contents of the SLB log.

   Log messages are listed below in descending order of severity.

   - emergency — the most severe
   - critical
   - major (error)
   - minor (error)
   - warning
   - notice
   - info — (default) the least severe
   - trace — (test/debug, not used in production environments)
   - debug — (test/debug, not used in production environments)
   - detail — (test/debug, not used in production environments)

   In the absence of an explicitly configured value, **log-level** defaults to critical, meaning that log messages with a severity of critical or greater (emergency) are written to the SLB log.

   ```
   ORACLE(cluster-config)# log-level critical
   ORACLE(cluster-config)#
   ```

4. Use the **auto-rebalance** parameter to specify SLB behavior when a new SBC joins an existing cluster.

   With this parameter enabled, the default setting, the SLB redistributes endpoints among cluster members when a new member joins the cluster. Refer to the Rebalancing section for operational details.

   With this parameter disabled, the alternate setting, pre-existing SBCs retain their endpoint populations, and the SLB directs all new endpoints to the newly active SBC until that SBC reaches maximum occupancy.

   ```
   ORACLE(cluster-config)# auto-rebalance enabled
   ORACLE(cluster-config)#
   ```

5. If **auto-rebalance** is set to enabled, use the **source-rebalance-threshold** and **dest-rebalance-threshold** parameters to specify threshold settings that identify existing cluster SBCs as either endpoint sources or endpoint destinations during the rebalance operation. Use the **dest-rebalance-max** parameter to specify the occupancy for the new cluster member. Refer to the Balancing section for details on occupancy and its calculation.

   If **auto-rebalance** is set to disabled, these three parameters can be ignored.

   Parameter values are numeric percentages within the range 0 through 100.

   source-rebalance-threshold specifies the minimum occupancy percent that identifies a clustered SBC as a source of endpoints during a rebalance operation. For example, using the default value of 50 (percent), any clustered SBC with an occupancy rate of 50% or

more sheds endpoints during a rebalance. The SLB assigns these endpoints to the new cluster member.

dest-rebalance-threshold specifies the maximum occupancy percent that identifies a clustered SBC as a destination for endpoints during a rebalance operation. Note that the default setting of 0 (percent), ensures that no pre-existing SBC gains endpoints during a rebalance.

dest-rebalance-max specifies the maximum occupancy percent that the SLB transfers to the new cluster member during a rebalance operation. The default setting is 80 (percent). Should this threshold value be attained, the SLB distributes remaining endpoints to those SBCs identified as endpoint destinations by their **dest-rebalance-threshold** settings.

```
ORACLE(cluster-config)# source-rebalance-threshold 50
ORACLE(cluster-config)# dest-rebalance-threshold 40
ORACLE(cluster-config)# dest-rebalance-max 75
```

6. If **auto-rebalance** is set to enabled, you can optionally use four additional parameters to fine-tune rebalance operational details.

   If **auto-rebalance** is set to disabled, these four parameters can be ignored.

   rebalance-request-delay specifies the interval (in milliseconds) between endpoint request messages sent from the SLB to a clustered SBC. As explained in the Rebalancing section, these messages request a list of endpoints that will be redistributed from the SBC to a new cluster member.

   By default, this parameter is set to 500 milliseconds.

   Setting this parameter to a higher value results in longer times for the completion of rebalancing; however longer durations provide more time for cluster member processsing of SIP traffic.

   rebalance-skip-ahead restricts the target set of SBC endpoints registration eligible for rebalancing to those whose re-registration is not imminent — that is, the registration is not scheduled within the number of milliseconds specified by the parameter setting. Setting this parameter to a non-zero value mitigates against the possibility of a race condition precipitated by a simultaneous endpoint removal generated by the SBC and the arrival of endpoint signalling on an SLB service port. The default setting (0 milliseconds) effectively makes the entire SBC endpoint set eligible for rebalancing.

   rebalance-max-refresh restricts the target set of SBC endpoints eligible for rebalancing to those whose re-registration is no further in the future than the time period (milliseconds) specified by this parameter— for example, assuming a parameter value of 6000, the target endpoint set is restricted to those whose re-registration is scheduled within the next 6 seconds.

   Because a re-balancing operation necessarily introduces a small window of unreachability for re-balanced endpoints, this parameter provides users with some degree of control over the period of time that a re-balanced endpoint may be unreachable.

   The default setting (0 milliseconds) effectively makes the entire SBC endpoint set eligible for rebalancing.

   rebalance-del-app-entries specifies when cached SIP entries for rebalanced endpoints are removed from the clustered SBC. The default setting (disabled) specifies that cached entries are retained after a rebalance operation, and subsequently removed from the cache by standard time-out procedures. When set to enabled, this parameter specifies that the SBC removes cached registration entries at the completion of the rebalance operation.

   ```
   ORACLE(cluster-config)# rebalance-request-delay 750
   ORACLE(cluster-config)# rebalance-skip-ahead 100
   ```

```
ORACLE(cluster-config)# rebalance-max-refresh 1000
ORACLE(cluster-config)# rebalance-del-app-entries enabled
```

7. Three parameters, **tunnel-fail-interval**, **tunnel-check-interval,** and **inactive-sd-limit** maintain and monitor the IP-in-IP tunnels established between the SLB and clustered SBCOCSLBs.

   tunnel-fail-interval specifies the interval (in milliseconds) between periodic keepalive messages sent from a clustered SBC to the SLB. If the SLB fails to receive a keepalive message within the specified period, it flags the tunnel as dead. By default, this parameter is set to 10000 milliseconds.

   tunnel-check-interval specifies the interval (in milliseconds) between SLB tunnel audits. During a tunnel audit, the SLB checks the status of each tunnel and removes all tunnels flagged as dead. If all of a cluster member's tunnels are removed. the SLB places that cluster member in an out-of-service state. By default, this parameter is set to 15000 milliseconds.

   If you change default settings for either parameter, ensure that the setting for **tunnel-check-interval** is greater than the **tunnel-fail-interval** setting.

   inactive-sd-limit specifies the maximum silent interval (defined as the absence of heartbeat traffic from any tunnel) seconds) before the SLB flags a cluster member as dead, and removes that SBC from the cluster. By default, this parameter is set to 1800 seconds (30 minutes). supported values are integers within the range 0 through 31556926 (365 days).

   ```
   ORACLE(cluster-config)# tunnel-fail-interval 10000
   ORACLE(cluster-config)# tunnel-check-interval 15000
   ORACLE(cluster-config)# inactive-sd-limit 900
   ```

8. Use the **session-multiplier** and **atom-limit-divisor** parameters to specify optional, user-configurable numeric factors used in occupancy and occupancy rate calculations.

   session-multiplier provides a factor that when multiplied by an SBC's licensed session limit, determines the maximum number of endpoints that the SBC can support (that is, its maximum occupancy).

   The default setting is 10; valid settings include any integer values within the range 1 through 100.

   Using the default setting, an SBC licensed for 32,000 concurrent sessions has a maximum theoretical occupancy of 320,000 endpoints.

   atom-limit-divisor provides another factor that can be used in occupancy and occupancy percent calculations. By default, occupancy calculations are based on endpoints (IP addresses), and do not take into account the fact that the same IP address can represent multiple users.

   The default setting is 1, which assumes a conservative 1-to-1 correlation between endpoints and users; valid settings include any integer values within the range 1 through 1000.

> **Note:**
>
> The SLB initially calculates a tentative maximum occupancy value, expressed as a number of endpoint addresses, for each clustered SBC. SLB calculations are based upon the licensed capacity of each cluster member, and the values assigned to the session-multiplier and atom-limit-divisor parameters. After calculating the tentative maximum occupancy value, the SLB compares this value to the value of the registration-cache-limit parameter as defined on the clustered SBC. If the value of registration-cache-limit is either 0, or greater than the tentative maximum occupancy value, the calculated value is retained as the occupancy ceiling. However, if the registration-cache-limit value is greater than 0, but less than the tentative calculation, the value of registration-cache-limit is used as the occupancy ceiling.

Once an SBC has reached its maximum number of endpoints, the SLB removes it from the load balancing algorithm. These parameter settings should be changed only after careful examination of network conditions and behavior.

```
ORACLE(cluster-config)# session-multiplier 10
ORACLE(cluster-config)# atom-limit-divisor 1
```

9. The **ignore-tgt-svc-on-rebalance** parameter is not currently supported, and can be safely ignored.
10. Retain default settings for the **red-port**, **red-max-trans**, **red-sync-start-time**, and **red-sync-comp-time** parameters.
11. Use **done**, **exit**, and **verify-config** to complete cluster configuration.

Sample Cluster Configuration

The following formatted extract from **show running-config** ACLI output shows a sample cluster configuration.

```
cluster-config
state                           enabled
log-level                       CRITICAL
auto-rebalance                  enabled
source-rebalance-threshold      50
dest-rebalance-threshold        40
dest-rebalance-max              75
tunnel-check-interval           750
tunnel-fail-interval            10000
rebalance-request-delay         500
session-multiplier              4
rebalance-skip-ahead            0
rebalance-max-refresh           0
ignore-tgt-svcs-on-rebalance    disabled
atom-limit-divisor              1000
rebalance-del-app-entries       disabled
inactive-sd-limit               1800
red-port                        2001
red-max-trans                   10000
red-sync-start-time             5000
red-sync-comp-time              1000
service-port
last-modified-by                admin@console
last-modified-date              2013-11-07 18:49:04
```

Service Ports Configuration

A service-port is essentially a SIP port monitored by the OCSLB for incoming signaling from the user population. For virtually all network topologies, multiple service ports are expected on a typical OCSLB configuration. A service-port is a multiple instance configuration element; for each service-port advertised to the access network(s), at least one service-port configuration element must be configured.

Configuration changes to service-ports cause a reset to the flow-IDs associated with that port. This reset causes a wide variety of data changes, including endpoint re-assignments, data counter discrepancies and so forth. Although these changes are allowed, the user must allow for a significant amount of time to pass before expecting up-to-date show commands and endpoint assignments.

Use the following procedure to perform required service-ports configuration.

1. From superuser mode, use the following ACLI command sequence to access service-port configuration mode. While in this mode, you configure one or more service-port configuration elements.

```
ORACLE# configure terminal
ORACLE(configure)# session-router
ORACLE(session-router)# cluster-config
ORACLE(cluster-config)# service-ports
ORACLE(service-port)# ?
address                   IP address
port                      port (default: 5060)
protocol                  transport protocol
network-interface         network interface for service port
select                    select cluster config
no                        delete cluster config
show                      show cluster config
done                      save cluster config information
exit                      return to previous menu
ORACLE(service-port)#
```

2. Use the required **address** parameter to specify the IPv4 or IPv6 address of this service port.

```
ORACLE(service-port)# address 10.0.0.1
ORACLE(service-port)#
```

3. Use the **port** parameter to specify the port monitored by the OCSLB for incoming signaling messages.

   In the absence of an explicitly configured port, the SLB provides a default value of 5060 (the registered SIP port).

   Allowable values are integers within the range 0 through 65535.

```
ORACLE(service-port)# port 5060
ORACLE(service-port)#
```

4. Use the **protocol** parameter to choose the transport protocol.

   The supported setting is UDP (the recommended default).

```
ORACLE(service-port)# protocol udp
ORACLE(service-port)#
```

5. Use the required **network-interface** parameter to identify the OCSLB network interface that supports this service port. With this parameter, you have the option of specifying IPv4 or IPv6 (.4 or .6).

```
ORACLE(service-port)# network-interface M00:0.4
ORACLE(service-port)#
```

6. Use **done**, **exit**, and **verify-config** to complete configuration of this service-port configuration element.
7. Repeat Steps 1 through 6 to configure additional service-port configuration elements.

Sample Service Port Configuration

The following formatted extract from **show running-config** ACLI output shows a sample service port configuration.

```
service-port
address                       192.169.203.83
port                          5060
protocol                      UDP
network-interface             M00:0.4
last-modified-by              admin@console
last-modified-date            2013-11-07 18:49:04
```

Traffic Policy Configuration

This configuration record will enable management of tunnel bandwidth on a per-cluster member basis. The **name** of this policy will be entered into the OCSBC Tunnel Configurations.

> **Note:**
>
> If you do not need to change any of the implicit defaults for the traffic policy, you do not need to configure this policy at all. The implicit default configuration for this policy is as below. If you must change any of the parameters from the implicit default, you must name the resulting traffic policy **default**.

Use the following procedure to perform traffic policy configuration if required.

1. Access the **traffic-policy-config** configuration element.

```
ORACLE# configure terminal
ORACLE(configure)# session-router
ORACLE(session-router)# traffic-policy-config
ORACLE(traffic-policy-config)#
name       throttle-rate     max-signaling-rate     min-untrusted-pct
max-untrusted-pct     options     select     no
show      done      quit      exit
```

2. Enter a **name** for this traffic policy configuration. This is the string identifier for this policy.

```
ORACLE(traffic-policy-config)# name  tp1
ORACLE(traffic-policy-config)#
```

3. Enter a **throttle-rate** for this traffic policy configuration. This is the host throttle rate in registrations per second.

```
ORACLE(traffic-policy-config)# throttle-rate 800
ORACLE(traffic-policy-config)#
```

4. Enter a **max-signaling-rate** for this traffic policy configuration. This is the maximum signaling rate to a cluster member in bytes per second.

```
ORACLE(traffic-policy-config)# max-signaling-rate 33000000
ORACLE(traffic-policy-config)#
```

5. Enter a **min-untrusted-pct** for this traffic policy configuration. This is the minimum percentage of signaling rate allocated to untrusted traffic.

   ```
   ORACLE(traffic-policy-config)# min-untrusted-pct 33
   ORACLE(traffic-policy-config)#
   ```

6. Enter a **max-untrusted-pct** for this traffic policy configuration. This is the maximum percentage of signaling rate allocated to untrusted traffic.

   ```
   ORACLE(traffic-policy-config)# max-untrusted-pct 66
   ORACLE(traffic-policy-config)#
   ```

7. Use **done**, **exit**, and **verify-config** to complete configuration of this traffic policy configuration element.
8. Repeat steps 1 through 7 to configure additional traffic policy configuration elements.

Sample Traffic Policy Configuration

The following formatted extract from **traffic-policy-config** shows the default policy configuration.

> **Note:**
>
> For this initial release of software, if you do not need to change any of the implicit defaults for the traffic policy, you do not need to configure this policy at all. The implicit default configuration for this policy is as below. If you need to change any of the parameters from the implicit default, you must name the resulting traffic policy **default**

```
SLB1(traffic-policy-config)# show
traffic-policy-config
        name                                    default
        throttle-rate                           800
        max-signaling-rate                      33000000
        min-untrusted-pct                       10
        max-untrusted-pct                       30
        options
```

Load Balancer Policy Configuration

The lbp-config configuration element manages the OCSLB endpoint table. It also creates and manages a list of service interfaces (signaling addresses) that are advertised to endpoints comprising the user access population.

Use the following procedure to perform required lbp-config configuration.

1. From superuser mode, use the following ACLI command sequence to access lbp-config configuration mode. While in this mode, you configure the lbp-config configuration element.

   ```
   ORACLE# configure terminal
   ORACLE(configure)# session-router
   ORACLE(session-router)# lbp-config
   ORACLE(lbp-config)#?
   ```

```
state                                lbp state
log-level                            configure log level
untrusted-grace-period               Untrusted grace period
max-untrusted-percentage             Maximum untrusted endpoints percentage
max-untrusted-upper-threshold        Maximum untrusted endpoints upper
                                     threshold
max-untrusted-lower-threshold        Maximum untrusted endpoints upper
                                     threshold
endpoint-capacity-upper-threshold    endpoint capacity upper threshold
endpoint-capacity-lower-threshold    endpoint capacity lower threshold
red-port                             lbp redundant sync port: 0 to disable
                                     and 2000 to enable
red-max-trans                        maximum redundancy transactions to keep
                                     on active
red-sync-start-time                  timeout for transitioning from standby
                                     to active
red-sync-comp-time                   sync request timeout after initial sync
                                     completion
port-aware-balancing                 Include endpoint source port, in
addition to the source IP address if NAT is used
options                              optional features/parameters
select                               select lbp config
no                                   delete lbp config
show                                 show lbp config
done                                 save lbp config information
exit                                 return to previous menu
ORACLE(lbp-config)#
```

2. Use the **state** parameter to enable or disable the OCSLB software.

   The default setting, enabled, enables SLB functionality; disabled renders the OCSLB inoperable.

   ```
   ORACLE(lbp-config)# state enable
   ORACLE(lbp-config)#
   ```

3. Use the **log-level** parameter to specify the contents of the SLB log.

   Log messages are listed below in descending order of severity.

   - emergency — the most severe
   - critical
   - major (error)
   - minor (error)
   - warning
   - notice
   - info — (default) the least severe
   - trace — (test/debug, not used in production environments)
   - debug — (test/debug, not used in production environments)
   - detail — (test/debug, not used in production environments)

   In the absence of an explicitly configured value, **log-level** defaults to critical, meaning that log messages with a severity of critical or greater (emergency) are written to the LBP log.

   ```
   ORACLE(lbp-config)# log-level critical
   ORACLE(lbp-config)#
   ```

4. Use the **untrusted-grace-period**, **max-untrusted-percentage**, **max-untrusted-upper-threshold**, and **max-untrusted-lower-threshold** parameters to implement percentage-based management and monitoring of untrusted endpoints in the OCSLB endpoint database. Management and monitoring of untrusted endpoints is instrumental in detecting and responding to Denial-of-Service (DOS) attacks aimed at the OCSLB.

   untrusted-grace-period specifies the maximum time, in seconds, that a forwarding rule is retained by the OCSLB before it is confirmed with a promotion message from the OCSBC that received the untrusted endpoint. Refer to the Balancing section for message details.

   In the absence of an explicitly assigned value, the OCSLB provides a default setting of 30 (seconds).

   If this time period elapses without a promotion message arriving to confirm this user, the OCSLB deletes the entry.

   Setting this parameter to 0 allows untrusted/unconfirmed entries to exist indefinitely without aging out.

   max-untrusted-percentage specifies the percentage of the overall endpoint population that is reserved for untrusted users.

   The default setting is 20 (percent); supported values are integers within the range 1 through 100.

   This percentage is applied to the overall remaining occupancy of the OCSLB after trusted (confirmed) users are accounted for. For example, when empty, the OCSLB holds two million forwarding rules; assuming the default setting, at most 400,000 rules are reserved for untrusted rules. By the time one million users have been promoted, 20% of the remaining space means that up to 200,000 entries can be used for untrusted users.

   max-untrusted-upper-threshold specifies a threshold level at which the OCSLB (1) raises an alarm, and (2) issues an SNMP trap reporting an excessive number of untrusted endpoints within the entire endpoint population.

   This parameter, which has a default setting of 80 (percent), is calculated as a percent of **max-untrusted-percentage**. For example, assuming default settings for both parameters, the OCSLB raises an alarm and issues an SNMP trap when the percentage of untrusted endpoints attains 16%.

   max-untrusted-lower-threshold specifies a threshold level at which the OCSLB (1) clears the existing untrusted endpoint alarm, and (2) issues an SNMP trap reporting alarm clearance.

   This parameter, which has a default setting of 70 (percent), is calculated as a percent of **max-untrusted-percentage**. For example, assuming default settings for both parameters, the OCSLB clears an alarm and issues an SNMP trap when the percentage of untrusted endpoints falls to 14%.

```
ORACLE(lbp-config)# untrusted-grace-period 30
ORACLE(lbp-config)# max-untrusted-percentage 20
ORACLE(lbp-config)# max-untrusted-upper-threshold 80
ORACLE(lbp-config)# max-untrusted-lower-threshold 70
ORACLE(lbp-config)#
```

5. Use the **endpoint-capacity-upper-threshold** and **endpoint-capacity-lower-threshold** parameters to implement license-based management and monitoring of the OCSLB endpoint counts.

   endpoint-capacity-upper-threshold specifies a threshold level at which the OCSLB (1) raises an alarm, and (2) issues an SNMP trap reporting an excessive number of active endpoints.

This parameter, which has a default setting of 80 (percent), is calculated as a percentage of the endpoints allowed by the installed SLB license.

endpoint-capacity-lower-threshold specifies a threshold level at which the OCSLB (1) clears the existing endpoint alarm, and (2) issues an SNMP trap reporting alarm clearance.

This parameter, which has a default setting of 70 (percent), is calculated as a percentage of the endpoints allowed by the installed OCSLB license.

```
ORACLE(lbp-config)# endpoint-capacity-upper-threshold 80
ORACLE(lbp-config)# endpoint-capacity-lower-threshold 70
ORACLE(lbp-config)#
```

6. Enable **port-aware-balancing** to include endpoint source port, in addition to the source IP and destination service representation when looking up a unique EPT prior to forwarding towards the OCSBC cluster. Choices are enabled and disabled. Default is disabled.

   Reboot all OCSLBs and OCSBCs when enabling or disabling this parameter.

   ```
   ORACLE(lbp-config)# port-aware-balancing enable
   ORACLE(lbp-config)#
   ```

   WARNING:

   The user must reset the deployment's endpoint tables upon any change to this parameter to establish entry consistency. Reboot or, in the case of devices operating in HA mode, dual reboot all systems affected by changes to this parameter.

7. Use **done**, **exit**, and **verify-config** to complete configuration of this load-balancer-policy configuration element.

Sample Load Balancer Policy Configuration

The following formatted extract from **show running-config** ACLI output shows a sample load balancer policy configuration with port-aware-balancing enabled.

```
lbp-config
state                                enabled
log-level                            NOTICE
untrusted-grace-period               30
max-untrusted-percentage             20
max-untrusted-upper-threshold        80
max-untrusted-lower-threshold        70
end-point-capacity-upper-threshold   80
end-point-capacity-lower-threshold   70
red-port                             0
red-max-trans                        500000
red-sync-start-time                  5000
red-sync-comp-time                   1000
port-aware-balancing                 enabled
last-modified-by                     admin@console
last-modified-date                   2015-11-07 18:49:04
```

Distribution Policy Configuration

Distributing endpoints equitably among the cluster members is the primary function of the OCSLB. The lb-policy configuration element allows you to control the method of the OCSLB's distribution based on matching criteria. Using inbound packet matching criteria, you can control the assignment of users to OCSBCs. Matching is done by data available up to and

including the transport layer of the packet: source IP address and port, destination IP address and port, and transport protocol. The IP addresses and ports may or may not include bit masks as well.

Conceptually, the load balancer policy table, with sample data, looks akin to the following.

Source IP/Mask	Source Port/ Mask	Destination IP/Mask	Destination Port/Mask	Transport Protocol Requirements (list)	Realm Identifiers (list)
192.168.7.22/32	0/0	10.0.0.1/32	5060/16		West
192.168.1.0/24	0/0	10.0.0.1/32	5060/16	UDP, TCP	North, South, West
192.168.0.0/16	0/0	10.0.0.1/32	5060/16	UDP, TCP	East, West
0.0.0.0/0	0/0	0.0.0.0/0	0/0		

Policies are matched using a longest prefix match algorithm; the most specific policy is selected when comparing policies to received packets. One and only one policy is chosen per packet; if the next hops in that route are all unavailable, the next best route is not consulted (instead, the default policy may be consulted – see below). This is different than the local-policy behavior on the OCSBC.

Within each policy you may configure multiple next hops, where each next hop is a named group of OCSBCs. In the sample policy table, this is indicated in the second policy with a source IP range of 192.168.1.0/24. The realm identifier list for this policy indicates North, South, West. Each of these realm identifiers represents a collection of zero or more OCSBCs, in OCSBC parlance these are roughly analogous to session-agent groups. Each of these realm identifiers is also assigned a priority (a value between 1 and 31, with 31 representing the highest priority) in the configuration, and the OCSLB sorts the possible destinations with the highest priority first. Upon receipt of a packet matching a policy with multiple configured realm identifiers, the OCSLB gives preference to OCSBCs from the realm identifier with the highest priority. Should no OCSBCs be available in that priority level (due to saturation, unavailability, and so on.) the SLB moves on to investigate the next priority level, and so on. Should no OCSBCs become available after traversing the entire list of all OCSBCs within each priority level, the OCSBC either drops the packet or attempt to use the default policy.

The bottom row of the sample table shows this implicit, last resort default policy. When enabled, the SLB reverts to the default policy when all of the potential next hop realms referenced in the endpoint's distribution rule are unavailable. In that event, the default policy attempts to locate a clustered OCSBC that advertises support for the service-interface that the packet arrived on. The realm is not considered when matching to the default policy. If such an OCSBC is found, the SLB forwards the packet to that DBC; if such an OCSBC is not found, the SLB drops the packet.

It is not necessary to configure the default policy — it is simply intended as a catchall policy, and may be used when all that is required is a simple round-robin balancing scheme based on simple metrics (for example, CPU utilization and number of registrations currently hosted by an OCSBC). If no policies are configured on the OCSLB, the default policy is used. The default realm is implied in the above table as * and is enabled by default for policy records.

Use the following procedure to perform required lb-policy configuration.

1. From superuser mode, use the following ACLI command sequence to access lb-policy configuration mode. While in this mode, you configure the distribution rules used to implement policy-based load balancing on the OCSLB.

```
ORACLE# configure terminal
ORACLE(configure)# session-router
ORACLE(session-router)# lb-policy
ORACLE(lb-policy)# ?
state                   lb policy state
default-realm           use default realm
description             load balancer policy description
protocols               list of protocols
lb-realms               list of realms
                              name
                              priority
source-addr             source ip address
destination-addr        destination ip address
select                  select lb policy
no                      delete lb policy
show                    show lb policy
done                    save lb policy information
quit                    quit out of configuration mode
exit                    return to previous menu
ORACLE(lb-policy)#
```

2. Use the **state** parameter to enable or disable this distribution rule.

   The default setting, enabled, enables the distribution rule; disabled disables the rule.

   ```
   ORACLE(lb-policy)# state enabled
   ORACLE(lb-policy)#
   ```

3. Use the **default-realm** parameter to enable or disable the default distribution policy.

   The default setting, enabled, enables the default policy; disabled disables the policy.

   With **default-realm** enabled, the OCSLB provides a best-effort delivery model if the next-hop realms listed in this distribution rule are unavailable. With **default-realm** disabled, the orphaned packet is dropped.

   ```
   ORACLE(lb-policy)# default-realm enabled
   ORACLE(lb-policy)#
   ```

4. Optionally use the **description** parameter to provide a description of this distribution rule.

   ```
   ORACLE(lb-policy)# description Local traffic to Los Angeles site
   ORACLE(lb-policy)#
   ```

5. Use the **protocols** parameter to construct a list of protocols that must be supported by this distribution rule.

   ```
   ORACLE(lb-policy)# protocols udp
   ORACLE(lb-policy)#
   ```

6. Use either the **source-addr** parameter or the **destination-address** parameter to specify matching criteria for this distribution rule.

   Use the **source-addr** parameter to specify source-address-based matching criteria.

   Packets whose source IP addresses match the criteria specified by this parameter are subject to this distribution rule.

   ```
   ORACLE(lb-policy)# source-addr 10.0.0.1
   ORACLE(lb-policy)#
   ```

   matches any port on the specified IP source address

   ```
   ORACLE(lb-policy)# source-addr 10.0.0.1:5060
   ORACLE(lb-policy)#
   ```

matches the specified IP source address:port pair

```
ORACLE(lb-policy)# source-addr 10.0.0.1/24
ORACLE(lb-policy)#
```

matches any IP source address, any port on the 10.0.0.x subnet

```
ORACLE(lb-policy)# source-addr 10.0.0.240/28:5060
ORACLE(lb-policy)#
```

matches IP source addresses 10.0.0.240:5060 through 10.0.0.255:5060

Use the **destination-addr** parameter to specify destination-address-based matching criteria.

Packets whose destination IP addresses match the criteria specified by this parameter are subject to this distribution rule.

```
ORACLE(lb-policy)# destination-addr 10.0.0.1
ORACLE(lb-policy)#
```

matches any port on the specified IP destination address

```
ORACLE(lb-policy)# destination-addr 10.0.0.1:5060
ORACLE(lb-policy)#
```

matches the specified IP destination address:port pair

```
ORACLE(lb-policy)# destination-addr 10.0.0.1/24
ORACLE(lb-policy)#
```

matches any IP destination address, any port on the 10.0.0.x subnet

```
ORACLE(lb-policy)# destination-addr 10.0.0.240/28:5060
ORACLE(lb-policy)#
```

matches destination IP addresses 10.0.0.240:5060 through 10.0.0.255:5060

7. Use the **lb-realms** parameter to access lb-realm configuration mode.

   While in lb-realm configuration mode you identify one or more OCSLBs eligible to receive traffic that matches this distribution rule.

   ```
   ORACLE(lb-policy)# lb-realms
   ORACLE(lb-realm)#
   name             realm name (string identifier)
   priority         priority (range 1-31)
   select           select a lb realm to edit
   no               delete selected lb realm
   show             show lb realm information
   done             write lb realm information
   exit             return to previous menu
   ORACLE(lb-realm)#
   ```

8. Use the **name** parameter to identify the realm.

   As previously discussed, the name field is roughly analogous to an OCSBC session-agent group. OCSBCs configured to communicate within a cluster hosted by an OCSLB advertise offered services to the OCSLB. These services (for example, SIP support) exist in realms, whose names are sent to the OCSLB as part of the OCSBC advertisement. The OCSLB, upon receipt of these advertisements, joins each OCSBC into one or more realm identifier groups based upon the realm name(s) the OCSBC has offered up. The **name** command of the lb-realm configuration element matches this distribution rule to a supporting OCSBC that has offered that realm name for cluster membership.

```
ORACLE(lb-realm)# name LosAngeles
ORACLE(lb-realm)#
```

9. Use the **priority** parameter to specify the realm priority.

   Priority is expressed as an integer value within the range 0 to 31 — the higher the integer, the greater the priority.

   The default value, 0, specifies use of the default routing policy, and should not be used when policy-based distribution is enabled.

   Priority values are considered when multiple OCSBCs offer the same service to matched packets.

   ```
   ORACLE(lb-realm)# priority 31
   ORACLE(lb-realm)#
   ```

10. Use **done**, **exit**, and **verify-config** to complete configuration of this lb-realm configuration element.
11. To specify other eligible OCSLBs, repeat Steps 7 through 10. For example,

    ```
    ORACLE(lb-policy)# lb-realms
    ORACLE(lb-realm)# name LasVegas
    ORACLE(lb-realm)# priority 25
    ORACLE(lb-realm)# done
    ORACLE(lb-realm)# exit
    ORACLE(lb-realm)# verify-config
    ```

12. Use **done**, **exit**, and **verify-config** to complete configuration of this distribution rule.
13. To specify additional distribution rules, repeat Steps 1 through 12 as often as necessary.

Sample Distribution Rule Configurations

The following formatted extract from **show running-config** ACLI output shows sample distribution rule configurations.

```
lb-policy
state                enabled
default-realm        enabled
description
protocols            TCP
       lb-realm
       name          Realm192p1
       priority      10
source-addr          1.1.0.0/16
destination-addr     0.0.0.0/0
last-modified-by     admin@console
last-modified-date   2013-11-07 18:58:10
lb-policy
state                enabled
default-realm        enabled
description
protocols            TCP
       lb-realm
       name          Realm192p1
       priority      7
source-addr          1.20.0.0/16
destination-addr     0.0.0.0/0
last-modified-by     admin@console
last-modified-date   2013-11-07 19:01:01
lb-policy
```

```
state               enabled
default-realm       enabled
description
protocols           TCP
       lb-realm
       name         Realm192p1
       priority     5
source-addr         1.120.0.0/16
destination-addr    0.0.0.0/0
last-modified-by    admin@console
last-modified-date  2013-11-07 19:00:49
lb-policy
state               enabled
default-realm       enabled
description
protocols           TCP
       lb-realm
       name         Realm192p1
       priority     3
```

Forced Rebalance

The **notify ccd rebalance** ACLI command initiates an immediate forced rebalance operation. A forced rebalance operation is identical to the one described in the Rebalancing section.

notify ccd rebalance [cancel [sd-name]]

```
ORACLE# notify ccd rebalance
```

initiates the forced rebalance by calculating drop counts for each eligible cluster member, and then requesting drops from the first cluster member in the rebalance queue.

```
ORACLE# notify ccd rebalance cancel
```

terminates the forced rebalance.

```
ORACLE# notify ccd rebalance cancel ~sam
```

terminates the forced rebalance for a specified cluster member. Note the use of tilde special character, which forces the SLB to do a substring match of the following string against all cluster member names. Assuming a cluster member samadams — that cluster member removes itself from the rebalance queue, if it has not yet removed endpoints, or ceases endpoint removal and exits the queue if it is currently doing so.

The **notify ccd drop** ACLI command instructs the target cluster member to drop a specific number of endpoints from a specific realm, from all realms, or without regard for realm.

notify ccd drop <sd-name> (<realm> <number> | <number>)

```
ORACLE# notify ccd drop ~sam boston 100
```

instructs the target cluster member to drop 100 endpoints from the boston realm

```
ORACLE# notify ccd drop ~sam * 100
```

using the * special character instructs the target cluster member to drop 100 endpoints from all realms

```
ORACLE# notify ccd drop ~sam 100
```

instructs the target cluster member to drop 100 endpoints without regard for realm

OCSBC Configuration

This section describes the configuration necessary to allow an Oracle Communications Session Border Controller (OCSBC) to join a cluster. Configuration is simplified to allow for an easy and seamless migration from a deployed standalone OCSBC to a deployed clustered OCSBC. There are only two places where new configuration is required: in the network-interface configuration element, where tunnel information is defined; and in the signaling application's interface, (the sip-interface configuration element).

OCSBC Tunnel Configuration

Configuring the properties of the IP-in-IP tunnel on the Oracle Communications Session Border Controller (OCSBC) is a matter of configuring the local IP address, remote IP address, and specifying transport layer and application layer protocol support.

The following example uses a tunnel named sipSignaling, which was initially and partially configured on the Oracle Communications Subscriber-Aware Load Balancer (OCSLB). Note in the following configuration that the value of **remote-ip-address** parameter must agree with the value which was previously set with the **local-ip-address** parameter on the OCSLB. The complementary configuration performed on the OCSLB enables tunnel establishment between the OCSBC and the OCSLB.

1. From superuser mode, use the following ACLI command sequence to access tunnel-config configuration mode. While in this mode, you perform required OCSLB tunnel configuration.

```
ORACLE# configure terminal
ORACLE(configure)# system
ORACLE(system)# network-interface
ORACLE(network-interface)# tunnel-config
ORACLE(tunnel-config)# ?
name                 tunnel name
local-ip-address     tunnel local IP address
remote-mac-address   tunnel remote mac address
remote-ip-address    tunnel remote IP address
application          application protocol for this tunnel
port                 tunnel local & remote control ports
protocol             tunnel control transport protocol
tls-profile          tunnel control TLS profile
traffic-policy                              Name of traffic policy that

          applies to this tunnel
select               select tunnel to edit
no                   delete tunnel
show                 show tunnel
done                 write tunnel information
exit                 return to previous menu
ORACLE(tunnel-config)#
```

2. Use the **name** command to provide a unique identifier for this tunnel instance.

```
ORACLE(tunnel-config)# name sipSignaling
ORACLE(tunnel-config)#
```

3. Use the **local-ip-address** parameter to specify the IP address at the OCSBC end of the tunnel.

> **Note:**
>
> This address also supports the exchange of CCP messages.

```
ORACLE(tunnel-config)# local-ip-address 1.1.1.100
ORACLE(tunnel-config)#
```

4. Ignore the **remote-mac-address** parameter which is not required for tunnel configuration.
5. Use the **remote-ip-address** parameter to specify the IP address at the OCSLB end of the tunnel.

> **Note:**
>
> This address also supports the exchange of CCP messages.

```
ORACLE(tunnel-config)# remote-ip-address 182.16.204.210
ORACLE(tunnel-config)#
```

6. Use the **port** parameter to specify the port used to send and receive cluster control messages.

   ```
   ORACLE(tunnel-config)# port 4444
   ORACLE(tunnel-config)#
   ```

7. Use the **protocol** parameter to specify the transport protocol used in support of cluster control messages.

   Supported transport protocol is UDP (the recommended default).

   ```
   ORACLE(tunnel-config)# protocol UDP
   ORACLE(tunnel-config)#
   ```

8. Use the **application** parameter to specify the application protocol supported by this tunnel.

   Specify the SIP protocol.

   ```
   ORACLE(tunnel-config)# application SIP
   ORACLE(tunnel-config)#
   ```

9. Use **traffic-policy** to enter the name of the traffic policy that applies to this tunnel (1-128 characters long) as configured on the OCSLB.

   This configuration is a per-tunnel configuration. Once configured, it will be passed on via the CCP protocol to OCSLB in Heartbeat messages.

   The CCD task running on the SLB will extract the traffic policy name and will find the matching traffic-policy configuration on the SLB.

   ```
   ORACLE(tunnel-config)# traffic-policy <pattern>
   ORACLE(tunnel-config)#
   ```

10. Use **done**, **exit**, and **verify-config** to complete configuration of this tunnel-config configuration element.
11. Repeat Steps 1 through 9 to complete tunnel configuration on other SIP interfaces as required.

Sample OCSBC Tunnel Configuration

The following formatted extract from **show running-config** ACLI output shows a sample OCSBC (cluster member) configuration.

```
tunnel-config
name                          one
local-ip-address              1.1.1.100
remote-mac-address
remote-ip-address
182.16.204.210
port                          4444
protocol                      UDP
tls-
profile
      TLS-LB
traffic-
policy                                                          tp1
application                   SIP
last-modified-by              admin@console
last-modified-date            2013-11-10 23:24:15
```

> **Note:**
>
> This configuration is a per-tunnel configuration. Once configured, it will be passed on via the CCP protocol to the OCSLB in Heartbeat messages.

SIP Configuration

In a traditional Oracle Communications Session Border Controller (OCSBC) configuration the IP address assigned to a sip-port configuration element is contained within the address space defined by the network interface netmask. This is not be the case for clustered OCSBCs. Rather, the IP address assigned to the sip-port is identical to the address of an Oracle Communications Subscriber-Aware Load Balancer (OCSLB) service-port advertised on the access network. The process of encapsulating the packets between the OCSLB and OCSBC masks the fact that the IP address the OCSBC expects to receive IP packets on is different than the Layer 5 address the OCSBC expects the SIP address on.

Consistency of realm identification is vital to successful and predictable policy-based load balancing. Take particular care to ensure that the **realm-id** of the sip-interface configuration element mirrors the **lb-realm** assignments made while configuring distribution rules. See the Distribution Policy Configuration section.

In the following configuration example, the **realm-id** is LosAngeles. This OCSBC, when booted, will detect that it is a member of an OCSLB cluster and register the service port 10.0.0.1:5060/UDP as the realm LosAngeles with the OCSLB. The OCSLB will automatically create the OCSBC group LosAngeles (if it doesn't exist) or join the OCSBC to the group LosAngeles (if it is not the first to advertise LosAngeles). Policy statements that direct packets to LosAngeles now consider this OCSBC as a potential destination, assuming the address:port/protocol also are consistent with the policy's matching criteria.

This technique allows you to configure the same IP:port/protocol on multiple OCSBCs, with different realm-id labels, to indicate priority of one OCSBC or group of OCSBCs over another. As an example, consider several OCSBCs geographically situated together with the label

LosAngeles, and several other OCSBCs geographically situated elsewhere with the label NewYork, all with the identical SIP interface and SIP port configuration. A policy can be easily defined to give preference to a source subnet of users in California to the LosAngeles member OCSBCs, with NewYork as a second priority. This provides flexibility in network design without undue burden in the configuration: OCSBCs' tagged with the same realm name are joined in dynamically created OCSBC groups by the OCSLB, with no explicit configuration required on the OCSLB whatsoever.

1. From superuser mode, use the following ACLI command sequence to access sip-interface configuration mode. While in this mode, you verify the **realm-id** and assign the newly created IP-in-IP tunnel to a SIP interface.

```
westy# configure terminal
westy(configure)# session-router
westy(session-router)# sip-interface
westy(sip-interface)# select
<realm-id>: LosAngeles
1: LosAngeles  172.192.1.15:5060
selection: 1
westy(sip-interface)# show
sip-interface
        state                   enabled
        realm-id                LosAngeles
        ...
        ...
        ...
westy(sip-interface)#
```

2. Use the **tunnel-name** parameter to assign the IP-in-IP tunnel to the current SIP interface.

```
westy(sip-interface)# tunnel-name sipSignaling
westy(sip-interface)# ?
```

3. Use the **sip-port** command to move to sip-port configuration mode.

```
westy(sip-interface)# sip-port
westy(sip-port)# ?
address            IP Address
port               port (default: 5060)
transport-protocol transport protocol
tls-profile        the profile name
allow-anonymous    allowed requests from SIP realm
ims-aka-profile    ims-aka profile name
select             select a sip port to edit
no                 delete a selected sip port
show               show sip port information
done               write sip port information
exit               return to previous menu
westy(sip-port)#
```

4. Use the **address**, **port**, and **transport-protocol** parameters to mirror the address of an existing SLB service port.

```
westy(sip-port)# address 10.0.0.1
westy(sip-port)# port 5060
westy(sip-port)# transport-protocol udp
westy(sip-port)#
```

5. Use **done**, **exit**, and **verify-config** to complete configuration of this sip-port configuration element.

6. Repeat Steps 1 through 5 as necessary to verify **realm-id**s, assign IP-in-IP tunnels, and create mirrored service ports on additional SIP interfaces.

Online Offline Configuration

The **set-system-state** ACLI command provides the ability to temporarily place a clustered OCSBC in the offline state. The offline setting puts the OCSBC into a state where it is powered on and available only for administrative purposes.

The transition to the offline state is graceful in that existing calls are not affected by the state transition. The OCSBC informs the Oracle Communications Subscriber-Aware Load Balancer (OCSLB) of the impending status change via a CCP message. Upon receiving such a message, the OCSLB ceases to forward new endpoints to the OCSBC, and places the OCSBC in the Shutdown state. The OCSBC, for its part, enters a state that results in the rejection of any incoming out-of-dialog SIP requests. Eventually all calls compete, registrations expire and are removed by the OCSLB, and returning endpoints are allotted to active OCSBCs.

Use the **set-system-state offline** ACLI command to place an OCSBC in the offline state.

```
ORACLE# set-system-state offline
Are you sure you want to bring the system offline? [y/n]?: y
Setting system state to going-offline, process will complete when all current
calls have completed
ORACLE#
```

> **Note:**
>
> An OCSBC in the offline state plays no role in a balance or rebalance operation.

In a similar fashion use the **set-system-state online** ACLI command to place an OCSBC in the online state.

```
ORACLE# set-system-state online
Are you sure you want to bring the system online? [y/n]?: y
Setting system state to online
ORACLE#
```

3
IMS-AKA and TLS Support

The Oracle Communications Subscriber-Aware Load Balancer (OCSLB) supports IMS-AKA and TLS traffic, forwarding it to and from the Session Border Controllers (SBCs) within IP-over-IP tunnels. Both IPv4 and IPv6 are supported.

IMS-AKA and TLS traffic support requires configuration on the OCSLB and the OCSBC:

- For IMS-AKA:
  - The SLB requires a **service-port** configured with **port** 0 and **protocol** ALL.
  - The OCSBC requires a dedicated range of client ports and a dedicated server port configured in the IMS-AKA config to accommodate encrypted traffic.
- For TLS:
  - The SLB requires the applicable **service-port** configured with either:
    * The applicable **service-port** configured with the **protocol** value of **ALL** and the **port** configured with **0**, or
    * The applicable **service-port** configured with the **protocol** value of **TCP** and the **port** configured with the correct number.
  - The OCSBC requires normal TLS configuration, as described in the *ACLI Configuration Guide*.

OCSLB Configuration for IMS-AKA and TLS Traffic

The user makes the settings below to the applicable **cluster-config** element on the Oracle Communications Subscriber-Aware Load Balancer (OCSLB) to support IMS-AKA and TLS traffic. These setting allow this support by preventing the OCSLB from restricting the type of traffic supported by the cluster.

1. From superuser mode, use the following ACLI command sequence to access the **cluster-config** element.

   ```
   ORACLE# configure terminal
   ORACLE(configure)# session-router
   ORACLE(session-router)# cluster-config
   ORACLE(cluster-config)#service-ports
   ORACLE(service-port)#
   ```

2. Use the **port** parameter to specify the port monitored by the OCSLB for incoming signaling messages.

   The required setting for IMS-AKA or TLS is **0**.

   ```
   ORACLE(service-port)# port 0
   ORACLE(service-port)#
   ```

3. Use the **protocol** parameter to choose the transport protocol.

   The required setting for IMS-AKA or TLS is **ALL**.

```
ORACLE(service-port)# protocol ALL
ORACLE(service-port)#
```

4. Use **done**, **exit**, and **verify-config** to complete configuration of this tunnel-config configuration element.
5. Use **done**, **exit**, and **verify-config** to complete configuration of the OCSBC **ims-aka-profile**.

OCSBC Configuration for IMS-AKA Traffic

The user makes the settings below on the Oracle Communications Session Border Controller (OCSBC) to support IMS-AKA traffic while operating with the Oracle Communications Subscriber-Aware Load Balancer.

1. On each OCSBC in the cluster, access the **ims-aka-profile**.

   The required setting for IMS-AKA or TLS is **ALL**.

   ```
   ORACLE# configure terminal
   ORACLE(configure)#security
   ORACLE(security)#ims-aka-profile
   ORACLE(ims-aka-profile)#
   ```

2. Use the **start-protected-client-port** parameter to set the starting port number for the range of ports needed for IMS-AKA.

   The example below show the start port as **4061**.

   ```
   ORACLE(ims-aka-profile)#start-protected-client-port 4061
   ORACLE(ims-aka-profile)#
   ```

3. Use the **end-protected-client-port** parameter to set the end port number for the range of ports needed for IMS-AKA.

   The example below show the end port as **4063**.

   ```
   ORACLE(ims-aka-profile)#start-protected-client-port 4063
   ORACLE(ims-aka-profile)#
   ```

4. Use the **protected-server-port** parameter to set the server port needed for IMS-AKA.

   The example below show the end port as **4060**.

   ```
   ORACLE(ims-aka-profile)#start-protected-client-port 4060
   ORACLE(ims-aka-profile)#
   ```

5. Use **done**, **exit**, and **verify-config** to complete this configuration.

Displaying Encrypted Traffic Detail on the OCSBC

The syntax of the **show sipd** ACLI command allows for the **tunnel** parameter, which displays Oracle Communications Subscriber-Aware Load Balancer (OCSLB) tunnel statistics on the Oracle Communications Session Border Controller (OCSBC). Sample output, which shows static operational information at the top and specific port statistics at the bottom, is shown below.

```
ORACLE# show sipd tunnel

|Tunnel       : 11|182.16.209.48|182.16.209.1
-------------------------------------------------------------
|Conf Name    : M01:11/one
|State        : InService      Cur Ping TMOs   : 0/5
```

```
|LB           : hermes         Total Ping TMOs : 0
|SBC Atoms    : 0              Service Ports   : 20/20
|SP Atoms     : 0              Application     : SIP
|Last Event   : srcAddrAware   Purge Timer     :
|Timer Event  : Heartbeat      Timer           : 1604ms
|IPT Handle   : 0x3f           Network Intf    : 0|1.11
|ActiveLbId   : 3              Waiting On      :
|LostCtlCount : 0              Last Lost Cntrl : Never
|NextCfgCheck :                CCP Version     : 7/7
|Source Key   : src-addr
|
|Service Port                                  Prev| Cur|Next lbStat Handle Atoms
|------------                                  ----|----|---- ------ ------ ------
|Realm192p1:192.168.209.1:4060<6>              CRng IS   -    200    513    0
|Realm192p1:192.168.209.1:4060<17>             CRng IS   -    200    518    0
|Realm192p1:192.168.209.1:4061<6>              CRng IS   -    200    514    0
|Realm192p1:192.168.209.1:4061<17>             CRng IS   -    200    519    0
|Realm192p1:192.168.209.1:4062<6>              CRng IS   -    200    515    0
|Realm192p1:192.168.209.1:4062<17>             CRng IS   -    200    520    0
|Realm192p1:192.168.209.1:4063<6>              CRng IS   -    200    516    0
|Realm192p1:192.168.209.1:4063<17>             CRng IS   -    200    521    0
|Realm192p1:192.168.209.1:5060<6>              CRng IS   -    200    517    0
|Realm192p1:192.168.209.1:5060<17>             CRng IS   -    200    522    0
```

To understand the command's service port output, consider the scenario where the user configures the OCSBC as shown in the section titled *SBC Configuration for IMS-AKA Traffic*. This configuration defines the protected port range over which IMS-AKA traffic moves between the OCSBC and the OCSLB.

The user also typically configures two **sip-port**s on the OCSBC to accommodate IMS-AKA. (This is true regardless of whether the OCSBC supports IMS-AKA behind an OCSLB or directly.) When configured in conjunction with the protected port range configured in *SBC Configuration for IMS-AKA Traffic*, the OCSBC creates OCSLB service ports for IMS-AKA in addition to the two ports listening on 5060. The **show sipd tunnel** , therefore, displays statistics for all TCP and UDP ports. In the command output below, <6> indicates a TCP port and <17> indicates a UDP port. Ports using IPv6 can exist simultaneously, and would also be displayed by the command.

4

OCSLB/Cluster Management & Diagnostics

OCSLB Statistics

The Oracle Communications Subscriber-Aware Load Balancer provides the operator with a full set of statistical data for troubleshooting and diagnostic purposes. This section describes current statistical outputs and defines displayed values. It is important to become familiar with the data and the collection process when opening trouble tickets as service personnel will rely upon this information to assist you in diagnosing hardware, software, and/or network issues.

show balancer

The **show balancer** command is the root of all statistical data pertinent to OCSLB operation. Below is a list of valid arguments, which are described in further detail in the following sections:

```
ORACLE# show balancer ?
endpoints  show session load balancer endpoints
members     show session load balancer cluster member summary
metrics     show load balancer metrics
realms      show load balancer realms
tunnels     show session load balancer statistics
statistics  show session load balancer IP-in-IP tunnel info
ORACLE#
```

show balancer endpoints

The **show balancer endpoints** command displays a full list of all IP-to-OCSBC mappings resident in the Oracle Communications Subscriber-Aware Load Balancer (OCSLB). As the OCSLB can hold up to ten million entries, the output of this command can and will grow very large, and extreme caution should be exercised when executing this command on a heavily trafficked OCSLB system.

```
ORACLE# show balancer endpoints
IP address Port Access   Core     Flags    SBC  Handle
---------  ---- -------- -------- -------- ---- ------
15.0.0.24  5060 00134324 10134324 c0000000 1023 [wigglytuff]
15.0.0.22  5060 00134323 10134323 c0000000 1022 [jigglypuff]
15.0.0.20  5060 00134322 10134322 c0000000 1021 [tuono]
15.0.0.18  5060 00134321 10134321 c0000000 1020 [superduke]
15.0.0.16  5060 00134320 10134320 c0000000 1023 [wigglytuff]
15.0.0.14  5060 00134319 10134319 c0000000 1022 [jigglypuff]
15.0.0.12  5060 00134318 10134318 c0000000 1021 [tuono]
15.0.0.10  5060 00134317 10134317 c0000000 1020 [superduke]
15.0.0.8   5060 00134316 10134316 c0000000 1023 [wigglytuff]
15.0.0.6   5060 00134315 10134315 c0000000 1022 [jigglypuff]
15.0.0.4   5060 00134314 10134314 c0000000 1021 [tuono]
15.0.0.2   5060 00134313 10134313 c0000000 1020 [superduke]
ORACLE#
```

The table provided by **show balancer endpoints** displays every endpoint mapping. In the above example, note that IP addresses in the 15.0.0.0/24 space are being distributed among a number of OCSLBs. The IP address and Port columns pinpoint a specific endpoint. The Index, Address, and Flags columns contain SLB internal reference identifiers for locating that specific endpoint in memory. The OCSLB Handle column identifies which OCSLB serves that endpoint; use the **show balancer members** command to display a mapping of OCSLB names to OCSLB handles.

You can use optional command arguments to filter/restrict command output.

show balancer endpoints address <ip-address> restricts the display to one endpoint.

For example:

```
show balancer endpoints address 15.0.0.232
```

displays data for the specified IP endpoint.

show balancer endpoints address <ip-address>/<:port_num>restricts the display to a specific port on a specific IP address.

For example:

```
show balancer endpoints address 15.0.0.232:5060
```

Displays data for port 5060 on the specified endpoint.

show balancer endpoints address <ip-address>/<bit-mask-len> restricts the display to a contiguous range of endpoint addresses.

For example:

```
show balancer endpoints address 15.0.0.0/24
```

Displays data for the 15.0.0.0 subnet.

```
show balancer endpoints address 15.0.0.240/28
```

Displays data for endpoint addresses 15.0.0.240 through 15.0.0.255.

```
show balancer endpoints <ip-address>/<bit-mask-len><:port_num>
```

Displays data for a specific port on a contiguous range of endpoint addresses.

show balancer members

The **show balancer members** command provides a list of all OCSBCs that have registered with the Oracle Communications Subscriber-Aware Load Balancer (OCSLB).

```
ORACLE# show balancer members
SBC Name                      Source Address   Destination Address  S/P/VLAN
Endpoints
---- ------------------------ --------------- ------------------- --------
---------
1020 superduke                 68.68.68.100     68.68.68.5           0/0/0    3
1021 tuono                     68.68.68.100     68.68.68.4           0/0/0    3
1022 jigglypuff                68.68.68.100     68.68.68.1           0/0/0    3
1023 wigglytuff                68.68.68.100     68.68.68.2           0/0/0    3

              max endpoints: 12
    max untrusted endpoints: 200
          current endpoints: 12
```

```
current untrusted endpoints: 0
               current SBCs: 4
ORACLE#
```

The OCSBC column contains the OCSBC handle, an internal shorthand that identifies a specific OCSBC. The **show balancer members** command provides a handle-to-hostname mapping.

Name contains the SBC hostname.

Source IP contains the local (OCSLB) tunnel address.

Destination IP contains the remote (SBC) tunnel address.

Slot, Port, and Vlan identify the local interface that supports the OCSLB-to-OCSBC tunnel.

endpoints contains the number of endpoint-SBC associations that the OCSLB created for each specific OCSBC,

max endpoints contains the licensed capacity of the OCSBC.

max untrusted endpoints contains the maximum allowed number of untrusted endpoints.

current endpoints contains the current number of endpoints, trusted and untrusted

current untrusted endpoints contains the current number of untrusted endpoints.

show balancer metrics

The Oracle Communications Subscriber-Aware Load Balancer (OCSLB)'s **show balancer metrics** command displays a comparison between the number of local endpoints (that is, the associations between source addresses and each OCSBC) and the number of remote endpoints (that is, what the OCSBC reports to the OCSLB as the number of endpoints it has received via the tunneled interface). In the following output, those two numbers are the same; this is true if and only if there are no users in the access network that have multiple phone lines sourced from the same IP address. Were that the case, the number of remote endpoints would be higher than the number of local endpoints.

This table is populated with the data received in the periodic heartbeats from the OCSBC to the OCSLB. As these heartbeats are somewhat infrequent (every two seconds by default), the data in this table should only be considered accurate within two seconds.

```
ORACLE# show balancer metrics
                           local remote             max         max  Over
SBC Name                   epts  epts max reg CPU   CPU  Mem%   Mem  Load
--- ---------------------- ----- ---- ------- ----  ---- -----  ----- ----
 93 magichat               0     0    480000  2.7  90.0  0.9    95.0   no
 94 westy                  0     0    480000  2.7  90.0  0.8    95.0   no
 95 samadams               0     0    480000  2.8  90.0  0.7    95.0   no
 96 bass                   0     0    480000  4.3  90.0  2.8    95.0   no
 97 sixtus                 0     0    480000  2.9  90.0  12.8   95.0   no
 98 newcastle              0     0    480000  2.9  90.0  1.8    95.0   no
 99 guiness                0     0    480000  3.6  90.0  0.8    95.0   no
ORACLE#
```

Fields descriptions include:

- SBC contains the OCSBC handle.
- Name contains the OCSBC hostname.

- max reg contains the maximum number of endpoints the OCSLB will send to this specific OCSBC. Its value is derived from the product of the **session-multiplier** parameter in the cluster-config configuration element and the OCSBC's licensed session capacity. The OCSBC passes this value to the OCSLB during the OCSBC's registration process into the cluster.
- CPU contains the last received information on the CPU percentage from this OCSBC.
- Max CPU contains the threshold percentage at at which the OCSBC defines itself as overloaded.
- Mem contains the last received information on the Mem percentage from this OCSBC.
- Max Mem contains the threshold percentage at which the OCSBC defines itself as overloaded.
- Overload displays whether or not the OCSBC is reporting itself as overloaded to the OCSLB.

show balancer realms

The **show balancer realms** command displays a composite list of realms that all member OCSBCs have registered with the OCSLB.

```
ORACLE# show balancer realms
Realm        SBC Tunnel Name                    ref count endpoints
---------- --- ------ ----------------------- --------- ---------
access       99   4092 newcastle                       1     53535
access       98   4091 magichat                        1     53535
access       97   4090 augustiner                      1     53535
access       94   4086 bass                            1     53535
access       93   4085 westy                           1     53535
access       92   4084 sixtus                          1     53535
access       96   4089 guiness                         1     53535
net-13       99   4088 samadams                        1     62550
net-13       91   4087 stbernie                        1     62550
ORACLE#
```

In this example, seven of the nine OCSBCs have registered the realm access and two have registered the realm net-13. The total number of endpoints for each of these services is indicated in the rightmost column. The **ref count** column is reserved for future use.

show balancer statistics

The **show balancer statistics** command displays statistical output pertinent to low-level events on the OCSLB. The contents and output of this command are subject to change, and will be documented in a subsequent document release.

```
ORACLE# show balancer statistics
Balance stats:
--------------
LBP agent not found          0
packets dropped by standby   0
max capacity reached drops   0
total packets processed      3
packets dropped in balance   0
  group not found            0
  service not found count    0
  untrusted dropped          0
  invalid endpoint           0
```

```
  duplicate ept packet drops 0
  insert error               0
  Tx packet failed count     0
  throttle drops             0
  sbc not found drops        0
forwarded duplicates         0
policy miss                  0
realm miss                   3
throttle skips               0
throttle policy skips        0
EPT mgmt stats:
untrusted age outs           3
Total Endpoint add reqs      3
Endpoints added              3
  ept added as trusted       0
  ept add invalid            0
  ept added unknown state    0
  ept added success          3
  ept insert not valid       0
  ept insert not pend        0
EPT add errors               0
  no endpoint handles        0
  already added              0
  ept add db fail            0
  flow add err               0
  datapath add err           0
Total Endpoint update reqs   0
Endpoints updated            0
  endpoint not valid         0
  endpoint being deleted     0
  endpoint already trusted   0
  endpoint not found         0
  unknown trust state        0
  not untrusted pending      0
  not trusted pending        0
  trusted not valid          0
  cbk unknown state          0
  bad callback               0
  ept update success         0
EPT update errors            0
  update param err           0
  find group err             0
  invalid index              0
  flow update err            0
  ept upd cbk invalid        0
  datapath upd err           0
marked invalid               0
not pending                  0
not inserted                 0
Total Endpoint remove reqs   3
CCD/RED Endpoint remove reqs 0
Endpoints removed            3
  unknown state              0
  del not wait               0
  del not pend               0
  ept delete success         3
EPT delete errors            0
  find group err             0
  endpoint not found         0
  invalid index              0
  delete in progress         0
```

```
  endpoint SBC mismatch      0
  ept del invalid            0
  ept del db fail            0
  datapath del err           0
  insert wait                0
  insert not pend            0
----------------------------
trusted endpoints (EPT db)   0
untrusted endpoints (EPT db) 0
----------------------------
total trusted endpoints      0
total untrusted endpoints    0
total endpoints              0
available endpoint handles   5000000


Map / queue sizing:
 insert size 0
 trust  size 0
 remove size 0


Max requests, etc.
g_lbpMaxRequests: 0
g_lbpMaxRequests_highwater: 1
g_lbpMsg_highwater: 0
g_lbp_setEndpointTrustLevel 0
g_lbp_removeEndpoint 0
g_lbp_max_untrusted 10000
g_pendingHAListHighWater 0
g_pendingHADelListHighWater 0
```

show balancer tunnels

When implemented on the OCSLB, the **show balancer tunnels** command generates a list of data for each tunnel between the Oracle Communications Subscriber-Aware Load Balancer (OCSLB) and its clustered OCSBCs. It includes the tunnel source and destination addresses, as well as an internal switch ID (swid) for this tunnel.

```
ORACLE# show balancer tunnels
1020(1025/1026)::
outer src addr = 68.68.68.100
outer dst addr = 68.68.68.5
slot/port/vlan = 0/0/0
traffic policy selected: "" ;  traffic policy configured: implicit defaults.
  service: 172.16.2.3:5060 [access] protocols: 17/21588

1021(1025/1026)::
outer src addr = 68.68.68.100
outer dst addr = 68.68.68.4
slot/port/vlan = 0/0/0
traffic policy selected: "" ;  traffic policy configured: implicit defaults.
  service: 172.16.2.3:5060 [access] protocols: 17/21588

1022(1025/1026)::
outer src addr = 68.68.68.100
outer dst addr = 68.68.68.1
slot/port/vlan = 0/0/0
traffic policy selected: "" ;  traffic policy configured: implicit defaults.
  service: 172.16.2.3:5060 [access] protocols: 17/21588
```

```
1023(1025/1026)::
outer src addr = 68.68.68.100
outer dst addr = 68.68.68.2
slot/port/vlan = 0/0/0
traffic policy selected: "" ;  traffic policy configured: implicit defaults.
  service: 172.16.2.3:5060 [access] protocols: 17/21588

ACMEPACKET# show balancer tunnels
errors       fragments    statistics
```

Use the **errors** argument for error reporting and troubleshooting.

```
ORACLE# show balancer tunnels errors
src addr 68.68.68.100 / dst addr 68.68.68.5 / slot 0 / port 0 / vlan 0:
  Proto Encaps Errors Decaps Errors
  ----- ------------ ------------
  17               0            0

src addr 68.68.68.100 / dst addr 68.68.68.4 / slot 0 / port 0 / vlan 0:
  Proto Encaps Errors Decaps Errors
  ----- ------------ ------------
  17               0            0

src addr 68.68.68.100 / dst addr 68.68.68.1 / slot 0 / port 0 / vlan 0:
  Proto Encaps Errors Decaps Errors
  ----- ------------ ------------
  17               0            0

src addr 68.68.68.100 / dst addr 68.68.68.2 / slot 0 / port 0 / vlan 0:
  Proto Encaps Errors Decaps Errors
  ----- ------------ ------------
  17               0            0

unknown protocol:      0
do not fragment drops: 0
no matching tunnel:    0
service lookup failed: 0
IP frag msg failure:   0
mblk alloc failues:    0
IP frame too large:    0
unknown errors:        0
unknown errors:        0
ORACLE#show balancer tunnels
errors       fragments    statistics
```

The **show balancer tunnels errors** command can also be executed on an OCSBC cluster member. In this usage, the displayed data is restricted to errors between the specific cluster member and the OCSLB.

Use the **fragments** argument for information related to packet fragmentation/reassembly details.

```
ORACLE# show balancer tunnels fragments
src addr 68.68.68.100 / dst addr 68.68.68.5 / slot 0 / port 0 / vlan 0:
  IP:Port:      172.16.2.3:5060
  Proto Encap Pkts Encap Octets Decap Pkts Decap Octets
  ----- ---------- ------------ ---------- ------------
  17             3         1239          0            0
```

```
src addr 68.68.68.100 / dst addr 68.68.68.4 / slot 0 / port 0 / vlan 0:
  IP:Port:      172.16.2.3:5060
  Proto Encap Pkts Encap Octets Decap Pkts Decap Octets
  ----- ---------- ------------ ---------- ------------
  17             3         1240          0            0


src addr 68.68.68.100 / dst addr 68.68.68.1 / slot 0 / port 0 / vlan 0:
  IP:Port:      172.16.2.3:5060
  Proto Encap Pkts Encap Octets Decap Pkts Decap Octets
  ----- ---------- ------------ ---------- ------------
  17             3         1243          0            0


src addr 68.68.68.100 / dst addr 68.68.68.2 / slot 0 / port 0 / vlan 0:
  IP:Port:      172.16.2.3:5060
  Proto Encap Pkts Encap Octets Decap Pkts Decap Octets
  ----- ---------- ------------ ---------- ------------
  17             3         1244          0            0
ORACLE#show balancer tunnels
errors       fragments    statistics
```

The **show balancer tunnels fragments** command can also be executed on an OCSBC cluster member. In this usage, the displayed data is restricted to fragmentation operations between the specific cluster member and the OCSLB.

Use the **statistics** argument for information related to packet counts.

```
ORACLE# show balancer tunnels statistics
src ip 182.16.203.83 / dst ip 182.16.203.87 / slot 0 / port 1 / vlan 0:
  IP:Port:  192.169.203.83:5050
  Proto Encap Pkts Encap Octets Decap Pkts Decap Octets
  ----- ---------- ------------ ---------- ------------
  6              0            0          0            0
  IP:Port:  192.169.203.83:5060
  Proto Encap Pkts Encap Octets Decap Pkts Decap Octets
  ----- ---------- ------------ ---------- ------------
  17         48011     24213914          0            0
src ip 182.16.203.83 / dst ip 182.16.203.86 / slot 0 / port 1 / vlan 0:
  IP:Port:  192.169.203.83:5060
  Proto Encap Pkts Encap Octets Decap Pkts Decap Octets
  ----- ---------- ------------ ---------- ------------
  17         48017     24217918          0            0
ORACLE#
```

The **show balancer tunnels statistics** command can also be executed on an OCSBC cluster member. In this usage, the displayed data is restricted to traffic counts between the specific cluster member and the OCSLB.

Cluster Control Protocol Statistics

The CCP provides the operator with a full set of statistical data for troubleshooting and diagnostic purposes.

show ccd

The **show ccd** command is the root of all statistical data pertinent to CCP operation. Below is a list of valid arguments, which are described in further detail in the following sections:

```
ORACLE# show ccd ?
ccp         Cluster Control Protocol Stats
rebalance   Display rebalance queue
reset       Reset Stats
sds         Controlled SDs
stats       Cluster Control Stats
ORACLE#
```

show ccd ccp

The **show ccd ccp** command displays aggregated data (that is, from all cluster members) about specific CCP operations.

```
Svc Add                Recent      Total  PerMax
====================   ======  =========  ======
Ops Recvd                   2         68       2
Op Replies Sent             2         68       2

                       -------- Received -------   ---------- Sent --------
Status Code            Recent      Total  PerMax   Recent      Total  PerMax
-----------            ------  ---------  ------   ------  ---------  ------
200 OK                      0          0       0        1         34       1
404 Not Found               0          0       0        1         34       1

Metrics                Recent      Total  PerMax
====================   ======  =========  ======
Ops Recvd                  16      43661      16
Op Replies Sent            16      43662      16

                       -------- Received -------   ---------- Sent --------
Status Code            Recent      Total  PerMax   Recent      Total  PerMax
-----------            ------  ---------  ------   ------  ---------  ------
200 OK                      0          0       0       14      43595      15
410 Gone                    0          0       0        2         67       2

OverloadMetrics        Recent      Total  PerMax
====================   ======  =========  ======
Ops Recvd                  16      43661      16
Op Replies Sent            16      43662      16

                       -------- Received -------   ---------- Sent --------
Status Code            Recent      Total  PerMax   Recent      Total  PerMax
-----------            ------  ---------  ------   ------  ---------  ------
200 OK                      0          0       0       15      43629      15
410 Gone                    0          0       0        1         33       1

Prov Done              Recent      Total  PerMax
====================   ======  =========  ======
Ops Recvd                   1         34       1
Op Replies Sent             1         34       1

                       -------- Received -------   ---------- Sent --------
Status Code            Recent      Total  PerMax   Recent      Total  PerMax
-----------            ------  ---------  ------   ------  ---------  ------
200 OK                      0          0       0        1         34       1

Stop Down              Recent      Total  PerMax
====================   ======  =========  ======
Ops Recvd                   3         98       3
Op Replies Sent             3         99       3
```

```
                    -------- Received -------   ---------- Sent --------
Status Code         Recent      Total  PerMax   Recent      Total  PerMax
-----------         ------  ---------  ------   ------  ---------  ------
200 OK                   0          0       0        3         98       3
410 Gone                 0          0       0        0          1       1
```

Use the hostname argument to display data for a specific cluster member.

```
ORACLE# show ccd ccp westy
--------------------
westy
--------------------
Svc Add             Recent      Total  PerMax
==================  ======  =========  ======
Ops Recvd                0         20      20
Op Replies Sent          0         20      20

                    -------- Received -------   ---------- Sent --------
Status Code         Recent      Total  PerMax   Recent      Total  PerMax
-----------         ------  ---------  ------   ------  ---------  ------
200 OK                   0          0       0        0         20      20

EP Promo            Recent      Total  PerMax
==================  ======  =========  ======
Ops Recvd                0       1000    1000
Duplicate Ops            0          1       1
Op Replies Sent          0       1000    1000

                    -------- Received -------   ---------- Sent --------
Status Code         Recent      Total  PerMax   Recent      Total  PerMax
-----------         ------  ---------  ------   ------  ---------  ------
200 OK                   0          0       0        0       1000    1000

Metrics             Recent      Total  PerMax
==================  ======  =========  ======
Ops Recvd               24      17517      15
Op Replies Sent         24      17517      15

                    -------- Received -------   ---------- Sent --------
Status Code         Recent      Total  PerMax   Recent      Total  PerMax
-----------         ------  ---------  ------   ------  ---------  ------
200 OK                   0          0       0       24      17516      15
410 Gone                 0          0       0        0          1       1

OverloadMetrics     Recent      Total  PerMax
==================  ======  =========  ======
Ops Recvd               24      17517      15
Op Replies Sent         24      17517      15

                    -------- Received -------   ---------- Sent --------
Status Code         Recent      Total  PerMax   Recent      Total  PerMax
-----------         ------  ---------  ------   ------  ---------  ------
200 OK                   0          0       0       24      17517      15

Prov Done           Recent      Total  PerMax
==================  ======  =========  ======
Ops Recvd                0          1       1
Op Replies Sent          0          1       1

                    -------- Received -------   ---------- Sent --------
```

```
Status Code           Recent      Total  PerMax   Recent      Total  PerMax
-----------           ------  ---------  ------   ------  ---------  ------
200 OK                     0          0       0        0          1       1

Stop Down             Recent      Total  PerMax
====================  ======  =========  ======
Ops Recvd                  0          2       2
Op Replies Sent            0          2       2

                      -------- Received -------   ---------- Sent --------
Status Code           Recent      Total  PerMax   Recent      Total  PerMax
-----------           ------  ---------  ------   ------  ---------  ------
200 OK                     0          0       0        0          2       2

ORACLE#
```

show ccd sds

The **show ccd sds** command displays a table containing an overview of all of the data gleaned from the CCP from each SBC.

```
ORACLE# show ccd sds
Session Director        Hdl  State     Tunnel Svcs Version     HW
----------------------- ---- --------- ------ ---- ---- ------ -----
augustiner                95 InService  1/1     2  6.2.0.30b8  SD3
bass                      94 InService  1/1     2  6.2.0.30b8  SD3
guinness                  96 InService  1/1     2  6.2.0.30b8  SD3
magichat                  97 InService  1/1     2  6.2.0.30b8  SD3
newcastel                 98 InService  1/1     2  6.2.0.30b8  SD3
samadams                  99 InService  1/1     2  6.2.0.30b8  SD3
sixtus                    92 InService  1/1     2  6.2.0.30b8  SD3
stbernie                  91 InService  1/1     2  6.2.0.30b8  SD3
westy                     93 InService  1/1     2  6.2.0.30b8  SD3
ORACLE#
```

Field descriptions include:

- Session Director contains the hostname of the cluster SBCs that are connected to the SLB.
- Hdl contains the clustered SBC handle, an internal shorthand that identifies a specific cluster member. The **show balancer members** command provides a handle to hostname mapping.
- State contains the current SBC state. Valid states are:
  - Init — during initial handshaking with the SLB
  - InService — healthy and operating normally
  - Rebalance — during a cluster expansion/contraction operation
  - LostControl — no longer communicating with the SLB
- Tunnel displays (the number of tunnels in service)/(the number of tunnels configured on the SBC).
- Svcs contains the number of advertised services (protocols) that the SBC has negotiated with the SLB.
- Version contains the software version running on that SBC.
- HW identifies the hardware platform (in this case, SD3 identifies an Acme Packet 4500 SBC).

- LastPing is not currently used.

When issued with an optional hostname argument, the **show ccd sds** command provides a detailed report for the target hostname.

```
ORACLE# show ccd sds bass
Session Director: bass

+--------------------------------------------------------------------
|State     : InService       Handle       : 0x3ff
|Tunnels   : 1               ServicePorts : 20
|HW Type   :                 SW Version   : 7.3.0.9b199
|Last Ping : 312ms           Remote State : Online
|App Count : 1               Active Id    : 4
|
|Service:        App  SvcPorts Tunnels Endpoints DropCount
+--------------- ---- -------- ------- --------- ---------
|Realm192p1       SIP       10       1         0         0
|Realm192p1_v66   SIP       10       1      1000         0
|
| Tunnel#: 0
+ ----------
| ID: (11|182.16.209.1|182.16.209.56)
| App: SIP
| Handle: 0x3ff
| Svcs: 20
| LastHB: 312ms
| Traffic Policy: Implicit Defaults
|
|# CPU   MAX  CurReg RegLimit CurSes  MaxSess State  CtlVer Mem%
+- ----- ---- ------ -------- ------- ------- ------ ------ ----
|0 0.0% 90.0% 1000   0        0       80000   InSer  7/7    38.0
|  0.0% 90.0% 1000   800000   0       80000
|
|Overloads Reported        : 0
|Causes: Memory Threshold Exceeded (0); Thread Overload- SIP (0),
|MBCD (0); Other (
|
|Service Port                        App  Handle   TunNdx Avail
+---------------------------------- ---- -------- ------ -----
|Realm192p1:192.168.218.7:4060<6>    SIP  513(1)     0    yes
|Realm192p1:192.168.218.7:4060<17>   SIP  514(2)     0    yes

ORACLE#
```

State

- State — the current SBC state
- Handle — the SBC handle
- Tunnels — the current number of SBC tunnels
- ServicePorts — the current number of SBC service ports
- HW Type — the hardware platform (in this case, SD3 identifies an Acme Packet 4500 SBC)
- SW Version — the installed software revision level
- Last Ping — the number of elapsed milliseconds, since a ping/keepalive was received from this SBC
- App Count — the number of applications supported by the SBC

Services State

- Service — the realm advertised by the SBC in the Service Port ID
- App — the supported protocol: SIP
- SVCPorts — the current number of service ports
- Tunnels — the current number of tunnels
- endpoints — the cumulative number of endpoints for this service
- DropCount — the number of elements to drop when rebalancing this SBC

Tunnel State

- # — the tunnel index (0 or 1)
- Tunnel — the SLB and SBC tunnel IP address
- App — the supported protocol: SIP
- Handle — the handle for the tunnel
- Svcs — the number if service ports supporting the tunnel
- LastHB — the number of elapsed milliseconds since a heartbeat was received from the remote end of this tunnel

Tunnel Metrics

- # — the tunnel number (0 or 1)
- CPU — the current CPU utilization rate
- Max — the maximum supported CPU utilization rate, if this value is exceeded, the tunnel implements a load limit algorithm
- CurReg — the current number of registrations supported by the SBC
- RegLimit — the maximum number of registrations supported by the SBC
- CurSess — the current call count reported by the SBC
- MaxSess — the maximum sessions for which the SBC is licensed
- State — whether or not the tunnel is in service
- Mem% — the current memory utilization
- Max — the maximum supported memory utilization rate, if this value is exceeded, the tunnel implements a load limit algorithm
- OverLoad — whether or not the SBC is reporting itself overloaded, and therefore out of contention for accepting new traffic

Service Port Data

- Service Port — the service path (the concatenation of realm, IP address, port number, and IP Level 4 protocol number — 17 for UDP, 6 for TCP)
- App — the supported protocol: SIP
- Handle — the handle for the service port
- TunNdx — the tunnel the service port is registered for
- Avail — current availability (yes or no) determined by the presence of heartbeats

show ccd stats

The **show ccd stats** command displays endpoint statistics for the OCSBC members of the cluster.

```
ORACLE# show ccd stats
17:10:09-54
                          -------- Period -------    ---- LifeTime ----
 SD                      Active  Rate   High Total  Total PerMax    High
bass                    I285714   0.0 285714    0 285.71K 13.76K 285.71K
guinness                I285714   0.0 285714    0 285.71K 13.76K 285.71K
magichat                I285714   0.0 285714    0 285.71K 13.76K 285.71K
newcastel               I285714   0.0 285714    0 285.71K 13.76K 285.71K
samadams                I285714   0.0 285714    0 285.71K 13.76K 285.71K
sixtus                  I285714   0.0 285714    0 285.71K 13.76K 285.71K
westy                   I285714   0.0 285714    0 285.71K 13.76K 285.71K
Total endpoints: 153908
Total rate     : 0.0
Total SDs      : 9
ORACLE#
```

The Period stats provided represent an accumulation of data for the amount of time specified after the dash separator in the timestamp printed in the first line of output (in this example, the period represents 54 seconds).

The single ASCII character between the SD column and the Active column is the state of that OCSBC; the letter I represents InService.

The Rate column displays the transmission rate of new endpoint associations to that particular OCSBC. (In the sample, no new endpoints are arriving in the cluster, so all of the OCSBCs show a rate of 0.0.) The High field indicates the highest number of active endpoint associations for the current period.

When issued with an optional hostname argument, the **show ccd stats** command provides a detailed report for the target hostname.

```
ORACLE# show ccd stats bass
15:09:25-59
SD bass               [InService]
State                 -- Period -- -------- Lifetime --------
            Active    High   Total      Total Permax     High
Tunnels          1       1       0          2      1        1
Service Ports    2       2       0          2      1        2
endpoints    53571   53571      0      53571  14399    53571
Contacts      53571   53571      0      53571  14399    53571
Sessions         0       0       0          0      0        0

                            ---- Lifetime ----
                          Recent        Total       PerMax
Heartbeats rcvd              30        27426           15
Heartbeats Missed             0            1            1
Tunnel Adds                   0            2            1
Tunnel Removes                0            1            1
Service Adds                  0            2            1
Service Removes               0            0            0
endpoint Removes              0            0            0
endpoint Promotes             0        53571        13561
endpoints Skipped             0            0            0
```

```
Rebalance Source              0           0           0
Rebalance Targe               0           0           0
Rebalance Request             0           0           0
Rebalance Replies             0           0           0
CPU Above Limit               0           0           0
CPU Above Threshold           0           0           0
Online Transitions            0           0           0
Offline transitions           0           0           0
Tunnel Add Fails              0           0           0
CCD Tunnel Add Fails          0           0           0
Tunnel Remove Fails           0           0           0
CCD Tunnel Remove Fails       0           0           0
Service Add Fails             0           0           0
CCD Svc Add Fails             0           0           0
Service Remove Fails          0           0           0
CCD Svc Remove Fails          0           0           0
Service Adds No Cfg           0           0           0
Bad Service Handle            0           0           0
endpoint Remove Fails        0           0           0
endpoint Prom Fail           0           0           0
ORACLE#
```

The **Period** stats provided represent an accumulation of data for the amount of time specified after the dash separator in the timestamp printed in the first line of output (in this example, the period represents 59 seconds).

Tunnels contains the number of tunnels between the OCSLB and the target OCSBC, in this case, bass.

Service Ports contains the number of Service Ports advertised by the target OCSBC when it joined the cluster.

endpoints and **Contacts** contain the number of endpoint associations the OCSLB has assigned to the target OCSBC. If there is only one registering device at a given endpoint, a one-to-one correlation between endpoints and contacts is expected. However, if the **atom-limit-divisor** parameter has been set to a non-default value, the number of contacts exceeds the number of endpoints.

Sessions contains the number of active calls.

The **Lifetime** stats provided represent an accumulation of data since the last reboot.

HeartBeats rcvd contains the number of heartbeat/keepalive messages received from the target OCSBC. Heartbeats are sent every two seconds by the OCSBC.

HeartBeats Missed contains the number of scheduled heartbeat/keepalive messages not received from the target OCSBC.

The **Tunnel Adds** and **Tunnel Removes** counters are incremented when an OCSBC joins the cluster and leaves the cluster, respectively.

The **Service Adds** and **Service Removes** counters are incremented when an OCSBC advertises support for a service and withdraws support for a service, respectively. This generally happens only when an OCSBC first joins the cluster, or if the configuration on a clustered OCSBC is changed, saved, and activated.

The **endpoint Removes** counter tracks the number of OCSBC-originated Cluster Control messages that request the OCSLB to delete a forwarding rule. Such a request can be the result of (1) a rebalance operation (when the OCSLB asks for the OCSBC to nominate candidates for rebalancing), (2) an endpoint de-registration with the OCSBC, or (3) an endpoint is power

down. Generally, whenever a registration cache entry on a clustered endpoint is removed by the OCSBC, it notifies the OCSLB to remove that binding.

The **endpoint Promotes** counter tracks the number of promotion messages the OCSBC sends to the OCSLB to validate an untrusted forwarding rule. When the SLB first creates a forwarding rule for a new endpoint, it treats it as untrusted. When the OCSBC receives a 200 OK for a REGISTER message from that endpoint's registrar, the OCSBC sends a Promote Cluster Control message to the OCSLB. At this point, the OCSLB modifies the particular forwarding rule and assigns it trusted status. If this Promote message is not received within the time configured as the untrusted-grace-period in the lbp-config, the OCSLB deletes the untrusted entry.

endpoints Skipped contains the number of endpoints in its registration cache that the OCSBC has skipped over during a rebalance request. Skipping may be done for one of two reasons: either the most appropriate user for rebalancing was in an active phone call (and **rebalance-skip-calls** was enabled in cluster-config), or the **rebalance-skip-ahead** value in cluster-config was set to a nonzero value. In this case, when the OCSBC is asked to nominate users for rebalance, it will skip over any users whose registration cache entry is due to expire within the number of milliseconds set as the **rebalance-skip-ahead** value.

Rebalance Source contains the number of times the target OCSBC was used as a source of endpoints during a rebalance operation (that is, it supplied endpoints to a cluster member that was added to the cluster after itself).

Rebalance Target contains the opposite: the number of times that OCSBC was the recipient of endpoints from other sources during a rebalance operation.

The **Rebalance Requests** and **Rebalance Replies** counters increment upon receipt of a Cluster Control message from the OCSLB to the OCSBC asking it to divest itself of endpoints, and the responsive Cluster Control message from the OCSBC that indicates the endpoints the OCSBC has chosen.

The **CPU Above Limit** and **CPU Above Threshold** counters increment whenever an OCSBC has reported a high CPU value, and has been taken out of consideration for new endpoint assignments. Generally, the CPU limit and threshold are the same value (90%). However, it is possible to configure the threshold to be lower using the sip-config **option load-limit**.

OCSBC Cluster Member Statistics

The OCSBC cluster member also provides the operator with summary statistical data for active endpoints

show sip lb-endpoints

The **show sipd lb-endpoints** command displays OCSBC endpoint stats by realm or tunneled service ports, by sip-interface since each SIP interface is uniquely identified by its realm name.

While this command was not changed for the addition of source port keys, there are some important items to note. When all endpoints are behind a NAT and source ports are used in endpoint keys, the number of endpoints should match the number of atoms. Were all endpoints are behind a single NAT, and source address keys in use, There would be many atoms and only one endpoint. Obviously in mixed environments this will be less clear and thus this command less useful. However, in lab environments this can be useful.

```
ORACLE# sho sipd lb-endpoints
-------------------------------------
```

```
Realm Endpoint Stats
------------------------------------
10:57:29-35
Service Realm192p1
              ------- Period -------      ------ Lifetime -----
              Active    High   Total      Total  PerMax    High
Endpoints     2                           2
2                     2                   2                          2
Atoms         2                            2
2                     2                   2                          2
                        ------- Lifetime -------
                        Recent      Total  PerMax
Refreshes                  0          0       0
Adds                       2          2       2
Low Skips                  0          0       0
High Skips                 0          0       0
Auth Promo Tries           0          0       0
noTrust Promo Tries        0          0       0
Promo Tries                0          0       0
Remove Conflicts           0          0       0
Remote Deletes             0          0       0
SP Removes                 0          0       0
Expiry Deletes                       0          0       0
Session Deletes                 0          0       0
Session Adds                    0          0       0
Move Deletes                    0          0       0
Move Del No Tells               0          0       0
SvcMove Deletes                 0          0       0
SvcMove Del NoTell              0          0       0
Auth Promotes                   0                          0                      0
Auth Deletes                    0          0       0
Add Errors                      0          0       0
Delete Deny Sess                0          0       0
Delete Deny Reg                 0          0       0
Delete Deny Purge               0          0       0
Delete Missing                  0          0       0
Delete Errors                   0          0       0
Update Deny Purge               0          0       0
Auth Deny Purge                 0          0       0
Remote Sess Skips               0          0       0
Remote Del Fails                0          0       0
SP Remove Fails                 0          0       0
Expiry Del Fails                0          0       0
Sess Del Fails                  0          0       0
Sess Add Fails                  0          0       0
Move Del Fails                  0          0       0
Move No Tell Fails              0          0       0
SvcMove Del Fails               0          0       0
SvcMv NoTell Fails              0          0       0
Auth Promo Fails                0          0       0
Auth Del Fails                  0          0       0
App Cache Dels                  0          0       0
```

show sip ccp

The **show sip ccp** command displays a cluster-member-specific summary of CCP operations.

```
westy# show sip ccp
--------------------
```

```
M00:0.4:T2
--------------------

EP Del                Recent      Total  PerMax
====================  ======  =========  ======
Ops Sent                   0          1       1
Op Replies Recvd           0          1       1

                      -------- Received -------  ---------- Sent --------
Status Code           Recent      Total  PerMax Recent      Total  PerMax
-----------           ------  ---------  ------   ------ ---------  ------
200 OK                     0          1       1 0          0       0

EP Promo              Recent      Total  PerMax
====================  ======  =========  ======
Ops Sent                   0        992     538
Op Replies Recvd           0        992     538

                      -------- Received -------  ---------- Sent --------
Status Code           Recent      Total  PerMax Recent      Total  PerMax
-----------           ------  ---------  ------   ------ ---------  ------
200 OK                     0        992     538 0          0       0

Metrics               Recent      Total  PerMax
====================  ======  =========  ======
Ops Sent                  25        207      15
Op Replies Recvd          25        207      15

                      -------- Received -------  ---------- Sent --------
Status Code           Recent      Total  PerMax Recent      Total  PerMax
-----------           ------  ---------  ------   ------ ---------  ------
200 OK                    25        207      15 0          0       0

Stop Down             Recent      Total  PerMax
====================  ======  =========  ======
Ops Sent                   0          2       2
Op Replies Recvd           0          2       2

                      -------- Received -------  ---------- Sent --------
Status Code           Recent      Total  PerMax Recent      Total  PerMax
-----------           ------  ---------  ------   ------ ---------  ------
200 OK                     0          2       2 0          0       0
westy#
```

5

Subscriber-Aware Load Balancer SNMP Reference

Overview

This chapter provides an overview of SNMP support for Oracle Communications Subscriber-Aware Load Balancer (OCSLB) features.

Enterprise Traps

The following table identifies the OCSLB proprietary traps supported by the OCSLB.

apSLBEndpointCapacityThresholdTrap	Generated when the number of endpoints on the OCSLB exceeds the configured threshold.
apSLBEndpointCapacityThresholdClearTrap	Generated when the number of endpoints on the OCSLB falls below the configured threshold.
apSLBUntrustedEndpointCapacityThresholdTrap	Generated when the number of untrusted endpoints on the OCSLB exceeds the configured threshold.
apSLBUntrustedEndpointCapacityThresholdClearTrap	Generated when the number of untrusted endpoints on the OCSLB falls below the configured threshold.

License MIB (ap-license.mib)

MIB Object	Object ID 1.3.6.1.4.1.9148.3.5.1.1.1+	Description
apLicenseSLBEndpointCap	.23	OCSLB endpoint capacity (leaf)

Subscriber-Aware Load Balancer MIB (ap-slb.mib)

SNMP GET Query Name	Object Identifier Name: Number	Description
Object Identifier Name: apSLBMIBObjects (1.3.6.1.4.1.9148.3.11.1)		
Object Identifier Name: apSLBMIBGeneralObjects (1.3.6.1.4.1.9148.3.11.1.1)		
apSLBStatsEndpointsCurrent	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.1	Number of endpoints currently on the SLB.
apSLBStatsEndpointsDenied	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.2	Number of endpoints denied by the SLB because the system has reached the maximum endpoint capacity.

SNMP GET Query Name	Object Identifier Name: Number	Description
apSLBEndpointCapacity	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.3	Maximum number of endpoints allowed on the SLB. This value is based on the installed SLB license(s).
apSLBEndpointCapacityUpperThresh	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.4	Percentage of endpoints relative to maximum threshold capacity.
apSLBEndpointCapacityLowerThresh	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.5	Percentage of endpoints relative to minimum threshold capacity.
apSLBStatsUntrustedEndpointsCurrent	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.6	Number of untrusted endpoints currently on the SLB.
apSLBStatsTrustedEndpointsCurrent	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.7	Number of trusted endpoints currently on the SLB.
apSLBStatsUntrustedEndpointsDenied	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.8	The number of untrusted endpoints denied by the SLB due to the total number of untrusted endpoints exceeding the configured maximum threshold.
apSLBStatsUntrustedEndpointsAgedOut	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.9	The number of untrusted endpoints aged out of the system because they were not authenticated within the configured grace period.
apSLBUntrustedEndpointCapacity	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.10	Maximum number of untrusted endpoints allowed on the SLB. This value is a configured percentage of the maximum endpoint capacity of the system.
apSLBUntrustedEndpointCapacityUpperThresh	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.11	Percentage of untrusted endpoint maximum threshold capacity in use.
apSLBUntrustedEndpointCapacityLowerThresh	apSLBMIBGeneralObjects: 1.3.6.1.4.1.9148.3.11.1.1.12	Percentage of untrusted enpoint minumum threshold capacity percentage.

A

Known Issues and Caveats

Known Issues for Release S-Cz7.3.10

The Known Issues below apply to release S-Cz7.3.10 of the Subscriber Aware Load Balancer (SLB). For Known Issues on the following products, when they are Subscriber-Aware Load Balancer (SLB) cluster members, refer to those products' Release Notes:

- Session Border Controllers (SBC)
- Unified Session Manager (USM)
- Core Session Manager (CSM)

TLS

ID	Description	Found In	Fixed In
	There is an issue when the OCSLB has a **cluster-config** element with a **service-port** sub-element configured with: • **port** parameter set to 0 • **protocol** parameter set to ALL When configured as above, and when supporting multiple services on the applicable tunnel, the OCSLB drops all TLS traffic on that tunnel.	S-Cz7.3.10	

Balance/Rebalance Feature

ID	Description	Found In	Fixed In
	When approaching the maximum supported registrations per second, the user may find that only a small percentage of endpoint registrations correctly expire and must re-register.	S-Cz7.2.10	

High Availability (HA)

ID	Description	Found In	Fixed In
	During a HA failover, IPT core miss errors are incremented, which results in retransmissions.	S-Cz7.2.10p3	
26050436	When an SLB is operating in HA mode, the standby periodically sends SYNC messages to the Active. If, for any reason, the Active's response is delayed, the standby resends these SYNCs. If this "resend" happens after the active has responded, the active writes a "Stray response" log message to the log.lbp file. This issue may confuse the user, but does not impact service.	S-Cz7.3.10	

ID	Description	Found In	Fixed In
	When the SLB is operating in HA mode and the user removes an SBC from a cluster that has a large number (~100k) of endpoints, both the active and secondary SLB may crash.	S-Cz7.3.10	
	When the SLB is operating in HA mode, it writes an inordinate number of SYNC messages to the log.lbp file. This makes it difficult for the user to parse through this file when troubleshooting a related issue, and causes the file to wrap sooner than expected.	S-Cz7.3.10	
	When populated with 10 million registrations or more, the SLB may not synchronize all registrations before the default **redundancy-config**'s **becoming-standby-time timeout** of 180000. Workaround: Set the SLB's **becoming-standby-time timeout** to 1800000 when handling 10 million registrations or more.	S-Cz7.3.10	

IMS-AKA

ID	Description	Found In	Fixed In
	This release does not support IMS-AKA endpoints.	OCSBC Release S-CZ800	

Handling Fragmentation

ID	Description	Found In	Fixed In
	When operating on the Acme Packet 6100, the OCSLB may crash when receiving 200 messages per second that are fragmented at 12K bytes or more.	S-Cz7.3.10	

Duplicate IPs on Applicable SBC Interfaces

ID	Description	Found In	Fixed In
	The Oracle Communications Session Border Controller does not support overlapping IP addresses on Media interfaces between end points and SBCs in deployments that use an Oracle Communications Subscriber Aware Load Balancer for load balancing.	S-Cz7.3.10	

Caveats for Release S-Cz7.3.10

The caveats below apply to release S-Cz7.3.10 of the Subscriber-Aware Load Balancer (SLB). For Session Border Controller (SBC) Caveats, when they are (SLB) cluster members, refer to the appropriate documentation for the SBC.

Cluster Membership

- Each SBC may be a member of only one cluster, and a cluster may be associated with only one SLB redundant pair.

Setup Product

- This release officially supports only the SLB product type, and only on the Acme Packet 6100 platform. You will not be able to configure the platform to run as the SBC product type using this release.

Protocol Support

- The Oracle Communications Session Border Controller's FTP Server is deprecated. Only SFTP server services are supported.
- FTP Client access for features such as HDR/CDR push remains.
- When handling TCP calls through load-balanced clusters, the SBC, in some scenarios, attempts to initiate the TCP handshake using the ephemeral port established for SIP services over the SBC-SLB tunnel instead of the end station's port. These calls fail because the SBC cannot utilize the tunnel properly. Example scenarios include:
  - After an HA SBC pair that is a member of a cluster fails over, the new active contains correct registrations, but not end station sockets. TCP calls to those end stations fail. When these end stations refresh their registrations, these calls can succeed.
  - TCP calls originating from the core to an SBC that is a member of a cluster, then the SLB, then toward end stations that are not registered at the SBC fail. The target end stations must register for these calls to succeed.

Fragmented Ping Support

- The Oracle Communications Session Border Controller does not respond to inbound fragmented ping packets.

Inactivity Age-out of Trusted Endpoints

- The inactivity age-out functionality for trusted endpoints is not yet implemented.

Physical Interface RTC Support

- After changing any Physical Interface configuration, a system reboot is required.
- Output from the packet trace local feature on hardware platforms running this software version may display invalid MAC addresses for signaling packets.

High Availability (HA) Pairing

- An Acme Packet 6100 running release S-Cz7.3.10 as a Subscriber-Aware Load Balancer may not be a member of a High Availability pair that includes an Acme Packet 4500.

Command Line Interface Discrepancies

- The SLB's **tunnel-config** element includes a **tls-profile** parameter. This parameter is not functional.
- A platform running as a Subscriber-Aware Load Balancer (SLB) can still configure Session Border Controllers (SBC)-specific group-names.

Upgrade from L-Cx1.5.0 configuration files

- When you upgrade from a configuration file created in release L-Cx1.5.0, the parameter **cluster-config>inactive-sd-limit** has an incorrect value after boot.

  - Workaround - Whatever the value of the parameter in the L-Cx1.5.0 config file, after the first boot, the value in the S-Cz7.3.10 file is 1000 times the original value. For example if the value was 1800 (the default value in L-Cx1.5.0), the S-Cz7.3.10 value is 1800000. You can change the value of the **cluster-config>inactive-sd-limit** back to the value in the L-Cx1.5.0 version of the config file and reboot the device, or change the parameter dynamically.

Incorrect Values Displayed by the show datapath Command

- The **show datapath np-stats tunnel** command may display the same amount of bandwidth committed to Maximum Signaling and Trusted traffic.