

Oracle® Communications Diameter Signaling Router

Zero Balance Application User's
Guide

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Acronyms

Acronym	Description
ART	Application Routing Table
CCR-I/E	Credit Control Request (Initial/Event)
CCA-I/E	Credit Control Answer (Initial/Event)
CTF	Charging Triggering Function
DRA	Diameter Routing Agent
DSR	Diameter Signaling Router
ECC	Extended Command Code
OC-DRA	Online Charging DRA
OCS	Online Charging Server
PCEF	Policy & Charging Enforcement Function

Acronyms

Acronym	Description
SBR	Session Binding Repository
U-SBR	Universal SBR
ZBA	Zero Balance Offload Application
ZBC	Zero Balance Counter
ZB-DB	Zero Balance Application Database
ZBT	Zero Balance Blocking Timer
ZDT	Zero Balance Detection Timer
DET	Zero Balance Detection Interval (configured)

Chapter 1

Introducing Zero Balance Application (ZBA)

Topics:

- [Revision History.....8](#)
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The ZBA application allows network operators to allow to reduce the load (offload) sent to the Online Charging Servers (OCS) by blocking those subscribers whose accounts have exceeded their credit limit (i.e. Zero Balance).

To achieve this, the ZBA application detects the Credit Control Request (CCR) and (Credit Control Answer (CCA) exchanged with the OCS and prevents subscribers whose account balances have gone down to zero from repeatedly querying the OCS.

ZBA application maintains records of subscribers identified by their MSISDN whose account balance have gone down to zero.

This document provides information about the ZBA application and its functionalities.

The ZBA application menu options allow you to work with:

- Custom MEALS
- General Options
- Trial MPs Assignment
- Application Control
- System Options (SO Only)

Also, ZBA is available as a Diameter Custom Application (DCA) Framework application. Like other DCA Framework applications, you can use ZBA to work with the DCA Framework functions. If ZBA is in the DCA Framework GUI menu, the application has already been activated.

Revision History

Date	Description
March 2017	Release 3

Overview of ZBA Tasks

The document provides the following types of information about ZBA tasks:

- ZBA application logic
- Procedures to configure and manage ZBA components, including Config Params and ZBA Profile tables
- Information about ZBA components and GUI elements
- References to related documentation, including *DCA Programmer's Guide* and *DCA Feature Activation*

Intended Scope and Audience

This content is intended for personnel using the ZBA application within the DCA Framework, it includes procedures for performing tasks using the product GUI.

This content does not describe how to install or replace software or hardware.

The ZBA software application interacts with U-SBR (*Universal Session Binding Repository*). For this reason, this content includes references to the shared applications, and may describe GUI options that are not visible or applicable to ZBA.

Content Organization

This content is organized as follows:

- [Introducing Zero Balance Application \(ZBA\)](#) contains general information about the ZBA application including overview and logic information, the organization of this content, and how to get technical assistance.
- [User Interface Introduction](#) describes the organization and usage of the user interface. In it you can find information about how the interface options are organized, how to use widgets and buttons, and how filtering and other page display options work.
- [Understanding ZBA and ZBA Logic](#) describes ZBA logic.
- [Customizing ZBA Behavior](#) provides information about customizing ZBA resources.
- [Using Configured ZBA Database Tables](#) provides information about how to configure ZBA database tables.

Related Specifications

For information about additional publications that are related to this document, refer to the Oracle Help Center site. See [Locate Product Documentation on the Oracle Help Center Site](#) for more information on related product publications.

Locate Product Documentation on the Oracle Help Center Site

Oracle Communications customer documentation is available on the web at the Oracle Help Center (OHC) site, <http://docs.oracle.com>. You do not have to register to access these documents. Viewing these files requires Adobe Acrobat Reader, which can be downloaded at <http://www.adobe.com>.

1. Access the Oracle Help Center site at <http://docs.oracle.com>.
2. Click **Industries**.
3. Under the Oracle Communications subheading, click the **Oracle Communications documentation** link.
The Communications Documentation page appears. Most products covered by these documentation sets will appear under the headings “Network Session Delivery and Control Infrastructure” or “Platforms.”
4. Click on your Product and then the Release Number.
A list of the entire documentation set for the selected product and release appears.
5. To download a file to your location, right-click the **PDF** link, select **Save target as** (or similar command based on your browser), and save to a local folder.

Customer Training

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<http://education.oracle.com/communication>

To obtain contact phone numbers for countries or regions, visit the Oracle University Education web site:

www.oracle.com/education/contacts

My Oracle Support (MOS)

MOS (<https://support.oracle.com>) is your initial point of contact for all product support and training needs. A representative at Customer Access Support (CAS) can assist you with MOS registration.

Call the CAS main number at 1-800-223-1711 (toll-free in the US), or call the Oracle Support hotline for your local country from the list at <http://www.oracle.com/us/support/contact/index.html>. When calling, make the selections in the sequence shown below on the Support telephone menu:

- 1 Select 2 for New Service Request
- 2 Select 3 for Hardware, Networking and Solaris Operating System Support
- 3 Select one of the following options:
 - For Technical issues such as creating a new Service Request (SR), Select 1
 - For Non-technical issues such as registration or assistance with MOS, Select 2

You will be connected to a live agent who can assist you with MOS registration and opening a support ticket.

MOS is available 24 hours a day, 7 days a week, 365 days a year.

Emergency Response

In the event of a critical service situation, emergency response is offered by the Customer Access Support (CAS) main number at 1-800-223-1711 (toll-free in the US), or by calling the Oracle Support hotline for your local country from the list at <http://www.oracle.com/us/support/contact/index.html>. The emergency response provides immediate coverage, automatic escalation, and other features to ensure that the critical situation is resolved as rapidly as possible.

A critical situation is defined as a problem with the installed equipment that severely affects service, traffic, or maintenance capabilities, and requires immediate corrective action. Critical situations affect service and/or system operation resulting in one or several of these situations:

- A total system failure that results in loss of all transaction processing capability
- Significant reduction in system capacity or traffic handling capability
- Loss of the system's ability to perform automatic system reconfiguration
- Inability to restart a processor or the system
- Corruption of system databases that requires service affecting corrective actions
- Loss of access for maintenance or recovery operations
- Loss of the system ability to provide any required critical or major trouble notification

Any other problem severely affecting service, capacity/traffic, billing, and maintenance capabilities may be defined as critical by prior

Chapter 2

Understanding ZBA and ZBA Logic

Topics:

- [ZBA Application Overview.....11](#)
- [Understanding ZBA Functionality.....11](#)
- [ZBA Logic Process... 12](#)

Zero Balance Application (ZBA) is a business logic application that function within the DSR Custom Application (DCA) Framework.

First DCA Framework must be activated then ZBA application must be activated in order to access the ZBA GUI menu and functionality.

Note: DCA Framework is a set of APIs and services that are made available to DCA developers (internal or external) who need to develop applications that run in the Diameter Application layer of the DSR.

ZBA Application Overview

When a mobile data service subscriber initiates a data session, a network Element (PCEF or CTF) may attempt to setup a data session for the subscriber and query the OCS for service units. In the case where the subscriber has no credit in their account, the OCS will reject the request, usually with an indication that the subscriber has no credit. However, in most cases the PCEF, or other CTFs (Charging Trigger Functions), will continue to attempt to query the OCS. This can create overload on the OCS to handle requests for subscribers that will always be denied during the period in which the subscriber has no credit.

The purpose of the ZBA application is to detect when a subscriber, identified by a MSISDN, has a zero balance in his/her account, the ZBA application under certain configurable conditions, may respond on behalf of the OCS and reduce the number of queries the OCS must handle for subscribers who temporarily have no credit.

The ZBA application is configured as the owner of a U-SBR database. To avoid overloading the ZBA application, the Application Routing Table (ART) is configured in such a way so as to route only CCR-I/E type messages to the ZBA application.

The ZBA application can be enabled and disabled as a DCA Framework application. Disabling ZBA on a specific site is possible only if ZBA has been disabled on all the DA-MPs on that specific site.

If ZBA is in the DCA Framework GUI menu, this means that the application is already enabled, but does not guarantee that it is provisioned. After ZBA is installed, a manual enablement is necessary on at least one DA-MP server.

Note: You can enable/disable ZBA from the **Diameter > Maintenance > Applications** page on the SOAM GUI. When the application is initially installed, it is disabled, and you must manually enable it.

ZBA functionality varies between the SOAM and NOAM, on the NOAM you have four menu available:

- The “custom MEALs” menu where you provision the measurements linked to ZBA application
- The “General Options” to set the options of the application.
- The “Trial MP assignment” to choose on which MP the application will be running.
- The “Application Control” where you can create new development environment and modify them.

The SOAM will have the same menu in “read only” and a fifth one called “System Options” where the user can configure the behavior of the application in case of errors.

Understanding ZBA Functionality

The Zero Balance offload Application (ZBA) is able to inspect ingress Gy/Ro Request and Answer messages to verify if subscribers who may have zero balance accounts should be blocked (based on answer messages). It uses MSISDN to check the subscriber’s status in SBR.

It forwards the ingress Gy/Ro Request messages to the OCSs if the subscriber’s status is not in "blocking" state.

Subscribers may have zero balance but their messages may still be routed to OCS if the number of Zero Balance events detected is less than a configured threshold during a configured detection interval.

The ZBA will block subscribers whose number of Zero Balance events has exceeded the configured threshold within the configured detection interval and will then generate a response message (CCA-I/E) on behalf of the OCS when a subscriber is blocked.

ZBA Logic Process

ZBA logic follows this process:

1. The ZBA application logic is triggered with the reception of a CCR-I/E message.
2. The Application reads the MSISDN from the Subscription-Id Grouped or the User-Name AVPs in the CCR-I/E message.
3. ZBA checks if the MSISDN extracted from the AVP already has a record entry in the SBR.
4. If no entry exists for that user, the application forwards the CCR-I/E to OCS via DRL and creates a new entry in the SBR if a qualified ZB event has been received in the CCA-I/E, that subscriber will then be monitored. If the OCS answer contains a result code which does indicate zero balance then the Zero Balance counter is incremented in the SBR and detection state is set to ON, ZBA forwards the CCA-I/E received from the OCS via DRL.
5. If an entry for that user exists, the application reads the status of the blocking and detection timers from the SBR to determine whether the subscriber is blocked or being monitored.
6. If the subscriber is not blocked, or blocked with expired blocking timer, ZBA forwards the CCR-I/E to OCS via DRL and resets the record to its initial state (i.e. not monitored, not blocked).
7. If a request comes in when the subscriber is blocked and not expired (Blocking timer is ON but not expired), the request will not be forwarded to OCS, instead the ZBA sends an answer message with the configurable Egress blocking result code to CTF via DRL (the OCS is not involved)
8. ZBA will continue to monitor the subscriber and answer on behalf of the OCS until the blocking timer expires.
9. ZBA will not process the Diameter messages in the following cases:
 - missing MSISDN in the CCR-I/E
 - ZBA U-SBR Database is unavailable
 - Stack event errors have been generated during processing.

Chapter 3

Configuring ZBA

Topics:

- [ZBA Pre-Configuration Activities14](#)
- [Verifying ZBA activation.....14](#)
- [Importing ZBA json file.....14](#)
- [Configuring ZBA Config_Data Table 14](#)
- [Configuring ZBA Egress_ResultSet.....15](#)
- [Configuring ZBA Ingress_ResultSet... 15](#)
- [Disabling ZBA.....16](#)

This section describes the procedures used to configure the ZBA application.

ZBA uses 3 tables for holding configuration values:

- Config_Data
- Egress_ResultSet
- Ingress_ResultSet

See [Using Configured ZBA Database Tables](#).

ZBA Pre-Configuration Activities

Before you can configure ZBA as a DCA Framework application, DCA Framework and ZBA must be activated.

Note: Following activation, individual applications are in the disabled state. While disabled, no diameter traffic is delivered to an application.

To enable ZBA as an independent application, enable **ZBA** from the **Diameter > Maintenance > Applications** GUI page from the SO on the desired DA-MPs. See *Diameter User's Guide* for details.

Verifying ZBA activation

To verify if ZBA is activated navigate to **DCA Framework>** menu:

The Zero Balance Application should be present in the GUI menu. You can then use **DCA Framework -> Zero Balance Application -> Application Control** menu to enable business logic and provision configuration data.

Importing ZBA json file

Once ZBA application is activated you can import the business logic, configuration tables and MEALs from a previously exported json file.

From the NOAM navigate to **DCA Framework -> Zero Balance Application -> Application Control** then click on **Import Business Logic** button to import the json file. Select the appropriate file and check the “import also config data” box, click on **Import** button.

This will create the config data, the custom MEAL templates and will map the logical and physical U-SBR DB (provided that a physical DB with the same name already exists). To verify or create the mapping navigate to **DCA Framework -> Zero Balance Application -> Application Control -> Zero Balance -> SBR DB Name Mapping**

Once imported the application still needs to be syntax checked and compiled before it can be made into Production cycle.

Configuring ZBA Config_Data Table

Use this task to configure “Config_Data” table. This table contains the user configurable parameters which determine the detection period, the Blocking period and the Max Zero Balance allowable Events.

Note: The available GUI choices differ between the SO and the NO. See *DCA Programmer's Guide* for GUI details and functionality.

The fields are described in [Config_Params, Egress and Ingress Result_Code Database Tables elements](#).

1. On the SOAM select **DCA Framework > Zero Balance Application > Application Control**.
2. Select a **Version Name** choice.
3. Click on **Config Data** button
4. Select a **Table Name**.
5. Select an action; for example, **View** to view the data, **Provision Table** to populate it.
6. Fill out the fields to define or edit the selected table.

Configuring Egress_ResultCode Table

Use this task to configure Egress_ResultCode table. This table contains the configurable result code which is used when ZBA generates an answer during a blocking period

Note: The available GUI choices differ between the SO and the NO. See *DCA Programmer's Guide* for GUI details and functionality.

The fields are described in [Config_Params, Egress and Ingress Result_Code Database Tables elements](#).

1. On the SOAM select **DCA Framework > Zero Balance Application > Application Control**.
2. Select a **Version Name** choice.
3. Click on **Config Data** button
4. Select a **Table Name**.
5. Select an action; for example, **View** to view the data, **Provision Table** to populate it.
6. Fill out the fields to define or edit the selected table.

Configuring Ingress_ResultCode Table

Use this task to configure Ingress_ResultCode table. This table contains the configurable result codes that are used to determine a Zero Balance event whenever an answer messages contains one of the configured result codes

Note: The available GUI choices differ between the SO and the NO. See *DCA Programmer's Guide* for GUI details and functionality.

The fields are described in [Config_Params, Egress and Ingress Result_Code Database Tables elements](#).

1. On the SOAM select **DCA Framework > Zero Balance Application > Application Control**.
2. Select a **Version Name** choice.
3. Click on **Config Data** button
4. Select a **Table Name**.
5. Select an action; for example, **View** to view the data, **Provision Table** to populate it.
6. Fill out the fields to define or edit the selected table.

Disabling ZBA

Use this task to disable ZBA from the SO.

Note: The available GUI choices differ between the SO and the NO. See *DCA Programmer's Guide* for GUI details and functionality.

1. Select **Diameter > Maintenance > Applications**.
2. Select **DCA_ZBA** on the MP where you want to disable the application.
3. Click **Disable**.

Chapter 4

Customizing ZBA Behavior

Topics:

- [Understanding ZBA Customization Options.. 42](#)

You can customize ZBA behavior in several ways.

The following ZBA functions are accessible from the **DCA Framework > Zero Balance Application** GUI page or as an independent application on the DSR menu:

- Custom MEALS
- General Options
- Trial MPs Assignment
- Application Control
- System Options (SO only)

Note: See *DCA Programmer's Guide* and *DCA Provisioning Interface* for details.

See [Using Configured ZBA Database Tables](#) for specific information about specific configuration activities.

Understanding ZBA Customization Options

The ZBA configuration database schema uses the following options to customize the application behavior:

Detection Interval	The time interval during which Zero Balance events are Monitored. Range: 1-30. Default is 5 (values are in seconds)
Blocking Interval	The time duration during which a subscriber is blocked after exceeding the number of allowed zero balance events. Range: 60-1800. Default is 60 (values in seconds)
Maximum ZB events	The number of allowed zero events during a detection interval before blocking a subscriber. Range: 1-5. Default is 1 (value is integer)
Egress Result Code	The configurable egress result code which is used when ZBA generates an answer during a blocking period. (value is string)
Ingress Result Code	One to four ingress result codes can be configured to determine a Zero Balance event whenever an answer message contains one of these result codes. (values are string)

Chapter 5

Using ZBA

Topics:

- [ZBA Functions.....44](#)

Like other DCA Framework applications, you can use ZBA to work with the DCA Framework functions. If ZBA is in the DCA Framework GUI menu, means that the application is already activated, but does not guarantee that it is provisioned. After ZBA is installed, you need to enable it manually and complete the configuration items, such as DB association, Config_Data parameters, Diameter connections, ART...

See [Using Configured ZBA Database Tables](#) for specific information about individual configuration activities.

ZBA Functions

ZBA lets you work with the following functions:

Custom MEALS	A list of any previously configured ZBA custom defined measurements and events. (NO view GUI page). Use this page to Insert, Edit, and Delete Custom MEALS.
General Options	Available from the NO and SO (view only) general options for configuring ZBA behavior. From the NO, this page enables specifying the Perl Subroutine for Diameter Request and Answer. From the SO, this page allows you to view the Perl Subroutine specified for Diameter Request and Answer in read-only mode.
Trial MPs Assignment	<p>From the NO, this page allows specifying which MPs run the trial version of an application. If there is a production version, all MPs enabled for the ZBA application, will run the application regardless of which is the trial MP. If there is a trial application version configured in the system, but no trial MPs is specified, a warning message is generated.</p> <p>From the SO, this page allows you to view which MPs run the trial version of an application. The page is accessible in read-only mode.</p>
Application Control	<p>From the NO, this page allows:</p> <ul style="list-style-type: none">• Listing all application versions configured in the system• Inserting a new application version• Copying and modifying an existing application version• Exporting an application version entirely (business logic + provisioned data from the NO)• Exporting only the NO provisioned data of an application version• Importing a previously exported application version (business logic + NO provisioned data)• Importing only the NO provisioned data to an existing application version• Accessing the application version configuration tables• Accessing a flowchart of an application version• Deleting an existing application version• Changing the status of an application version (Development, Trial, Production, Archived) <p>From the SO, this page allows:</p> <ul style="list-style-type: none">• Listing all application versions configured in the system• Exporting only the SO provisioned data of an application version• Importing only the SO provisioned data to an existing application version• Accessing the application version configuration tables• Accessing a flowchart of an application version (read-only) <p>You can control a variety of ZBA functions here, such as create new application versions or copy and edit existing versions, import and export business logic, and make trials. You can also copy an entire application together with the business logic and the NO provisioned data and assign a new version name to it.</p>

System Options (SO Only):

Use this task to work with ZBA Systems Options, which includes the following categories:

- Run-time error configuration: behavior of the DSR application when a Run-time error occurs Resource exhaustion configuration
- Resource exhaustion configuration: behavior of the DSR application when internal resources are being exhausted
- Application unavailable configuration: Action to be taken when the application is unavailable to process messages.
- Configuration for the DCA generated Answer: to specify a realm and FQDN different from the default one.

Chapter 6

Using Configured ZBA Database Tables

Topics:

- [ZBA Database Tables... 47](#)

This section describes ZBA application database table content and functionality.

Use **DCA Framework > Zero Balance Application > Application Control** select the current version of ZBA application and click on “Config Data” to access the configuration table page.

ZBA Database Tables

[ZBA Database Tables](#) lists the ZBA database tables.

Table 8: ZBA Database Table fields

Field	Description	Single Row Setting	Level
Config_Data	This table includes configuration parameters for the ZBA application.	YES	SO
Egress_ResultSetCode	This contains The configurable result code which is used when ZBA generates an answer during a blocking period	YES	SO
Ingress_ResultSetCode	This contains one to four ingress result codes that can be configured to determine a Zero Balance event whenever an answer message contains one of these result codes.	YES	SO