Oracle® Communications
Diameter Signaling Router

Range Based Address Resolution (RBAR) User's Guide

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Oracle® Communications Range Based Address Resolution (RBAR) User's Guide

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Chapter 1

Introduction

Topics:

This chapter contains an overview of procedures to use to configure the RBAR application. The contents include sections on the scope, audience, and organization of the documentation, and how to contact Oracle for assistance.

Overview

The Range Based Address Resolution (RBAR) document provides information about how to use the DSR GUI to configure the RBAR application.

The document provides procedures to configure:

- Applications
- Exceptions
- Destinations
- Address Tables
- Addresses
- Address Resolutions
- System Options

Scope and Audience

The RBAR documentation is intended for anyone responsible for configuring and using the Range Based Address Resolution application. Users of this manual must have a working knowledge of telecommunications, of network installations, and of the product that is using the RBAR functions.

Documentation Admonishments

Admonishments are icons and text throughout this manual that alert the reader to assure personal safety, to minimize possible service interruptions, and to warn of the potential for equipment damage.

Table 1: Admonishments

Icon	Description
	**Danger**: (This icon and text indicate the possibility of *personal injury*.)
	**Warning**: (This icon and text indicate the possibility of *equipment damage*.)
	**Caution**: (This icon and text indicate the possibility of *service interruption*.)

Icon	Description
	**Topple**: (This icon and text indicate the possibility of *personal injury* and *equipment damage*.)

Manual Organization

This manual is organized into the following chapters:

- *Introduction* contains general information about the RBAR help documentation, the organization of this manual, and how to get technical assistance.
- *Range Based Address Resolution* describes the function of the RBAR application.
- *Configuration* describes how to configure the RBAR application, including Applications, Exceptions, Destinations, Address Tables, Addresses, Address Resolutions, and System Options.

Customer Care Center

Oracle's Tekelec Customer Care Center is your initial point of contact for all product support needs. A representative takes your call or email, creates a Customer Service Request (CSR) and directs your requests to the Technical Assistance Center (TAC). Each CSR includes an individual tracking number. Together with TAC Engineers, the representative will help you resolve your request.

The Customer Care Center is available 24 hours a day, 7 days a week, 365 days a year, and is linked to TAC Engineers around the globe.

TAC Engineers are available to provide solutions to your technical questions and issues 7 days a week, 24 hours a day. After a CSR is issued, the TAC Engineer determines the classification of the trouble. If a critical problem exists, emergency procedures are initiated. If the problem is not critical, normal support procedures apply. A primary Technical Engineer is assigned to work on the CSR and provide a solution to the problem. The CSR is closed when the problem is resolved.

Technical Assistance Centers are located around the globe in the following locations:

Related - Global

Email (All Regions): support@tekelec.com

- **USA and Canada**

  Phone:

  1-888-367-8552 (toll-free, within continental USA and Canada)

  1-919-460-2150 (outside continental USA and Canada)

  TAC Regional Support Office Hours:

  8:00 a.m. through 5:00 p.m. (GMT minus 5 hours), Monday through Friday, excluding holidays

- **Caribbean and Latin America (CALA)**

  Phone:

  +1-919-460-2150

  TAC Regional Support Office Hours (except Brazil):

  10:00 a.m. through 7:00 p.m. (GMT minus 6 hours), Monday through Friday, excluding holidays

  - **Argentina**

    Phone:

    0-800-555-5246 (toll-free)

  - **Brazil**

    Phone:

    0-800-891-4341 (toll-free)

    TAC Regional Support Office Hours:

    8:00 a.m. through 5:48 p.m. (GMT minus 3 hours), Monday through Friday, excluding holidays

  - **Chile**

    Phone:

    1230-020-555-5468

  - **Colombia**

    Phone:

    01-800-912-0537

  - **Dominican Republic**

    Phone:

    1-888-367-8552

  - **Mexico**

    Phone:

    001-888-367-8552

  - **Peru**

    Phone:

    0800-53-087

  - **Puerto Rico**

    Phone:

    1-888-367-8552

  - **Venezuela**

    Phone:

    0800-176-6497

- **Europe, Middle East, and Africa**

  Regional Office Hours:

  8:30 a.m. through 5:00 p.m. (GMT), Monday through Friday, excluding holidays

  - **Signaling**

    Phone:

    +44 1784 467 804 (within UK)

  - **Software Solutions**

    Phone:

    +33 3 89 33 54 00

- **Asia**

  - **India**

    Phone:

    +91-124-465-5098 or +1-919-460-2150

    TAC Regional Support Office Hours:

    10:00 a.m. through 7:00 p.m. (GMT plus 5 1/2 hours), Monday through Saturday, excluding holidays

  - **Singapore**

    Phone:

    +65 6796 2288

    TAC Regional Support Office Hours:

    9:00 a.m. through 6:00 p.m. (GMT plus 8 hours), Monday through Friday, excluding holidays

Emergency Response

In the event of a critical service situation, emergency response is offered by Oracle's Tekelec Customer Care Center 24 hours a day, 7 days a week. 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 discussion and agreement with Oracle's Tekelec Customer Care Center.

Related Publications

The Diameter Signaling Router (DSR) documentation set includes the following publications, which provide information for the configuration and use of DSR and related applications.

Getting Started includes a product overview, system architecture, and functions. It also explains the DSR GUI features including user interface elements, main menu options, supported browsers, and common user interface widgets.

Feature Notice describes new features in the current release, provides the hardware baseline for this release, and explains how to find customer documentation on the Oracle Customer Support Site.

Roadmap to Hardware Documentation provides links to access manufacturer online documentation for hardware related to the DSR.

Operation, Administration, and Maintenance (OAM) Guide provides information on system-level configuration and administration tasks for the advanced functions of the DSR, both for initial setup and maintenance.

Communication Agent User's Guide explains how to use the Communication Agent GUI pages to configure Remote Servers, Connection Groups, and Routed Servers, and to maintain configured connections.

Diameter User's Guide explains how to use the Diameter GUI pages to manage the configuration and maintenance of Diameter Configuration components, including Local and Peer Nodes, Connections, Configuration Sets, Peer Routing Rules, Application Route Tables, System Options, and DNS options; describes the functions of Diameter Message Copy; and describes DSR capacity and congestion controls.

Diameter Mediation User's Guide describes the functions of Diameter Mediation, and explains how to use the Diameter Mediation GUI pages (nested inside the Diameter GUI folder) to configure and test Rule Templates, how to use the Formatting Value Wizard, and how to configure Rule Sets.

IP Front End (IPFE) User's Guide explains how to the use the IPFE GUI pages to configure IPFE to distribute IPv4 and IPv6 connections from multiple clients to multiple nodes.

Range-Based Address Resolution (RBAR) User's Guide explains how to use the RBAR GUI pages to configure RBAR to route Diameter end-to-end transactions based on Diameter Application ID, Command Code, Routing Entity Type, and Routing Entity address ranges and individual addresses.

Full-Address Based Resolution (FABR) User's Guide explains how to use the FABR GUI pages to configure FABR to resolve designated Diameter server addresses based on Diameter Application ID, Command Code, Routing Entity Type, and Routing Entity addresses.

Charging Proxy Application (CPA) and Offline Charging Solution User's Guide describes the Offline Charging Solution and explains how to use the CPA GUI pages to set System Options for CPA, configure the CPA's Message Copy capability, and configure the Session Binding Repository for CPA.

Policy DRA User's Guide describes the topology and functions of the Policy Diameter Routing Agent (Policy DRA) DSR Application and the Policy Session Binding Repository, and explains how to use the GUI pages to configure Policy DRA.

Gateway Location Application (GLA) User's Guide describes the functions of retrieving subscriber data stored in Policy Session Binding Repository (pSBR) provided by Policy DRA and explains how to use the GUI pages to configure GLA.

DSR Alarms, KPIs, and Measurements Reference provides detailed descriptions of alarms, events, Key Performance Indicators (KPIs), and measurements; indicates actions to take to resolve an alarm, event, or unusual Diameter measurement value; and explains how to generate reports containing current alarm, event, KPI, and measurement information.

DSR Administration Guide describes DSR architecture, functions, configuration, and tools and utilities (IPsec, Import/Export, DIH, and database backups); and provides references to other publications for more detailed information.

Locate Product Documentation on the Customer Support Site

Oracle customer documentation is available on the web at the Oracle Technology Network (OTN) 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 *www.adobe.com*.

1. Log into the Oracle Customer Support site at *http://docs.oracle.com*.
2. Under **Applications**, click the link for **Communications**.
   The **Oracle Communications Documentation** window opens with Tekelec shown near the top.
3. Click **Oracle Communications Documentation for Tekelec Products**.
4. Navigate to your Product and then the Release Number, and click the **View** link (the **Download** link will retrieve the entire documentation set).
5. To download a file to your location, right-click the PDF link and select **Save Target As**.

Chapter 2

Range Based Address Resolution

Topics:

This section provides an overview of the function of the Range Based Address Resolution (RBAR) DSR Application.

Range Based Address Resolution overview

Range Based Address Resolution (RBAR) is a DSR-enhanced routing application that allows the routing of Diameter end-to-end transactions based on Diameter Application ID, Command Code, Routing Entity Type, and Routing Entity Addresses (range and individual) as a Diameter Proxy Agent. A Routing Entity can be:

- A User Identity:
  - International Mobile Subscriber Identity (IMSI)
  - Mobile Subscriber Integrated Services Digital Network (Number) (MSISDN)
  - IP Multimedia Private Identity (IMPI)
  - IP Multimedia Public Identity (IMPU)
- An IP Address associated with the User Equipment
  - IPv4 (based upon the full 32-bit value in the range of 0x00000000 to 0xFFFFFFFF)
  - IPv6-prefix (1 to 128 bits)
- A general purpose data type: UNSIGNED16 (16-bit unsigned value)

Routing resolves to a Destination that can be configured with any combination of a Realm and Fully Qualified Domain Name (FQDN); Realm-only, FQDN-only, or Realm and FQDN.

When a message successfully resolves to a destination, RBAR replaces the destination information (Destination-Host and/or Destination-Realm) in the ingress message with the corresponding values assigned to the resolved destination, and forwards the message to the (integrated) Diameter Relay Agent for egress routing into the network.

Reserved MCC Ranges

Mobile Country Code (MCC) ranges that are reserved for future use are defined in a system-wide **MCC Ranges** table. If the MCC digits portion of a decoded IMSI digits fall within one of the ranges designated in the **MCC Ranges** table, the IMSI digits will NOT be used for further Address Resolution. RBAR will continue decoding the digits using other AVP instances, or next PriorityAVP (if provisioned), or next Routing Entity (if provisioned).

Routing Exception Handling

When an ingress RBAR Request message cannot be resolved to a Destination (no address matched, no valid digits decoded, or any other error is returned), RBAR will invoke a routing exception handling procedure based on user-defined configuration.

The following routing exception handling procedures are supported:

- Forward the message unchanged
- Forward the message using a user-defined default Destination
- Send an Answer response with a user-defined Result-Code AVP value
- Send an Answer response with user-defined Experimental-Code AVP values
- Abandon Transaction

The following types of routing exceptions are supported:

- Unknown Application ID
- Unknown Command Code

- No valid Routing Entity Addresses were found
- A valid Routing Entity Address did not resolve to a configured address

Assumption and Limitation

In Diameter, all IMSIs are in the form of an ITU-T E.212 number. It is assumed that customers will provision all IMSIs within the RBAR database as E.212 values. E.212 to E.214 conversion is not supported.

Chapter 3

Configuration

Topics:

This section describes the procedures used to configure the RBAR DSR Application.

Pre-Configuration Activities

Before RBAR configuration can be performed, the following activities need to be performed in the system:

- Verify Server status
- Gather information that is required for Diameter and RBAR configuration
- Configure Diameter components that are required for RBAR configuration

Verifying Server status

Use this task to verify Server status prior to RBAR configuration.

1. From the active SOAM, select **Status & Manage** > **Server**.
2. Verify that for each Server, the **Appl State** field is **Disabled**, and the **DB**, **Reporting Status**, and **Proc** fields are **Norm**.

Diameter Configuration for RBAR

The following Diameter configuration must be done before RBAR configuration can be performed.

All Diameter Configuration is done using the SOAM GUI.

Use the explanations and procedures in the Diameter Configuration help and the *Diameter User's Guide* to complete the Diameter configuration, including the Diameter components needed for use with RBAR.

1. **MP Profiles**

   Use the **Diameter** > **Configuration** > **DA-MPs** > **Profile Assignments** page to assign an **MP Profile** for each configured RBAR DA-MP shown in the **DA-MP** list.

   From the pulldown list, select the MP Profile that is for the correct blade and for a Database application, for example **G6:Database** or **G8:Database**.

   If you are running RBAR and P-DRA on the same DA-MP, select a Session_Database MP Profile.

2. **Application Ids**

   Diameter Application Ids must be configured prior to making them available for use in an RBAR Address Resolution. Use the **Diameter** > **Configuration** > **Application Ids [Insert]** page to configure Diameter Application Ids.

   The Application Ids that need to be configured depend on the types of Diameter Servers being supported, including HSS, PCRF, OFCS, and OCS.

3. **Command Codes**

   Diameter Command Codes must be configured prior to using them in an RBAR Address Resolution. Use the **Diameter** > **Configuration** > **Command Codes [Insert]** page to configure Diameter Command Codes.

Configure any Command Codes that need to be handled by RBAR. The Command Codes are associated with the Diameter Applications supported by the Diameter Servers (for example, HSS, PCRF, OCFS, or OCS) which are the destination of Diameter Requests being routed by RBAR. For example, the combination of Application Id = S6a and Command Code = ULR/ULA might be relevant for HSS.

4. **Application Route Tables**

   Either use the default **Application Route Table** (always available), or use the **Diameter** > **Configuration**> **Application Route Tables > [Insert]** page to configure one or more **Application Route Tables** in addition to the default. **Application Route Tables** contain **Application Routing Rules** that direct messages to RBAR and other DSR Applications.

5. **Application Routing Rules**

   On the **Diameter**>**Configuration** >**Application Route Tables** page, select an **Application Route Table Name** and click **View/Edit Rules**.

   Use the **Viewing Rules for Application Route Table** page to insert or edit an **Application Routing Rule** so that messages with Diameter Application ID = 3 are directed to RBAR.

   When defining the **Application Routing Rule**:

   - In the **Conditions** field, set the **Application-Id Operator** to **Equals** and the **Value** to **3**. For all other Parameters, set the **Operator** to **Always True**.
   - Set the **Application Name** to **RBAR**.

6. **Reserved MCC Ranges**

   Use the **Diameter** > **Configuration** > **MCC Ranges[Insert]** page to specify up to 10 distinct, non-overlapping **MCC Ranges.**

   The following two **MCC Ranges** are reserved by telephony standards and are recommended to be created in addition to other specified ranges:

   1. 000-199
   2. 800-899

RBAR Configuration

The **RBAR** > **Configuration** pages allow you to manage the RBAR configuration.

RBAR configuration typically occurs in the following order:

1. Add Diameter **Applications** to a list of RBAR supported Diameter Applications.
2. Configure **Destinations**.
3. If necessary, edit the Routing Exception Action associated with routing **Exceptions**.
4. Configure **Address Tables**.
5. Configure **Addresses**, specifying either address ranges or individual addresses.
6. Configure **Address Resolutions**.
7. If necessary, change the **System Options**.

Applications configuration

The **RBAR > Configuration > Applications** page allows you to access a list of Diameter Applications supported by RBAR.

From the **RBAR > Configuration > Applications** page, you can:

- Filter the list of supported Diameter Applications to display only the desired Application(s).
- View a list of supported Diameter Applications.
- Insert a supported Diameter Application.

  Note: When an Application entry is added, Routing Exceptions (**Unknown Command Code**, **No valid Routing Entity Address**, **No Address Match**) are automatically inserted with the **Routing Exception Action** value as Forward Unchanged.

- Edit a supported Diameter Application.
- Delete a Diameter Application from the list of supported Diameter Applications.

  Note: When an Application entry is deleted, the associated Routing Exceptions are automatically deleted.

Applications configuration elements

Table 2: Applications Configuration Elements describes the fields on the Applications View, Insert, and Edit pages. Data Input Notes apply only to the Insert and Edit pages; the View page is read-only.

Table 2: Applications Configuration Elements

Field	Description	Data Input Notes
Application ID	Diameter Application ID which can be used by RBAR, along with Command Code and Routing Entity Type, to determine Address Resolution for routing Request messages.	Format: Pulldown list Range: Configured Diameter Application IDs
Routing Mode (Read only)	Method of routing for Request messages received containing the Diameter Application ID	Format: Disabled pulldown list with a value of **Proxy**.

Viewing supported Diameter applications

Use this task to view currently configured supported Diameter applications.

Select **RBAR** > **Configuration** > **Applications**.
The **RBAR > Configuration > Applications** page appears.

The Applications page appears with a list of supported Diameter applications. This list of applications can be filtered to display only desired applications. The fields are described in *Applications configuration elements*.

Inserting a supported Diameter application

Use this task to add a new Diameter application.

Inserting a supported Application automatically adds three (3) Routing Exceptions (**Unknown Command Code**, **No valid Routing Entity Address**, and **Missing Configured Address Entry**) with the **Routing Exception Action** set to Forward Unchanged.

1. Select **RBAR** > **Configuration** > **Applications**.
   The **RBAR > Configuration > Applications** page appears.
2. Click **Insert**.
   The **RBAR > Configuration > Applications [Insert]** page appears.
3. From the **Application ID** drop down list, select the Application ID in the Diameter message.

   Note: The Application IDs presented in this list are those created using **Main Menu** > **Diameter** > **Application Ids**.

4. Note that the **Routing Mode** field is disabled.
5. Perform one of the following actions:

   - Click **OK** to save the application and return to the **RBAR > Configuration > Applications** page.
   - Click **Apply** to save the application and stay on this page.

     Note: If field validations succeed after clicking either **OK** or **Apply**, the new Application is saved and an informational message about the automatic addition of the Routing Exceptions appears.

   - Click **Cancel** to return to the **RBAR > Configuration > Applications** page without saving the changes.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:

   - The **Application ID** is empty; no value was entered or selected
   - The **Application Name** or **Application ID** is not unique; it already exists in the system
   - The entry in any field is not valid (wrong data type or out of the valid range)
   - The maximum number of supported Diameter applications (16) is already defined in the system

Editing a supported Diameter application

A supported Diameter Application entry cannot be edited. Selecting a supported Diameter Application, clicking **Edit**, and changing the **Application ID** value results in an error message.

To change a supported Diameter Application entry:

- Use the procedure in *Inserting a supported Diameter application* to insert the Diameter Application you want.
- Use the procedure in *Deleting a Diameter application from the list of supported Diameter applications* to delete the Diameter Application you do not want.

Use this task to edit a supported Diameter Application entry.

1. Select **RBAR** > **Configuration** > **Applications**.
   The **RBAR > Configuration > Applications** page appears.
2. Select the Application you want to edit, then click **Edit**.

The **RBAR > Configuration > Applications [Edit]** page appears.

3. From the **Application ID** drop down list, select the Application ID in the Diameter message.
4. Note that the **Routing Mode** field is disabled.
5. Perform one of the following actions:
   - Click **OK** to save the Application and return to the **RBAR > Configuration > Applications** page.
   - Click **Apply** to save the Application and stay on this page.
   - Click **Cancel** to return to the **RBAR > Configuration > Applications** page without saving the changes.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:
   - The **Application Name** is not unique; it already exists in the system
   - The entry in the **Application Name** field is not valid (wrong data type or out of the valid range)

Deleting a Diameter application from the list of supported Diameter applications

Use this task to delete a Diameter application from the list of supported Diameter applications.

An application cannot be deleted if it is being used by an Address Resolution. Before you perform this task, delete any Address Resolution that uses the Application.

1. Select **RBAR** > **Configuration** > **Applications**.
   The **RBAR > Configuration > Applications** page appears.
2. Select the Application you want to delete, then click **Delete**.
   A popup window appears.
3. Perform one of the following actions:
   - Click **OK** to delete the application.
   - Click **Cancel** to cancel the delete function and return to the **RBAR > Configuration > Applications** page.

   If **OK** is clicked and the following condition exists, an error message appears:
   - The Application is in use by an Address Resolution

Exceptions configuration

The **RBAR > Configuration > Exceptions** page allows you to specify the routing exception action to take when RBAR is unable to resolve an address to a Destination for each supported Diameter Application and Routing Exception Type.

There are three (3) Routing Exception entries (**No Address Match, No valid Routing Entity Address**, and **Unknown Command Code**) automatically inserted with the **Routing Exception Action** set to Forward Unchanged as the default action for a supported Diameter application entry when that application entry is added. Similarly, these Routing Exceptions that are associated with an application entry are automatically deleted when that application entry is deleted.

From the **RBAR > Configuration > Exceptions** page, you can:

- Filter the list of exceptions to display only the desired exceptions.

- View a list of supported Diameter applications and their associated Routing Exception Types and Routing Exception Actions.
- Edit the Routing Exception Action and its associated attributes for a supported Diameter application.

Exceptions configuration elements

Table 3: Exceptions Configuration Elements describes the fields on the Exceptions View and Edit pages.

Table 3: Exceptions Configuration Elements

Field	Description	Data Input Notes
Application ID (Read only)	Application ID in a Diameter message	N/A
Application Name (Read only)	Name of the application	N/A
Routing Exception Type (Read only)	The routing exception that prevented address resolution. This field displays one of the following values: • Unknown Application ID • Unknown Command Code • No valid Routing Entity Address • No Address Match	N/A
Routing Exception Action	Action that RBAR takes associated with the **Routing Exception Type**	Format: Radio buttons Range: • Forward Unchanged • Forward to Destination • Send Answer with Result-Code AVP • Send Answer with Experimental-Result AVP • Abandon Request
Destination	Destination to where the message is forwarded associated with the **Routing Exception Type**. This field is enabled when the **Routing Exception Action** is set to Forward to Destination.	Format: Pulldown list Range: Available user-configured destinations
Result-Code Value	Result code associated with this **Routing Exception Type**. This field is enabled when the **Routing Exception Action** is set to either Send Answer with Result-Code AVP or Send Answer with Experimental-Result AVP.	Format: • Selection text box; numeric • Selection pulldown list Range:

Field	Description	Data Input Notes
		• Selection box: 1000–5999 • Selection pulldown list: available Diameter answer codes
Vendor-ID	Value returned in the Vendor-ID AVP of the answer message associated with this **Routing Exception Type**. This field is enabled when the **Routing Exception Action** is set to Send Answer with Experimental-Result AVP.	Format: Text box; numeric Range: 1–4294967295
Error Message	Value returned in the Error-Message AVP of the answer message. This field is enabled when the **Routing Exception Action** is set to either Send Answer with Result-Code AVP or Send Answer with Experimental-Result AVP.	Format: Alphanumeric, underscore (_), period (.) Range: 0–64 characters Default: Null string

Viewing Exceptions

Use this task to view currently configured Exceptions.

Select **RBAR** > **Configuration** > **Exceptions**.
The **RBAR > Configuration > Exceptions** page appears. This list of applications and associated Routing Exception information can be filtered to display only desired items.

Editing a Routing Exception

Use this task to edit a Routing Exception.

1. Select **RBAR** > **Configuration** > **Exceptions**.
   The **RBAR > Configuration > Exceptions** page appears.
2. Select the Application ID/Name you want to edit, then click **Edit**.
   The **RBAR > Configuration > Exceptions [Edit]** page appears.
3. Update the relevant fields.

   For more information about each field, see *Exceptions configuration elements*.
4. Perform one of the following actions:

   - Click **OK** to save the application and return to the **RBAR > Configuration > Exceptions** page.
   - Click **Apply** to save the application and stay on this page.
   - Click **Cancel** to return to the **RBAR > Configuration > Exceptions** page without saving the changes.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:

   - A valid **Vendor-ID** is missing when the **Routing Exception Action** is **`Send Answer with Experimental Result-Code AVP`**.

- A valid **Destination** is missing when the **Routing Exception Action** is **`Forward to Destination`**.
- A valid **Result-Code Value** is missing when the **Routing Exception Action** is **`Send Answer`** or **`Send Answer with Experimental-Result AVP`**.

Destinations configuration

The **RBAR > Configuration > Destinations** page contains the attributes associated with a destination to which RBAR routes a message. RBAR uses these attributes to modify the contents of a received message before forwarding the message.

Each destination can be configured with any combination of a Realm and FQDN such as Realm-only, FQDN-only, or Realm and FQDN.

From the **RBAR > Configuration > Destinations** page, you can:

- Filter the list of destinations to display only the desired destinations.
- View a list of destinations.
- Insert a destination.
- Edit a destination.
- Delete a destination.

Destinations configuration elements

Table 4: Destinations Configuration Elements describes the fields on the Destinations View, Insert, and Edit pages.

Table 4: Destinations Configuration Elements

Field	Description	Data Input Notes
Name	Unique name of the Destination If a duplicate Name is entered or the Name is not specified, an error message appears.	Format: Alphanumeric and underscore (_) Range: 1–32 characters; cannot start with a digit and must contain at least one alpha
Realm	Realm of the Destination The **Realm** and **Fully Qualified Domain Name** cannot both be empty; otherwise, an error message appears.	Format: Text box; string consisting of a list of labels separated by dots, where a label must contain letters, digits, hyphen (-) and underscore (_). A label must start with a letter or underscore and must end with a letter or digit. Underscores may
Fully Qualified Domain Name	Unique Fully Qualified Domain Name of the Destination If a duplicate FQDN is entered, an error message appears.	

Field	Description	Data Input Notes
	The **Fully Qualified Domain Name** and **Realm** cannot both be empty; otherwise, an error message appears.	be used only as the first character. Range: A valid FQDN or Realm. A label consists of up to 63 characters and a Realm or FQDN up to 255 characters
Allow Subsequent RBAR invocation	Enables the subsequent invocation of RBAR on a different DSR node in the network, when RBAR resolves to this destination **Note:** If the **System Options** Allow Subsequent RBAR Invocation option is checked, then this attribute will be ignored.	Format: Check box Range: Checked, unchecked Default: Checked

Viewing Destinations

Use this task to view currently configured Destinations.

Select **RBAR** > **Configuration** > **Destinations**.
The **RBAR > Configuration > Destinations** page appears. This list of destinations can be filtered to display only desired items.

Inserting a Destination

Use this task to add a new Destination.

1. Select **RBAR** > **Configuration** > **Destinations**.
   The **RBAR > Configuration > Destinations** page appears.
2. Click **Insert**.
   The **RBAR > Configuration > Destinations [Insert]** page appears.
3. Enter a unique name for the destination in the **Name** field.
4. Enter the realm in the **Realm** field.
5. Enter a unique FQDN in the **Fully Qualified Domain Name** field.
6. If you want to allow subsequent invocation of RBAR on a different DSR node in the network, leave the **Allow Subsequent RBAR invocation** check box selected (by default, this option is checked).

   Note: If you do not want to allow subsequent invocation of RBAR on a different DSR node in the network when RBAR resolves to this destination, uncheck this check box. In addition, the **Allow Subsequent RBAR invocation** check box on the **System Options** page *must* be unchecked. For more information about the **System Options** attributes, see *System Options elements*.

7. Perform one of the following actions:
   - Click **OK** to save the destination and return to the **RBAR > Configuration > Destinations** page.
   - Click **Apply** to save the destination and stay on this page.

- Click **Cancel** to return to the **RBAR > Configuration > Destinations** page without saving the data.

If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:

- Both the **Realm** and **Fully Qualified Domain Name** are empty; no value was entered
- The **Name** or **Fully Qualified Domain Name** is not unique; it already exists in the system
- The entry in any field is not valid (wrong data type or out of the valid range)
- The required **Name** is empty
- The maximum number of destinations (1024) is already defined in the system

Editing a Destination

Use this task to edit a Destination.

1. Select **RBAR** > **Configuration** > **Destinations**.
   The **RBAR > Configuration > Destinations** page appears.
2. Select the Destination you want to edit, then click **Edit**.
   The **RBAR > Configuration > Destinations [Edit]** page appears.
3. Update the relevant fields.

   For more information about each field, see *Destinations configuration elements*.

   The **Name** field is read-only and cannot be edited.

4. Perform one of the following actions:
   - Click **OK** to save the changes and return to the **RBAR > Configuration > Destinations** page.
   - Click **Apply** to save the changes and stay on this page.
   - Click **Cancel** to return to the **RBAR > Configuration > Destinations** page without saving the changes.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:

   - Both the **Realm** and **Fully Qualified Domain Name** are empty; no value was entered
   - The **Fully Qualified Domain Name** is not unique; it already exists in the system
   - The entry in any field is not valid (wrong data type or out of the valid range)

Deleting a Destination

Use this task to delete a destination. A destination cannot be deleted if it is being used by any Address Range, Individual Address, or Routing Exception. Before this task is performed, delete the association with any Individual Address, Address Range, or Routing Exception.

1. Select **RBAR** > **Configuration** > **Destinations**.
   The **RBAR > Configuration > Destinations** page appears.
2. Select the destination you want to delete, then click **Delete**.
   A popup window appears.
3. Perform one of the following actions:
   - Click **OK** to delete the destination.
   - Click **Cancel** to cancel the delete function and return to the **RBAR > Configuration > Destinations** page.

If **OK** is clicked and the following condition exists, an error message appears:

- The destination is in use by an Address Range, Individual Address, or Routing Exception.

Address Tables configuration

The **RBAR > Configuration > Address Tables** page allows you to access an Address Table and its associated attributes.

From the **RBAR > Configuration > Address Tables** page, you can:

- Filter the list of address tables to display only the desired application(s).
- View a list of address tables.
- Insert an address table.
- Delete an address table.

Address Tables configuration elements

Table 5: Address Tables Configuration Elements describes the fields on the Address Tables View and Insert pages only.

Table 5: Address Tables Configuration Elements

Field	Description	Data Input Notes
Name	Unique name of the Address Table If a duplicate Name is entered or the Name is not specified, an error message appears.	Format: Alphanumeric and underscore (_) Range: 1–32 characters; cannot start with a digit and must contain at least one alpha
Comment	Information about the Address Table	Format: Text box; free form Range: up to 64 characters
Routing Entity Type	Type of Routing Entity If the Routing Entity Type is not specified, an error message appears.	Format: Pulldown list Range: • IMSI • MSISDN • IMPI • IMPU • IPv4 • IPv6 Prefix • UNSIGNED16

Viewing Address Tables

Use this task to view currently configured Address Tables.

Select **RBAR** > **Configuration** > **Address Tables**.
The **RBAR > Configuration > Address Tables** page appears. This list of address tables can be filtered to display only desired tables.

Inserting an Address Table

Use this task to add a new Address Table.

1. Select **RBAR > Configuration > Address Table**.
   The **RBAR > Configuration > Address Table** page appears.
2. Click **Insert**.
   The **RBAR > Configuration > Address Table [Insert]** page appears.
3. Enter a unique name for the Address Table in the **Name** field.
4. If needed, enter a comment or additional information about the Address Table in the **Comment** field.
5. Select the type of routing entity from the **Routing Entity Type** pulldown list.
6. Perform one of the following actions:
   - Click **OK** to save the Address Table and return to the **RBAR > Configuration > Address Table** page.
   - Click **Apply** to save the Address Table and stay on this page.
   - Click **Cancel** to return to the **RBAR > Configuration > Address Table** page without saving the data.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:
   - Any required field is empty; no value was entered or selected
   - The **Name** is not unique; it already exists in the system
   - The entry in any field is not valid (wrong data type or out of the valid range)
   - The maximum number of Address Tables (40) is already defined in the system

Deleting an Address Table

Use this task to delete an Address Table. An Address Table cannot be deleted if it is being used by any Individual Address, Address Range, or Address Resolution. Before you perform this task, delete the association with any Individual Address, Address Range, or Address Resolution.

1. Select **RBAR > Configuration > Address Table**.
   The **RBAR > Configuration > Address Table** page appears.
2. Select the Address Table you want to delete, then click **Delete**.
   A popup window appears.
3. Perform one of the following actions:
   - Click **OK** to delete the Address Table.
   - Click **Cancel** to cancel the delete function and return to the **RBAR > Configuration > Address Table** page.

If **OK** is clicked and the following condition exists, an error message appears:

- The Address Table is in use by an Address Range, Individual Address, or Address Resolution.

Addresses configuration

The **RBAR > Configuration > Addresses** page allows you to access the Routing Entity Address Range and Individual Address configurable options.

- The Address Range provides the mapping between a single address range and a Destination for routing.
- The Individual Address provides the mapping between an individual address and a Destination for routing.

Note: If an incoming message maps both an Address Range and an Individual Address, then the Individual Address entry takes priority.

The Address Range and Individual Address entries have their own associated attributes, which are accessed from this **RBAR > Configuration > Addresses** page.

From the **RBAR > Configuration > Addresses** page, you can:

- Filter the list of addresses to display only the desired records. You can filter the list by the following criteria:
  - Address table
  - Address table and Individual address
  - Address table and Range (start address, end address)
  - Address table, Individual address, and Range (start address, end address)
  - Destination
  - Destination and Address table
  - Destination, Address table, and Individual address
  - Destination, Address table, and Range (start address, end address)
  - Destination, Address table, Individual address, and Range (start address, end address)
- View a list of addresses.
- Insert an address.
- Edit an address.
- Delete an address.

Addresses configuration elements

Table 6: Addresses Configuration Elements describes the fields on the Addresses View, Insert, and Edit pages. Data Input Notes apply only to the Insert and Edit pages; the View page is read-only.

Table 6: Addresses Configuration Elements

Field	Description	Data Input Notes
View pages		
Table Name	Address Table name	N/A

Field	Description	Data Input Notes
Address	Address of destination	N/A
Entry Type	Address type (Individual or Range)	N/A
Routing Entity	Routing Entity type	N/A
Individual Address	Specific address	N/A
Start Address	Starting address of the Range	N/A
End Address	Ending address of the Range	N/A
Destination	Destination of the Address	N/A
Insert and Edit pages		
Routing Entity Type	Routing Entity type	Format: Pulldown list Range: • IMSI • IMSISDN • IMPI • IMPU • IPv4 • IPv6 Prefix • UNSIGNED16
Table Name	Address Table name	Format: Pulldown list Range: Available user-configured address table names associated to the selected **Routing Entity Type**
Address Type	Type of address for the Routing Entity Type	Format: Radio buttons Range: Range or Individual Address

Start Address	Starting address for an Address Range
	This field is required when Range is selected as **Address Type**.
	If Address is an IPv6-prefix, the prefix length must be entered in the **IPv6 Prefix length** field.
		Format: Text box
		Range: End Address must be greater than Start Address.
		• Routing Entity Address:
		  • IMSI: 15 digit string
		  • MSISDN: 3-14 digit string
		  • IMPI: 15 digit string
		  • IMPU: 3-15 digit string
		• IPv4 Address: a 15 character string; quad-dotted format; valid characters are numeric (0–9) and dot (.); both compressed and expanded form are supported; for

End Address	Ending address for an Address Range This field is required when Range is selected as **Address Type**. If Address is an IPv6-prefix, the prefix length must be entered in the **IPv6 Prefix length** field.	

Field	Description	Data Input Notes
Address	Specific address This field is enabled and required when Individual Address is selected as **Address Type**. If Address is an IPv6-prefix, the prefix length must be entered in the **IPv6 Prefix length** field.	example: `192.168.1.15` or `192.168.001.015` • IPv6-Prefix Address: Hexadecimal value; up to 39 characters; valid alphanumeric characters (0-9, A-F, a-f) and colon (:); both compressed and expanded form are supported; for example: `1:::2` or `0001:0000:0000:0000:0000:0000:0000:0002` **Note:** If this IPv6 address portion of the IPv6-prefix address is expressed in binary form (converting hexadecimal digits to bits), then no bit that is set (value=1) can be at an index that is greater than the configured IPv6 Prefix length. For example: `0001:0001::` for prefix length 28 is invalid as the 32nd bit is set. In addition, trailing zeros (0) can be dropped in this IPv6 address portion of the IPv6-prefix address but not the leading zeros (0); for example: `8::` for prefix length 1 is invalid because `8::` is treated as `0008::` • UNSIGNED16: Hexadecimal value; valid alphanumeric characters (0-9, A-F, a-f); for example: `512`, `20`, `40`, `AA`, `50A`, `FFFF`
IPv6 Prefix length	Prefix length of an IPv6-prefix address; specifies how many of the leftmost contiguous bits of the address comprise the prefix. This field is enabled and required when IPv6 Prefix is selected as **Routing Entity Type**.	Format: Text box; numeric Range: 1–128
Destination	Destination of the Address	Format: Pulldown list Range: Available user-configured destinations

Viewing Addresses

Use this task to view currently configured addresses.

1. Select **RBAR** > **Configuration** > **Addresses**.
   The **RBAR > Configuration > Addresses** page appears.
2. Click the desired tab (**Address Ranges**, **Individual Addresses**, or **All Addresses**) to display the associated records.
   The list of associated records appears. The total number of records is also provided.
3. If you want to filter this list of records, select the desired criteria and click **Go**.

   Note: To clear any of the fields, click **Reset**.

   The list can be filtered in the following combinations:

   - Address table
   - Address table and Individual address
   - Address table and Range (start address, end address)
   - Address table, Individual address, and Range (start address, end address)
   - Destination
   - Destination and Address table
   - Destination, Address table, and Individual address
   - Destination, Address table, and Range (start address, end address)
   - Destination, Address table, Individual address, and Range (start address, end address)

   The addresses that match the search criteria appear.

   Note: The IPv4 address appears in a collapsed form (for example: 1:2:3:4). The IPv6 Prefix address appears in the format *ipv6-address/prefix-length* where *ipv6-address* is in a collapsed form and *prefix-length* is a decimal value specifying how many of the leftmost contiguous bits of the address comprise the prefix.

   The list of addresses is restricted to display a maximum of 100,000 records. If this condition occurs, an informational message will display stating that the number of records was restricted to 100,000. In addition, an informational message appears stating the number of records that correspond to the applied filter.

   When **Go** is clicked and any of the following conditions exist, an error message appears:

   - **Address** entry is not within the **Start Address** and **End Address** entries
   - **Start Address** is greater than the **End Address**
   - The entry in any field is not valid (wrong data type or out of the valid range)

Inserting an Address

Use this task to add a new address or range of addresses to a Routing Entity type.

Before this task is performed, make sure there is at least one Address Table and one Destination configured in the system.

1. Select **RBAR** > **Configuration** > **Addresses**.
   The **RBAR > Configuration > Addresses** page appears.
2. Click **Insert**.

The **RBAR > Configuration > Addresses [Insert]** page appears.

3. Select the type of Routing Entity from the **Routing Entity Type** pulldown list.
4. Select the name of the Address Table from the **Address Table** pulldown list.
5. Select the desired **Address Type** radio button (Range or Individual Address).
6. Enter the appropriate address data depending on the selection of the **Address Type**:
   - For Range:
     1. Enter the starting address for the range in the **Start Address** field.
     2. Enter the ending address for the range in the **End Address** field.
   - For Individual Address, enter the specific address in the **Address** field.
7. If the address entered is an IPv6-prefix, enter the prefix length in the **IPv6 Prefix length** field.
8. Select the Destination from the **Destination** pulldown list.
9. Perform one of the following actions:
   - Click **OK** to save the address entry and return to the **RBAR > Configuration > Addresses** page.
   - Click **Apply** to save the address entry and stay on this page.
   - Click **Cancel** to return to the **RBAR > Configuration > Addresses** page without saving the data.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:
   - **Start Address** is greater than the **End Address**
   - **Start Address** and **End Address** for an Address Range are overlapping or already exists
   - At least one **Address Table** and one **Destination** have not been configured; they do not exist in the system
   - Address already exists for a **Table Name**
   - The entry in any field is not valid (wrong data type or out of the valid range)
   - Any required field is empty
   - The maximum number of records for the Address Type (1,000,000 for each type) is already defined in the system

Editing an Address

Use this task to edit an address associated with a Routing Entity type.

1. Select **RBAR** > **Configuration** > **Addresses**.
   The **RBAR > Configuration > Addresses** page appears.
2. Select the Address you want to edit, then click **Edit**.

   Note: For details about locating an address, see *Viewing Addresses*.

   The **RBAR > Configuration > Addresses [Edit]** page appears.
3. Update the relevant fields.
   For more information about each field, see *Addresses configuration elements*.

   The following fields are read-only and cannot be edited:
   - **Routing Entity Type**
   - **Address Type**
4. Perform one of the following actions:

- Click **OK** to save the changes and return to the **RBAR > Configuration > Addresses** page.
- Click **Apply** to save the changes and stay on this page.
- Click **Cancel** to return to the **RBAR > Configuration > Addresses** page without saving the changes.

If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:

- **Start Address** is greater than the **End Address**
- **Start Address** and **End Address** for an Address Range are overlapping or already exists
- Address already exists for a **Table Name**
- The entry in any field is not valid (wrong data type or out of the valid range)
- Any required field is empty

Deleting an Address

Use this task to delete an Address.

1. Select **RBAR** > **Configuration** > **Addresses**.
   The **RBAR > Configuration > Addresses** page appears.
2. Select the Address you want to delete, then click **Delete**.

   Note: For details about locating an address, see *Viewing Addresses*.

   A popup window appears.
3. Perform one of the following actions:
   - Click **OK** to delete the Address.
   - Click **Cancel** to cancel the delete function and return to the **RBAR > Configuration > Addresses** page.

Address Resolutions configuration

The **RBAR > Configuration > Address Resolutions** page allows you to define the routing relationship between message content and an address by mapping a Diameter Application ID, Command Code, and Routing Entity Type to a user-configured address (a range or individual address). An Address Resolution supports up to two prioritized Routing Entity Types for each Application ID and Command Code (highest priority – Primary Routing Entity Type – and lowest priority – Secondary Routing Entity Type).

From the **RBAR > Configuration > Address Resolutions** page, you can:

- Filter the list of address resolutions to display only the desired records.
- View a list of address resolutions.
- Insert an address resolution.
- Edit an address resolution.
- Delete an address resolution.

Address Resolutions configuration elements

Table 7: Address Resolutions Configuration Elements describes the fields on the Address Resolutions View, Insert, and Edit pages. Data Input Notes apply only to the Insert and Edit pages; the View page is read-only.

Table 7: Address Resolutions Configuration Elements

Field	Description	Data Input Notes
Application ID	Application ID in a Diameter message The Application ID is an IANA-assigned Diameter Application ID, which is a 32-bit field that is mandatory in all Diameter messages. It is commonly used for screening and routing messages between Diameter nodes. If a combination of the Application ID and Command Code already exists, an error message appears.	Format: Pulldown list Range: Application IDs configured for RBAR
Command Code	Command Code in a Diameter message If a combination of the Application ID and Command Code already exists, an error message appears.	Format: Pulldown list Range: Command Codes configured for Diameter
Primary Routing Entity and Secondary Routing Entity sections		
Routing Entity Type	Routing Entity type The same Routing Entity Type cannot be selected for both the Primary and the Secondary Routing Entity; if the same type is selected, an error message appears. If the Routing Entity Type is not specified for the Primary Routing Entity, an error message appears.	Format: Pulldown list Range: • IMSI • MSISDN • IMPI • IMPU • IPv4 • IPv6 Prefix • UNSIGNED16

Primary AVP	Primary AVP used for extracting the Routing Entity address
	The same Primary AVP and Secondary AVP cannot be selected for either the Primary Routing Entity or for the Secondary Routing Entity; if the same AVP is selected, an error message appears.
	If Primary AVP is not selected for the Primary Routing Entity, an error message appears.
		Format: Pulldown list
		Range:
		• User Identity Routing Entity Type:
		  • Public Identity
		  • ServiceInfo.Subscription-Id(0)
		  • ServiceInfo.Subscription-Id(1)
		  • ServiceInfo.Subscription-Id(2)
		  • ServiceInfo.Subscription-Id(3)
		  • ServiceInfo.Subscription-Id(4)

Field	Description	Data Input Notes
Secondary AVP	Secondary AVP used for extracting the Routing Entity address The same Primary AVP and Secondary AVP cannot be selected for either the Primary Routing Entity or for the Secondary Routing Entity; if the same AVP is selected, an error message appears. The Secondary AVP field is available for User Identity routing types only; this field is disabled if IPV4, IPV6 Prefix, and UNSIGNED16 are selected as the Routing Entity Type.	• Subscription-Id(0) • Subscription-Id(1) • Subscription-Id(2) • Subscription-Id(3) • Subscription-Id(4) • UserIdentity.MSISDN • UserIdentity.Public-Identity • UserName • IPv4 Routing Entity Type: Framed IP Address • IPv6 Prefix Routing Entity Type: Framed IPv6 Prefix • UNSIGNED16 Routing Entity Type: ServiceInfo.PSInfo.3GPP-CC
Address Table Name	Address Table for this Routing Entity Type If Address Table Name is not selected for the Primary Routing Entity, an error message appears.	Format: Pulldown list Range: Available configured Address Table names

Viewing Address Resolutions

Use this task to view currently configured Address Resolutions.

Select **RBAR** > **Configuration** > **Address Resolutions**.
The **RBAR > Configuration > Address Resolutions** page appears. This list of Address Resolutions can be filtered to display only desired records.

Inserting an Address Resolution

Use this task to add a new Address Resolution.

Before this task is performed, make sure there is at least one supported Diameter Application and one Address Table configured in the system.

1. Select **RBAR** > **Configuration** > **Address Resolutions**.
   The **RBAR > Configuration > Address Resolutions** page appears.
2. Click **Insert**.
   The **RBAR > Configuration > Address Resolutions [Insert]** page appears.
3. Select an application ID from the **Application ID** pulldown list.

   Note: The Application IDs presented in this list are those created using **Main Menu** > **RBAR** > **Configuration** > **Applications**.

4. Select the appropriate command code from the **Command Code** pulldown list.

   Note: The Command Codes presented in this list are those created using **Main Menu** > **Diameter** > **Command Codes**.

5. For the Primary Routing Entity section, perform the following:
   a) Select the appropriate Routing Entity type from the **Routing Entity Type** pulldown list.
   b) Select the Primary AVP from the **Primary AVP** pulldown list.
   c) If needed, select the Secondary AVP from the **Secondary AVP** pulldown list.

      Note: The **Secondary AVP** field is disabled if either IPv4, IPv6 Prefix, or UNSIGNED16 is selected in the **Routing Entity Type** field.

   d) Select the Address Table name from the **Address Table Name** pulldown list.
6. If needed, for the Secondary Routing Entity section, perform the following:
   a) Select the appropriate Routing Entity type from the **Routing Entity Type** pulldown list.
   b) Select the Primary AVP from the **Primary AVP** pulldown list.
   c) If needed, select the Secondary AVP from the **Secondary AVP** pulldown list.

      Note: The **Secondary AVP** field is disabled if either IPv4, IPv6 Prefix, or UNSIGNED16 is selected in the **Routing Entity Type** field.

   d) Select the Address Table name from the **Address Table Name** pulldown list.
7. Perform one of the following actions:

   - Click **OK** to save the address resolution and return to the **RBAR > Configuration > Address Resolutions** page.
   - **Apply** to save the address resolution and stay on this page.
   - Click **Cancel** to return to the **RBAR > Configuration > Address Resolutions** page without saving the data.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:

   - The combination of **Application ID** and **Command Code Value** is not unique; it already exists in the system
   - At least one supported Diameter **Application** and one **Address Table** have not been configured; they do not exist in the system
   - The entry in any field is not valid (wrong data type or out of the valid range)
   - Any required field is empty
   - Duplicate Routing Entity Types were selected in the **Primary** and **Secondary** Routing Entity sections
   - Duplicate AVPs were selected in the **Primary AVP** and **Secondary AVP** fields
   - The maximum number of Address Resolutions (64) is already defined in the system

Editing an Address Resolution

Use this task to edit an Address Resolution.

1. Select **RBAR** > **Configuration** > **Address Resolution**.
   The **RBAR > Configuration > Address Resolutions** page appears.
2. Select the Address Resolution you want to edit, then click **Edit**.
   The **RBAR > Configuration > Address Resolutions [Edit]** page appears.
3. Update the relevant fields.

   For more information about each field, see *Address Resolutions configuration elements*.

   The following fields are read-only and cannot be edited:

- **Application ID**
- **Command Code**

4. Perform one of the following actions:
   - Click **OK** to save the changes and return to the **RBAR > Configuration > Address Resolutions** page.
   - Click **Apply** to save the changes and stay on this page.
   - Click **Cancel** to return to the **RBAR > Configuration > Address Resolutions** page without saving the changes.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:
   - The entry in any field is not valid (wrong data type or out of the valid range)
   - Any required field is empty
   - Duplicate Routing Entity Types were selected in the **Primary** and **Secondary** Routing Entity sections
   - Duplicate AVPs were selected in the **Primary AVP** and **Secondary AVP** fields

Deleting an Address Resolution

Use this task to delete an Address Resolution.

1. Select **RBAR** > **Configuration** > **Address Resolutions**.
   The **RBAR > Configuration > Address Resolutions** page appears.
2. Select the Address Resolution you want to delete, then click **Delete**.
   A popup window appears.
3. Perform one of the following actions:
   - Click **OK** to delete the Address Resolution.
   - Click **Cancel** to cancel the delete function and return to the **RBAR > Configuration > Address Resolutions** page.

System Options configuration

The **RBAR > Configuration > System Options** page allows you to modify the default system values for RBAR global parameters (for example, FQDN/Realm, or Allow Subsequent RBAR Invocation, or Application Unavailable action).

System Options elements

Table 8: System Options Elements describes the fields on the System Options page.

Table 8: System Options Elements

Field	Description	Data Input Notes
IMPU URI Local Number Enabled	This only applies to the Routing Entity Type **IMPU**; defines whether Local Numbers are considered valid addresses within a SIP or TEL URI. An address of this form is considered a "Local Number" if it does not start with the Global Number prefix character "+". If checked, both Local and Global Numbers are valid addresses for IMPU decoded from Diameter Requests. If unchecked, only Global Numbers are valid addresses.	Format: Check box Range: Checked, unchecked Default: Unchecked
ASCII Excluded Digits	List of ASCII characters to ignore while parsing digits from a raw AVP data field of AVP Type UTF8String. If an invalid character is entered, an error message appears.	Format: Text boxes Range: ASCII-printable characters except "%"
Exclude Space	Defines whether ASCII character space is ignored while parsing digits from a raw AVP data field of AVP Type UTF8String If checked, ASCII character space is ignored. If not checked, ASCII character space is not ignored.	Format: Check box Range: Checked, unchecked Default: Unchecked
TBCD Excluded Digits	Defines whether the associated character is ignored while parsing digits from a raw AVP data field of AVP Type OctetString encoded as a TBCD-string If checked, character is ignored. If not checked, character is not ignored.	Format: Check boxes Range: Checked, unchecked for each option: *(0010), #(1011), a(1100), b(1101), c(1110) Default: Unchecked
Allow Subsequent RBAR Invocation	Enables the subsequent invocation of RBAR on a different DSR node in the network If checked, this setting overrides the **Allow Subsequent RBAR Invocation** attribute in **Destination**.	Format: Check box Range: Checked, unchecked Default: Unchecked
Remove Destination-Host	If checked, RBAR deletes any instance of "Destination-Host" AVPs in the message when performing "Realm only" resolution.	Format: Check box Range: Checked, unchecked Default: Unchecked

Field	Description	Data Input Notes
Realm	Value to be placed in the Origin-Realm AVP of the Answer message generated by RBAR A Realm must be paired with a Fully Qualified Domain Name. If entering a value for Realm, then a value for Fully Qualified Domain Name must also be entered; otherwise, an error message appears. If not configured, the local node Realm for the egress connection is used to populate Origin-Realm AVP.	Format: Text box; string consisting of a list of labels separated by dots, where a label must contain letters, digits, hyphen (-) and underscore (_). A label must start with a letter or underscore and must end with a letter or digit. Underscores may be used only as the first character. Range: A valid Realm or FQDN. A label consists up to 63 characters and a Realm or FQDN up to 255 characters
Fully Qualified Domain Name	Value to be placed in the Origin-Host AVP of the Answer message generated by RBAR A Fully Qualified Domain Name must be paired with a Realm. If entering a value for Fully Qualified Domain Name, then a value for Realm must also be entered; otherwise, an error message appears. If not configured, the local node FQDN for the egress connection is used to populate the Origin-Host AVP.	
Resource Exhaustion Result-Code	Result-Code or Experimental-Result-Code value to be returned in an Answer message when a message is not successfully routed because of internal resource being exhausted If Vendor-Id is configured, this result-code value is encoded as Experimental-Result-Code AVP; otherwise the result-code is encoded as Result-Code AVP.	Format: • Selection text box; numeric • Selection pulldown list Range: • Selection box: 1000–5999 • Pulldown list: available Code values Default: 3004
Resource Exhaustion Error Message	Error-Message AVP value to be returned in an Answer message when a message is not successfully routed because of internal resource being exhausted	Format: Alphanumeric, underscore (_), and period (.) Range: 0–64 characters Default: RBAR Resource Exhausted

Field	Description	Data Input Notes
Resource Exhaustion Vendor-Id	Vendor-Id AVP value to be returned in an Answer message when a message is not successfully routed because of internal resource being exhausted	Format: Text box; numeric Range: 1–4294967295
Application Unavailable Action	Defines action to be taken when RBAR is not available to process messages If the Default Route option is selected, an entry must be provided for the Application Unavailable Route List.	Format: Radio buttons Range: • Continue Routing • Default Route • Send Answer with Result-Code AVP • Send Answer with Experimental-Result AVP Default: Continue Routing
Application Unavailable Route List	Defines where the requests will be routed when RBAR is not available. Peer Routing Rules will be bypassed. A route list must be entered if Default Route is selected as the **Application Unavailable Action**.	Format: Pulldown list Range: Available Route List entries
Application Unavailable Result-Code	Result-Code or Experimental-Result-Code value to be returned in an Answer message when a message is not successfully routed because RBAR is not available. If Vendor-Id is configured, this result-code value is encoded as Experimental-Result-Code AVP; otherwise the result-code is encoded as Result-Code AVP. A code must be entered if either the Send Answer with Result-Code AVP or the Send Answer with Experimental Result-Code AVP option is selected as the **Application Unavailable Action**.	Format: • Selection Text box; numeric • Selection pulldown list Range: • Selection box: 1000–5999 • Pulldown list: available Code values Default: 3002
Application Unavailable Error Message	Error-Message AVP value to be returned in an Answer message when a message is not successfully routed because RBAR is not available. A message can be entered, if needed, when either the Send Answer with Result-Code AVP or the Send Answer with Experimental Result-Code AVP option is selected as the **Application Unavailable Action**.	Format: Alphanumeric, underscore (_), and period (.) Range: 0–64 characters Default: RBAR Unavailable

Field	Description	Data Input Notes
Application Unavailable Vendor-Id	Vendor-Id AVP value to be returned in an Answer message when a message is not successfully routed because RBAR is not available. A vendor-Id must be entered if the Send Answer with Experimental Result-Code AVP option is selected as the **Application Unavailable Action**.	Format: Text box; numeric Range: 1–4294967295

Editing System Options

Use this task to edit System Options.

1. Select **RBAR** > **Configuration** > **System Options**.
   The **RBAR > Configuration > System Options** page appears.
2. Update the relevant fields.
   For more information about each field, see *System Options elements*.
3. Perform one of the following actions:
   - Click **OK** to save the changes and return to the **RBAR > Configuration > System Options** page.
   - Click **Apply** to save the changes and stay on this page.
   - Click **Cancel** to return to the **RBAR > Configuration > System Options** page without saving the changes.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:
   - Either the **Realm** or **Fully Qualified Domain Name** is empty; no value was entered; these fields must be configured as a pair
   - Any required field is empty; no value was entered
   - The entry in any field is not valid (wrong data type or out of the valid range)

Post-Configuration Activities

After RBAR configuration is complete, the following activities need to be performed to make RBAR fully operational in the system:

- Enabling the RBAR application
- Status Verification

Enabling the RBAR Application

Use this task to enable the RBAR application.

1. From the each active SOAM, select **Diameter** > **Maintenance** > **Applications**.
   The **Diameter > Maintenance > Applications** page appears.
2. Under **DSR Application Name**, select each **RBAR** row.
   To select more than one row, press and hold **Ctrl** while you click each row.

3. Click **Enable**.
4. Verify the application status on the page.

   The **Admin State**, **Operational Status**, **Operational Reason**, and **Congestion Level** in each of the selected rows should have changed respectively to **Enabled**, **Available**, **Normal**, and **Normal**.

Status Verification

Use this task to verify RBAR status after configuration is complete.

1. Verify Communication Agent (ComAgent) Connection status.
   a) From the active SOAM, select **Communication Agent** > **Maintenance** > **Connection Status**
   b) Verify that the **Automatic Connections Count** field displays **X of X in service** where X is the number of peer server connections.
2. Verify Server status.
   a) From the active SOAM, select **Status & Manage** > **Server**
   b) Verify that for each Server, the **Appl State** field is **Enabled**, and the **DB**, **Reporting Status**, and **Proc** fields are **Norm**.

DSR Bulk Import and Export

The following documents describe the use and operation of DSR Bulk Import and Export functions:

- *Diameter User's Guide*, "Diameter Configuration", "DSR Bulk Import", "DSR Bulk Export"
- **Help** > **Diameter** > **Configuration** > **DSR Bulk Import**
- **Help** > **Diameter** > **Configuration** > **DSR Bulk Export**

The DSR Bulk Import and Export functions can be used to export Diameter, IPFE, and DSR Application configuration data in CSV files to a location outside the system, and to import the files (usually edited) into the system where the Import function is executed.

Configuration data refers to any data that is configured for one of the Export **Export Application** types (FABR, RBAR, Policy DRA, GLA , or CPA and SBR DSR Applications; IPFE; and the Diameter Configuration components).

DSR Bulk Export

The DSR Bulk Export operation creates ASCII Comma-Separated Values (CSV) files (.csv) containing Diameter , IPFE, and DSR Application configuration data. Exported configuration data can be edited and used with the DSR Bulk Import operations to change the configuration data in the local system without the use of GUI pages. The exported files can be transferred to and used to configure another DSR system.

Each exported CSV file contains one or more records for the configuration data that was selected for the Export operation. The selected configuration data can be exported once immediately, or exports can be scheduled to periodically occur automatically at configured times.

The following configuration data can be exported in one Export operation:

- All exportable configuration data in the system
- All exportable configuration data from the selected DSR Application, IPFE, or Diameter (each component's data is in a separate file)

- Exportable configuration data from a selected configuration component for the selected DSR Application, IPFE, or Diameter

Exported files can be written to the File Management Directory in the local File Management area (**Status & Manage > File** page), or to the Export Server Directory for transfer to a configured remote Export Server.

CSV files that are in the local File Management area can be used for Bulk Import operations on the local system.

If the export has any failures or is unsuccessful, the results of the export operation are logged to a log file with the same name as the exported file but with a ".log" extension. Successful export operations will not be logged.

DSR Bulk Import

The DSR Bulk Import operations use configuration data in ASCII Comma-Separated Values (CSV) files (.csv), to insert new data into, update existing data in, or delete existing data from the Diameter Configuration, IPFE Configuration, or DSR Applications (FABR, RBAR, Policy DRA, GLA, and CPA/SBR) Configuration data in the system.

Note: Some configuration data can be imported only with the Update operation, and other data can be imported with Insert and Delete operations but not Update. Refer to the "DSR Bulk Import" section of the *Diameter User's Guide* or the **Diameter > Configuration > Import** Help for valid Import operations.

Import CSV files can be created by using a DSR Bulk Export operation, or can be manually created using a text editor.

Note: The format of each Import CSV file record must be compatible with the configuration data in the DSR release that is used to import the file.

Files that are created using the DSR Bulk Export operation can be exported either to the local Status & Manage File Management Directory (**Status & Manage > Files** page), or to the local Export Server Directory.

CSV files that are in the local File Management area can be used for Bulk Import operations on the local system.

Files can be created manually using a text editor on a computer; the files must be uploaded to the File Management area of the local system before they can be used for Import operations on the local system.

The following Import operations can be performed:

- Insert new configuration data records that do not currently exist in the system
- Update existing configuration data in the system
- Delete existing configuration data from the system

Each Import operation creates a log file. If errors occur, a Failures CSV file is created that appears in the File Management area. Failures files can be downloaded, edited to correct the errors, and imported to successfully process the records that failed. Failures files that are unchanged for more than 14 days and log files that are older than 14 days are automatically deleted from the File Management area.

Glossary

A

AVP	Attribute-Value Pair The Diameter protocol consists of a header followed by one or more attribute-value pairs (AVPs). An AVP includes a header and is used to encapsulate protocol-specific data (e.g., routing information) as well as authentication, authorization or accounting information.

D

Destination	The node to which the signaling link traffic is routed. This destination is identified by a point code, either a full point code or a cluster point code.
Diameter Relay Agent	Diameter agent that forwards requests and responses to other Diameter nodes based on routing-related AVPs (e.g., Destination-Realm) and routing table entries. Since relays do not make policy decisions, they do not examine or alter non-routing AVPs. As a result, relays never originate messages, do not need to understand the semantics of messages or non-routing AVPs, and are capable of handling any Diameter application or message type.
DSR	Diameter Signaling Router A set of co-located Message Processors which share common Diameter routing tables and are

D

	supported by a pair of OAM servers. A DSR Network Element may consist of one or more Diameter nodes.

G

GUI	Graphical User Interface The term given to that set of items and facilities which provide the user with a graphic means for manipulating screen data rather than being limited to character based commands.

H

HSS	Home Subscriber Server A central database for subscriber information.

I

IANA	Internet Assigned Numbers Authority An organization that provides criteria regarding registration of values related to the Diameter protocol.
IMPI	IP Multimedia Private Identity
IMPU	IP Multimedia Public Identity
IMSI	International Mobile Subscriber Identity International Mobile Station Identity

M

MSISDN	The MSISDN is the network specific subscriber number of a

M

	mobile communications subscriber. This is normally the phone number that is used to reach the subscriber. Mobile Subscriber Integrated Services Digital Network [Number] Mobile Station International Subscriber Directory Number. The unique, network-specific subscriber number of a mobile communications subscriber. MSISDN follows the E.164 numbering plan; that is, normally the MSISDN is the phone number that is used to reach the subscriber.

O

OCS	Online Charging Server
OFCS	Offline Charging Server

P

PCRF	Policy and Charging Rules Function. The ability to dynamically control access, services, network capacity, and charges in a network. Maintains rules regarding a subscriber's use of network resources. Responds to CCR and AAR messages. Periodically sends RAR messages. All policy sessions for a given subscriber, originating anywhere in the network, must be processed by the same PCRF.
P-DRA	Policy DRA
Proxy Agent	Performs the basic forwarding functions of a Relay Agent, but unlike a Relay Agent, a Proxy Agent can modify the message content and provide value-added

P

	services, enforce rules on different messages, or perform administrative tasks for a specific realm.
pSBR	Policy SBR

R

Range Based Address Resolution	See RBAR.
RBAR	Range Based Address Resolution A DSR enhanced routing application which allows the user to route Diameter end-to-end transactions based on Application ID, Command Code, "Routing Entity" Type, and Routing Entity address ranges.

S

SIP	Session Initiation Protocol A peer-to-peer protocol used for voice and video communications.
SOAM	System Operations, Administration, and Maintenance Site Operations, Administration, and Maintenance

U

URI	Uniform Resource Identifier An internet protocol element consisting of a short string of characters that conform to a certain syntax. The string comprises a name or address that can be used to refer to a resource.