

**Oracle® Communications
Diameter Signaling Router**

Range Based Address Resolution (RBAR) User's Guide

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Table of Contents

Chapter 1: Introduction.....	7
Overview.....	8
Scope and Audience.....	8
Documentation Admonishments.....	8
Manual Organization.....	9
My Oracle Support (MOS).....	9
Emergency Response.....	9
Related Publications.....	10
Locate Product Documentation on the Oracle Technology Network Site.....	10
Chapter 2: Range Based Address Resolution.....	11
Range Based Address Resolution overview.....	12
Address Ranges.....	13
Individual Addresses.....	13
Request Routing with Chained DSR Applications.....	14
Request Message Validation.....	16
Multiple DSR Application Invocation Prevention.....	22
Metadata Recording for Integrated DIH (IDIH).....	23
Chapter 3: Configuration.....	25
Pre-Configuration Activities.....	26
Verifying Server status.....	26
Diameter Common Configuration for RBAR.....	26
Diameter Configuration for RBAR.....	27
RBAR Configuration.....	28
Applications configuration.....	28
Exceptions configuration.....	31
Destinations configuration.....	33
Address Tables configuration.....	36
Addresses configuration.....	38
Address Resolutions configuration.....	44
System Options configuration.....	48
Post-Configuration Activities.....	52

Enabling the RBAR Application.....	52
Status Verification.....	52
DSR Bulk Import and Export.....	52
Chapter 4: Maintenance.....	55
Overview.....	56
Glossary.....	57

List of Figures

Figure 1: Request Processing with Multiple DSR Applications.....	14
Figure 2: IMSI/MSISDN Overlap Range Scenario.....	22

List of Tables

Table 1: Admonishments.....	8
Table 2: RBAR Supported AVPs.....	17
Table 3: Combinations of User Identity Types and Associated AVPs.....	18
Table 4: Relation between Configured User Identity Types and Data Formats.....	19
Table 5: DSR-Application-Invoked AVP.....	22
Table 6: RBAR Metadata-Generating Events.....	23
Table 7: Applications Configuration Elements.....	29
Table 8: Exceptions Configuration Elements.....	31
Table 9: Destinations Configuration Elements.....	34
Table 10: Address Tables Configuration Elements.....	37
Table 11: Addresses Configuration Elements.....	39
Table 12: Address Resolutions Configuration Elements.....	44
Table 13: System Options Elements.....	48

Chapter 1

Introduction

Topics:

- *Overview.....8*
- *Scope and Audience.....8*
- *Documentation Admonishments.....8*
- *Manual Organization.....9*
- *My Oracle Support (MOS).....9*
- *Emergency Response.....9*
- *Related Publications.....10*
- *Locate Product Documentation on the Oracle Technology Network Site.....10*

The *Range Based Address Resolution (RBAR) User's Guide* and *Help* provide an overview of RBAR functions and of procedures to use to configure RBAR. The contents of this chapter 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) documentation provides information about RBAR functions, and how to use the RBAR GUI and the following procedures to configure the RBAR application.

- 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	Danger: (This icon and text indicate the possibility of <i>personal injury</i> .)
 WARNING	Warning: (This icon and text indicate the possibility of <i>equipment damage</i> .)
 CAUTION	Caution: (This icon and text indicate the possibility of <i>service interruption</i> .)

Icon	Description
	Topple: (This icon and text indicate the possibility of <i>personal injury and equipment damage.</i>)

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.
- *Maintenance* describes maintenance functions and information that can be used with the RBAR application.

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 **2** for Non-technical issue

You will be connected to a live agent who can assist you with MOS registration and provide Support Identifiers. Simply mention you are a Tekelec Customer new to MOS.

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 discussion and agreement with Oracle.

Related Publications

For information about additional publications that are related to this document, refer to the *Related Publications Reference* document, which is published as a separate document on the Oracle Technology Network (OTN) site. See [Locate Product Documentation on the Oracle Technology Network Site](#) for more information.

Locate Product Documentation on the Oracle Technology Network 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 Technology Network 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**.

Range Based Address Resolution

Topics:

- *Range Based Address Resolution overview.....12*
- *Request Routing with Chained DSR Applications.....14*
- *Request Message Validation.....16*
- *Multiple DSR Application Invocation Prevention.....22*
- *Metadata Recording for Integrated DIH (IDIH).....23*

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.

RBAR Functions

RBAR provides the following functions:

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 Priority AVP (if provisioned), or next Routing Entity (if provisioned).

Identifying IMSIs and MSISDNs

Address resolution applications like Full Address Based Resolution (FABR) and Range Based Address Resolution (RBAR) need to categorize User Identities (digit strings) decoded from the Diameter Request AVPs as either MSISDN or IMSI, to allow looking up the User Identity in the appropriate lookup table.

If there is no "+" sign before the digits, the Routing Entity Type is IMPU, and decoded digits falls within MSISDN and IMSI overlap range, configured MCC+MNC combinations can be compared to the first 5 or 6 digits of the User Identity. If a match occurs, the User Identity is considered as an IMSI and used for IMSI lookup. If a match does not occur, the User Identity is considered as an MSISDN and used for MSISDN lookup.

See [Identifying IMSIs and MSISDNs](#) for more information about identifying IMSIs and MSISDNs using digit string lengths and MCC+MNC combinations.

Application Chaining

Application Routing Rules can be configured so that RBAR and the DM-IWF applications can both process the same Diameter Request message. See [Request Routing with Chained DSR Applications](#).

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.

Address Ranges

An Address Range contains the following attributes:

- Routing Entity Type
- Start Address
- End Address
- Destination

RBAR Address Ranges are at least two addresses.

A common set of Address Ranges (such as all IMSIs associated with a LTE-HSS) is called a Digit Range Table (DRT).

For a DRT that can be associated with User Identity Types,

- RBAR supports DRT Address Ranges with different digit lengths.

or example, the range 9195550000 - 9195559999 and the range 303200 - 303299 are allowed in the same DRT.

- RBAR supports a minimum of 8 different DRT Address Range digit lengths.

For example, an MSISDN DRT could contain Address Ranges with 3 digits, 6 digits, 10 digits and 15 digits.

For a DRT that can be associated with the Routing Entity Type "IPv6-Prefix Address", RBAR supports a minimum of 32 different DRT Address Range bit lengths.

For example, a DRT with the Routing Entity Type "IPv6-Prefix Address" could contain address ranges with 4 bits, 8 bits, 12 bits, ..., 128 bits.

The "Start Address" and the "End Address" attributes of an Address Range entry that can be associated with the Routing Entity Type "UNSIGNED16" will always be a 16-bit value.

Individual Addresses

An Individual Address contains the following attributes:

- (AET) Table Name
Routing Entity Type

- Address
- Routing Entity Type
- Destination

A common set of Individual Addresses (such as all IMSIs associated with a LTE-HSS) is called an Address Exception Table (AET).

The Address attribute of an Individual Address that can be associated with User Identity Types will contain a minimum of three (3) and a maximum of fifteen (15) digits.

The Address attribute of an Individual Address that can be associated with the Routing Entity Type "IPv4 Address" will always be a 32-bit value.

The Address attribute of an Individual Address that can be associated with the Routing Entity Type "IPv6-Prefix Address" will contain a minimum of one (1) and a maximum of 128 bits.

The Address attribute of an Individual Address that can be associated with the Routing Entity Type "UNSIGNED16" will always be a 16-bit value.

For an AET that can be associated with User Identity Types and with the Routing Entity Type "IPv6-Prefix Address", RBAR supports addresses with different digit lengths.

Request Routing with Chained DSR Applications

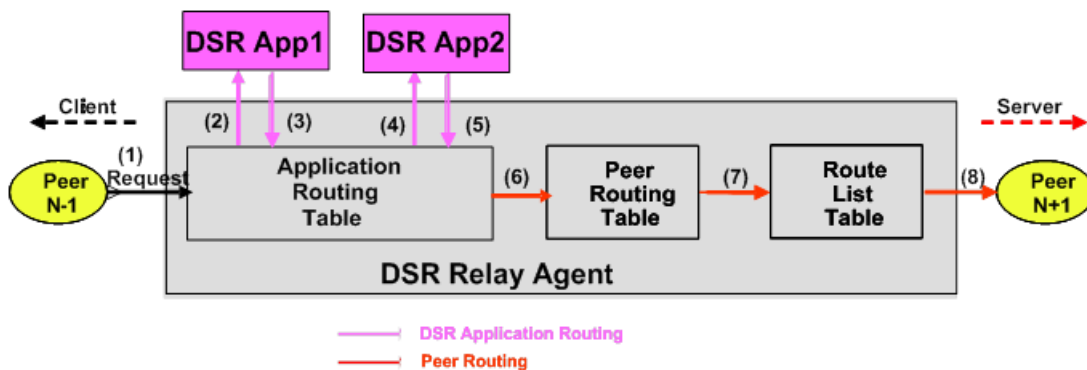
Application Chaining is a method for invoking multiple DSR Applications in sequence on the same DSR.

Figure 1: Request Processing with Multiple DSR Applications shows an example of Request processing for two DSR Applications executing in sequence. The Application Route Table in this example is executed three times:

1. When the Request enters the system at (1)
2. When DSR Application 1 sends the Request back to the Diameter Routing Function at (3)
3. when DSR Application 2 sends the Request back to the Diameter Routing Function at (5)

At (5) there is no matching Application Routing Rule for the Request, the Request is routed to Peer Route Table processing.

Figure 1: Request Processing with Multiple DSR Applications



- **Application Route Table (ART)**

Application Route Tables are used for routing Request messages to DSR Applications. An ART contains a prioritized list of user-configurable Application Routing Rules. Each Application Routing Rule associates Request message content with a DSR Application.

An ART is searched when a Request message is received from a Peer Node or a DSR Application. Searching an ART when a Request message is received from a DSR Application allows the operator to route the ingress Diameter transaction to multiple DSR Applications in sequence. The operator can create multiple ARTs to assign an ART to a Request message based upon a set of user-defined criteria.

- **Application Routing Rules**

An Application Route Table (ART) consists of a set of prioritized Application Routing Rules that the Diameter Routing Function searches with the content of a Request message, to determine whether the message should be forwarded to a DSR Application for processing.

One ART is searched each time a Request message is received from a Peer Node or a DSR Application. This method allows forwarding a Diameter transaction to one or more DSR Applications for processing.

However, the Diameter Routing Function does not allow a DSR Application to process a Diameter transaction more than once. (The Diameter Routing Function internally keeps track of which DSR Applications have already processed the message.) When the Diameter Routing Function is searching an ART and encounters an Application Routing Rule that is associated with a DSR Application that has already processed the transaction, that Application Routing Rule will be bypassed.

The system always contains a Default ART that cannot be removed using the configuration GUI. The user can create additional ARTs and then define, through configuration, which ART will be searched based on ART precedence selection rules.

Each time that a Request message is received from a Peer Node or DSR Application, the Diameter Routing Function selects an ART to search based on the following ART precedence selection rules (highest to lowest priority):

1. The ART provided by the DSR Application, if it exists (applies only when the Request message was received from a DSR Application)
2. The ART assigned to the ingress Peer Node from which the Request message was received, if it exists
3. The ART assigned to the Diameter Application ID in the Request message header, if it exists
4. The Default ART

The order of DSR Applications which can process an ingress Request message is determined by operator configuration of one or more Application Route Tables.

- Each time the Diameter Routing Function receives a Request message from a Peer Node or DSR Application, it searches the Application Route Tables to determine where to forward the message.
- The highest priority Application Routing Rule matched defines where to forward the message.
- If no Application Routing Rule match is found, the Diameter Routing Function begins Relay Agent routing to an upstream Peer Node.

When RBAR and the Diameter-MAP Interworking (DM-IWF) applications run in the same DA-MP, the same Diameter Request message can be processed by both applications.

For a Diameter-to-MAP Request message received from a Diameter Peer that needs to be processed by RBAR followed by DM-IWF, two Application Routing Rules are needed; one for routing the message first to RBAR and the second one to route the message to DM-IWF after RBAR processing is completed

- After the Request is received from the Peer, the Diameter Routing Function searches the Application Routing Rules for the highest priority matching rule. This rule contains the RBAR application name, and will result in the Request being routed to RBAR
- RBAR processes the message and returns it to the Diameter Routing Function.
- The Diameter Routing Function searches the Application Routing Rules for the highest priority matching rule (excluding all rules that would result in routing of the Request to RBAR again). This rule contains the DM-IWF application name, and will result in the Request being routed to DM-IWF.
- DM-IWF processes the message and sends it to an MD-IWF application (SS7-MP).

For a MAP-to-Diameter Request message received by DM-IWF from an MD-IWF application (SS7-MP) that needs to be processed by RBAR after DM-IWF processing, a single Application Routing Rule is needed for routing the message to RBAR after DM-IWF processing is completed.

- DM-IWF processes the message and sends it to the Diameter Routing Function.
- The Diameter Routing Function searches the Application Routing Rule for the highest priority matching rule (excluding all rules that would cause routing of the Request to DM-IWF again). This rule contains the RBAR application name, and will result in the Request being routed to RBAR for processing.
- RBAR returns the message to the Diameter Routing Function to complete the routing process.

Request Message Validation

The RBAR application processes the Diameter Request message based on the configuration, to extract the User Identity addresses.

When RBAR receives a Diameter Request message, the following validation is performed:

- First determine whether the Application ID in the message header is defined in the configuration.
If a valid Application ID cannot be found, the message is not processed. An Answer response with a Result Code AVP for DIAMETER_APPLICATION_UNSUPPORTED is returned.
- If a valid (configured) Application ID is received in a Diameter Request message, validate whether the pair (Application ID, Command Code) received in the message is defined in the configuration.
If the pair cannot be found in the configuration, the appropriate Routing Exception Handling procedure is invoked.
- If the pair is configured, search for a valid Routing Entity address in the message based on the highest priority Routing Entity Type (Primary Routing Entity Type in Address Resolution configuration) assigned to the pair.
- Search for a valid Routing Entity Address in the message based on a prioritized set of AVPs assigned to the triplet.

If a valid Routing Entity Address cannot be found in searching the configured Routing Entity Types assigned to the pair, the Routing Exception Handling procedure is invoked that is assigned to the Application ID and this Routing Entity Type.

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 Answer response with a user-defined Result-Code AVP value and Error-Message AVP
- Send Answer response with user-defined Experimental-Code AVP values and Error-Message AVP
- Abandon Request (discard the ingress Diameter Request message)

The following types of Routing Exceptions will be supported:

- Unknown Command Code
- Valid address not found
- Valid address was found and did match a configured address or address range

Supported AVPs

RBAR supports the AVPs associated with a User Identity Type (IMSI, MSISDN, IMPI, IMPU), as defined in [Table 2: RBAR Supported AVPs](#).

Table 2: RBAR Supported AVPs

AVPs	Vendor ID and AVP Code	AVP Type	AVP Reference
For a User Identity Type (IMSI, MSISDN, IMPI, IMPU)			
User-Name	Vendor-ID: none AVP Code: 1	UTF8String	Section 8.14 of RFC 3588bis
Service-Information [Subscription-Id] [...]	Vendor-ID: 10415 (3GPP) AVP Code: 873	Grouped	Section 7.2.192 of 3GPP 32.299
Subscription-Id [Subscription-Id-Data]	Vendor-ID: none AVP Code: 443	Grouped	Section 8.46 of RFC 4006
Subscription-Id-Data	Vendor-ID: none AVP Code: 444	UTF8String	Section 8.48 of RFC 4006
Public Identity	Vendor-ID: 10145 (3GPP) AVP Code: 601	UTF8String	Section 6.3.2 of 3GPP 29.229
User-Identity: [Public-Identity] [MSISDN]	Vendor-ID: 10415 (3GPP) AVP Code: 700	Grouped	Section 6.3.1 of 3GPP 29.329

Range Based Address Resolution

AVPs	Vendor ID and AVP Code	AVP Type	AVP Reference
MSISDN	Vendor-ID: 10415 (3GPP) AVP Code: 701	OctetString	Section 6.3.2 of 3GPP 29.329
Public-Identity	Vendor-ID: 10415 (3GPP) AVP Code: 601	UTF8String	Section 6.3.2 of 3GPP 29.229
For a Routing Entity Type "IPv4 Address"			
Framed-IP-Address	Vendor-ID: none AVP Code: 8	OctetString	Section 6.11.1 of RFC 4005
For a Routing Entity Type "IPv6-Prefix Address"			
Framed-IPv6-Prefix	Vendor-ID: none AVP Code: 97	OctetString	Section 6.11.6 of RFC 4005

Each of the configured User Identity types supported in RBAR is associated with certain AVPs that contain the User Identity type as defined by various Diameter application standards. [Table 3: Combinations of User Identity Types and Associated AVPs](#) presents all possible combinations of the User Identity types and the associated AVPs.

Table 3: Combinations of User Identity Types and Associated AVPs

User Identity Types	IMSI	MSISDN	IMPI	IMPU
AVPs				
MSISDN		Applicable		Applicable
User-Identity: MSISDN		Applicable		Applicable
Public-Identity	Applicable	Applicable	Applicable	Applicable
User-Identity: Public-Identity	Applicable	Applicable	Applicable	Applicable
User-Name	Applicable		Applicable	
Subscription-ID-Data (0-E.164)		Applicable		Applicable
Service-Information: Subscription-ID-Data (0-E.164)		Applicable		Applicable
Subscription-ID-Data (1-IMSI)	Applicable		Applicable	
Service-Information: Subscription-ID-Data (1-IMSI)	Applicable		Applicable	

Range Based Address Resolution

User Identity Types	IMSI	MSISDN	IMPI	IMPU
Subscription-ID-Data (2-SIP URI)	Applicable	Applicable	Applicable	Applicable
Service-Information: Subscription-ID-Data (2-SIP URI)	Applicable	Applicable	Applicable	Applicable
Subscription-ID-Data (3-NAI)	Applicable	Applicable	Applicable	Applicable
Service -Information: Subscription-ID-Data (3-NAI)	Applicable	Applicable	Applicable	Applicable
Subscription-ID-Data (4-Private)	Applicable	Applicable	Applicable	Applicable
Service -Information: Subscription-ID-Data (4-Private)	Applicable	Applicable	Applicable	Applicable
Wildcarded-Public-Identity				Applicable

A User Identity type can be associated with one or more data formats that will be examined when deriving the user identity address from the associated AVPs. The relation between User Identity types and the corresponding data formats to be encountered in the ingress Diameter request message are listed in [Table 4: Relation between Configured User Identity Types and Data Formats](#).

Table 4: Relation between Configured User Identity Types and Data Formats

Configurable User Identity Types	IMSI	MSISDN	IMPI	IMPU
User Identity Formats in Messages				
IMSI Format: ASCII Example: 311480123456789	Applicable		Applicable	
MSISDN Format: ASCII and TBCD Example: 19194605500		Applicable		Applicable
SIP URI with IMSI Format: ASCII	Applicable		Applicable	
Examples: sip:123456789012345@nai.epc.mnc456.mcc123.3gppnetwork.org sip:631115099995555@ims.mnc015.mcc311.3gppnetwork.org				

Range Based Address Resolution

Configurable User Identity Types	IMSI	MSISDN	IMPI	IMPU
sip:31148099995555@my.network.org sip: 631148099995555@my.network.org				
SIP URI with MSISDN Format: ASCII Examples: sip:+1-919-460-5500@xyz.com;user=phone sip:31148099995555@my.network.org		Applicable		Applicable
SIP URI with NAI Format: ASCII Example: sip:handy.manny@xyz.com			Applicable	Applicable
SIP URI with Wildcarded PSI Format: ASCII Example: sip:WP-A_ServiceType-!.*!@att.com				Applicable
TEL URI with MSISDN FORMAT: ASCII		Applicable		Applicable
Examples: tel:+1-919-460-5500;phone-context=example.com tel:+19258889999 tel:19195551212				
NAI with IMSI/MSISDN Format: ASCII	Applicable	Applicable	Applicable	Applicable
Examples: 123456789012345@xyz.com 123456789012345 31148099995555@ims.mnc480.mcc311.3gppnetwork.org 631115099995555@xyz.com 631115099995555@ims.mnc015.mcc311.3gppnetwork.org				
NAI Format: ASCII Example: handy.manny@xyz.com			Applicable	Applicable

Routing Based on IMSI/MSISDN Prefix Lookup

If configured, RBAR will perform prefix-based lookups after the full address lookup is performed. The prefix and range based lookup will only be performed if the full address lookup does not find a match and can be enabled by the operator for a combination of Application-Id, Command-Code and Routing Entity Type.

If a match is found in the prefix database, that RBAR application will populate the Destination-Host AVP and/or the Destination-Realm AVP based on configuration settings (similar to the full address lookups).

If a match is not found in the prefix database, then RBAR will perform the routing exception handling procedure.

The IMSI/MSISDN Prefix and Range lookup can be enabled or disabled on a system wide basis.

Identifying IMSIs and MSISDNs

In certain Diameter messages over the Cx interface (and possibly over the Sh interface), certain AVPs that typically carry an IMSI sometimes can carry an MSISDN.

Address resolution applications like Full Address Based Resolution (FABR) and Range Based Address Resolution (RBAR) need to categorize User Identities (digit strings) decoded from the Diameter Request AVPs as either MSISDN or IMSI, to allow looking up the User Identity in the appropriate lookup table.

Most of the time, these applications can clearly categorize the decoded User Identity based on:

- The configured Routing Entity Type
- The contents of the AVP

For instance, if the User Identity has been decoded from a SIP URI that has a "+" sign before the digits (such as sig:+1-919-460-5500@oracle.com), it can be directly categorized as an MSISDN.

- The number of digits in the User Identity

In certain cases, none of these methods allow a clear categorization (for example, if the number of digits needs to be used and the received number of digits are applicable to both IMSIs and MSISDNs, and thus leads to an ambiguous determination; or if there is no "+" sign before the digits).

If RBAR has been configured to decode an IMPU/MSISDN from a User Identity (digit string) but cannot determine whether the user identity is an IMSI or an MSISDN based on digit analysis, a tie-breaker is needed to properly categorize the User Identity.

If the Routing Entity Type is IMPU, the User Identity extracted results in only digits, and the length of the digits in the User Identity falls within an overlap digits range of MSISDN and IMSI (see [Figure 2: IMSI/MSISDN Overlap Range Scenario](#)), the following logic can be used to determine if the User Identity is an IMSI or MSISDN.

- RBAR extracts the first 5 or 6 digits of the User Identity and compares them against a list of configured 5- or 6-digit MCC-MNC combinations.

The **Diameter Common > Network Identifiers > MCCMNC** GUI pages can be used to configure up to 2500 distinct combinations of Mobile Country Code (MCC) and Mobile Network Code (MNC). (Refer to the "MCCMNC Configuration" section of the *Diameter Common User's Guide* and Help for procedures to configure MCC-MNC combinations.)

- If a match occurs, the User Identity is considered as an IMSI. RBAR will bypass the AVP, as RBAR does not support decoding an IMSI from a Routing Entity IMPU or MSISDN.

- If a match does not occur, the User Identity is considered as a MSISDN and used for MSISDN lookup.

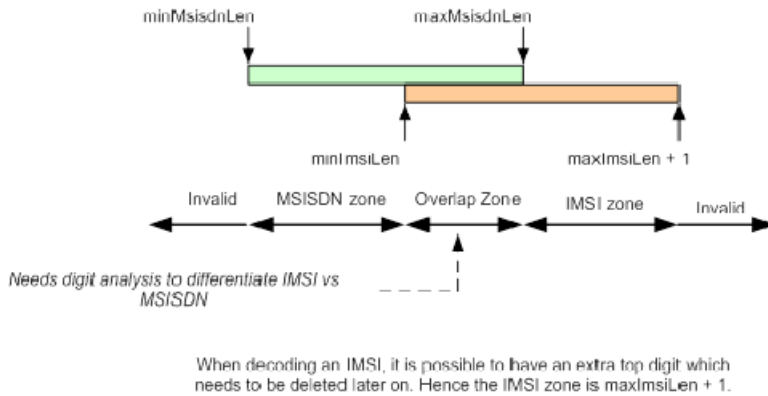


Figure 2: IMSI/MSISDN Overlap Range Scenario

Multiple DSR Application Invocation Prevention

The DSR provides a mechanism for preventing the same DSR Application from being invoked on two different DSR nodes:

- When a DSR Application does not want to be invoked a second time on another DSR, it can insert a DSR AVP called "DSR-Application-Invoked" containing its DSR Application ID.
- When the Diameter Routing Function searches an ART, it ignores any Application Routing Rules associated with a DSR-Application that has inserted the "DSR-Application-Invoked" AVP

DSR-Application-Invoked AVP

In order to prevent the same DSR Application from being invoked on multiple DSRs in a network (and processing the same message twice by the same DSR Application), a DSR Application can (optionally) add to the Request message a DSR-Application-Invoked AVP containing the DSR Application ID.

Table 5: DSR-Application-Invoked AVP

Byte 1	Byte 2	Byte 3	Byte 4
AVP Code = 2468			
Flags=10000000		Length = 16	
Vendor ID = 323			
DSR Application Id = Unsigned32			

This AVP is decoded by the Diameter Routing Function prior to ART processing to prevent multiple invocations of the same DSR Application. Any Application Routing Rule with this DSR Application Id will be ignored by the Diameter Routing Function.

Range Based Address Resolution

This AVP can be repeated in the Request to indicate different DSR Applications, but will be inserted only once per DSR Application.

Insertion of a DSR Application-Invoked AVP is controlled by DSR Application specific configuration, such as:

Allow Subsequent RBAR Invocation - Checked = Yes, Unchecked = No

If checked, subsequent invocation of RBAR on a different DSR node in the network is allowed.

Metadata Recording for Integrated DIH (IDIH)

Integrated DIH (IDIH) can be used to capture detailed information about selected Diameter transactions, and transmit this information to DIH for further analysis.

The Diameter Routing Function and invoked DSR Applications record detailed information about each Diameter transaction - called transaction metadata. Each metadata record describes an important event in the lifetime of a Diameter transaction. Metadata appears in the Trace Transaction Record (TTR) in the order that the metadata-generating events actually occurred. Together, all of the metadata records combine to document the processing performed on the entire transaction, and can later be used to provide diagnostic information when performing troubleshooting. Metadata is recorded to a TTR for each transaction so that, even if the transaction is selected to be sent to DIH at an Answer Troubleshooting Trigger Point (TTP-IA or TTP-EA), the metadata for all of the messages in the transaction will be present.

The functions of IDIH are described in the *Integrated DIH User's Guide* and Help.

RBAR will record the Application-specific metadata events described in [Table 6: RBAR Metadata-Generating Events](#).

Table 6: RBAR Metadata-Generating Events

Event	Type	Scope	Instance Data	When Recorded
Address Resolution Match found	Address Resolution Match	App Data	<ul style="list-style-type: none">• Routing Entity Type (such as "IMSI")• Routing Entity AVP (such as "User Name")• Routing Entity Address (such as "123456789012345")	After RBAR searches and finds a valid Routing Entity address in an ingress Request message using a prioritized set of AVPs associated with the highest priority Routing Entity Type assigned to the Address Resolution order pair (Diameter Application ID, Command Code).

Range Based Address Resolution

Event	Type	Scope	Instance Data	When Recorded
Routing Entity address resolved to a Destination address for request message routing	Destination Resolution	App Data	<ul style="list-style-type: none"> • Destination Routing Table Format (such as "AET") • Destination Realm (such as "xyz.com") • Destination FQDN (such as "hss1.hss.xyz.com") 	When a valid Routing Entity address extracted from an Ingress Request message matches an AET or DRT entry for request message routing.
Routing Exception	Routing Exception	App Data	<ul style="list-style-type: none"> • Routing Exception Type (such as "Unknown Command Code") • Routing Exception Action (such as "Abandon Request") 	After any Routing Exception is encountered.

Chapter 3

Configuration

Topics:

- *Pre-Configuration Activities.....26*
- *RBAR Configuration.....28*
- *Post-Configuration Activities.....52*

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, Diameter Common, and RBAR configuration
- Configure Diameter Common components that are required for 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 Common Configuration for RBAR

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

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

SOAM Diameter Common Configuration

Diameter Common configuration for MCC Ranges Network Identifiers and MP Profile assignment for RBAR is done from the SOAM GUI in a 3-tiered DSR topology.

1. MPs

Select **Diameter Common > MPs > Profile Assignments**, and verify that the correct Database MP Profiles have been assigned for RBAR DA-MPs shown in the **DA-MP** list. If assignments need to be made or changed, use the **Diameter Common > MPs > Profile Assignments** page to assign the correct MP Profiles.

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

2. MCC Ranges

Use the **Diameter Common > Network Identifiers > 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

NOAM Diameter Common Configuration

Diameter Common configuration for MCCMNC and MCCMNC Mapping Network Identifiers for RBAR is done from the NOAM GUI in a 3-tiered DSR topology.

1. Use the **Diameter Common > Network Identifiers > MCCMNC [Insert]** page to configure MCCMNC entries.

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 in a 3-tiered DSR topology.

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. 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.

2. 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.

3. 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.

4. 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 are directed to RBAR.

Set the **Application Name** to **RBAR**.

If the RBAR application and the DM-IWF application will be "chained" so that both of them can process the same Request message, insert or edit a second Application Routing Rule with the Application Name set to DM-IWF.

Set the Priority in each of the two Application Routing Rules to indicate which application will process the message first (the higher priority processes first).

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 7: 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 7: 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 > Configuration > 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 8: Exceptions Configuration Elements describes the fields on the Exceptions View and Edit pages.

Table 8: 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: <ul style="list-style-type: none"> • Unknown Application ID • Unknown Command Code • No valid Routing Entity Address • No Address Match 	N/A

Field	Description	Data Input Notes
Routing Exception Action	Action that RBAR takes associated with the Routing Exception Type	Format: Radio buttons Range: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Selection text box; numeric • Selection pulldown list Range: <ul style="list-style-type: none"> • 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 9: Destinations Configuration Elements describes the fields on the Destinations View, Insert, and Edit pages.

Table 9: Destinations Configuration Elements

Field	Description	Data Input Notes
Name	<p>Unique name of the Destination</p> <p>If a duplicate Name is entered or the Name is not specified, an error message appears.</p>	<p>Format: Alphanumeric and underscore (_)</p> <p>Range: 1–32 characters; cannot start with a digit and must contain at least one alpha</p>
Realm	<p>Realm of the Destination</p> <p>The Realm and Fully Qualified Domain Name cannot both be empty; otherwise, an error message appears.</p>	<p>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.</p>
Fully Qualified Domain Name	<p>Unique Fully Qualified Domain Name of the Destination</p> <p>If a duplicate FQDN is entered, an error message appears.</p> <p>The Fully Qualified Domain Name and Realm cannot both be empty; otherwise, an error message appears.</p>	<p>Range: A valid FQDN or Realm. A label consists of up to 63 characters and a Realm or FQDN up to 255 characters</p>
Allow Subsequent RBAR invocation	<p>Enables the subsequent invocation of RBAR on a different DSR node in the network, when RBAR resolves to this destination</p> <p>Note: If the System Options Allow Subsequent RBAR Invocation option is checked, then this attribute will be ignored.</p>	<p>Format: Check box</p> <p>Range: Checked, unchecked</p> <p>Default: Checked</p>

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

Table 10: 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: <ul style="list-style-type: none"> • 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 11: 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 11: Addresses Configuration Elements

Field	Description	Data Input Notes
View pages		
Table Name	Address Table name	N/A
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: <ul style="list-style-type: none"> • IMSI • IMSISDN • IMPI • IMPU • IPv4 • IPv6 Prefix

Field	Description	Data Input Notes
		<ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> Routing Entity Address: <ul style="list-style-type: none"> 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 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 <p>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.</p> <p>In addition, trailing zeros (0) can be dropped in this IPv6 address</p>
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.	
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.	

Field	Description	Data Input Notes
		<p>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 : :</p> <ul style="list-style-type: none"> UNSIGNED16: Hexadecimal value; valid alphanumeric characters (0-9, A-F, a-f); for example: 512, 20, 40, AA, 50A, FFFF
IPv6 Prefix length	<p>Prefix length of an IPv6-prefix address; specifies how many of the leftmost contiguous bits of the address comprise the prefix.</p> <p>This field is enabled and required when IPv6 Prefix is selected as Routing Entity Type.</p>	<p>Format: Text box; numeric</p> <p>Range: 1–128</p>
Destination	Destination of the Address	<p>Format: Pulldown list</p> <p>Range: Available user-configured destinations</p>

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 12: 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 12: 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		

Field	Description	Data Input Notes
Routing Entity Type	<p>Routing Entity type</p> <p>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.</p> <p>If the Routing Entity Type is not specified for the Primary Routing Entity, an error message appears.</p>	<p>Format: Pulldown list</p> <p>Range:</p> <ul style="list-style-type: none"> • IMSI • MSISDN • IMPI • IMPU • IPv4 • IPv6 Prefix • UNSIGNED16
Primary AVP	<p>Primary AVP used for extracting the Routing Entity address</p> <p>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.</p> <p>If Primary AVP is not selected for the Primary Routing Entity, an error message appears.</p>	<p>Format: Pulldown list</p> <p>Range:</p> <ul style="list-style-type: none"> • User Identity Routing Entity Type: <ul style="list-style-type: none"> • Public Identity • ServiceInfo.Subscription-Id(0) • ServiceInfo.Subscription-Id(1) • ServiceInfo.Subscription-Id(2) • ServiceInfo.Subscription-Id(3) • ServiceInfo.Subscription-Id(4) • 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
Secondary AVP	<p>Secondary AVP used for extracting the Routing Entity address</p> <p>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.</p> <p>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.</p>	
Address Table Name	<p>Address Table for this Routing Entity Type</p> <p>If Address Table Name is not selected for the Primary Routing Entity, an error message appears.</p>	<p>Format: Pulldown list</p> <p>Range: Available configured Address Table names</p>

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 13: System Options Elements describes the fields on the System Options page.

Table 13: System Options Elements

Field	Description	Data Input Notes
IMPU URI Local Number Enabled	<p>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 "+".</p> <p>If checked, both Local and Global Numbers are valid addresses for IMPU decoded from Diameter Requests.</p> <p>If unchecked, only Global Numbers are valid addresses.</p>	<p>Format: Check box</p> <p>Range: Checked, unchecked</p> <p>Default: Unchecked</p>
ASCII Excluded Digits	<p>List of ASCII characters to ignore while parsing digits from a raw AVP data field of AVP Type UTF8String.</p> <p>If an invalid character is entered, an error message appears.</p>	<p>Format: Text boxes</p> <p>Range: ASCII-printable characters except "%"</p>
Exclude Space	<p>Defines whether ASCII character space is ignored while parsing digits from a raw AVP data field of AVP Type UTF8String</p> <p>If checked, ASCII character space is ignored.</p> <p>If not checked, ASCII character space is not ignored.</p>	<p>Format: Check box</p> <p>Range: Checked, unchecked</p> <p>Default: Unchecked</p>

Field	Description	Data Input Notes
TBCD Excluded Digits	<p>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</p> <p>If checked, character is ignored.</p> <p>If not checked, character is not ignored.</p>	<p>Format: Check boxes</p> <p>Range: Checked, unchecked for each option: *(0010), #(1011), a(1100), b(1101), c(1110)</p> <p>Default: Unchecked</p>
Allow Subsequent RBAR Invocation	<p>Enables the subsequent invocation of RBAR on a different DSR node in the network</p> <p>If checked, this setting overrides the Allow Subsequent RBAR Invocation attribute in Destination.</p>	<p>Format: Check box</p> <p>Range: Checked, unchecked</p> <p>Default: Unchecked</p>
Remove Destination-Host	<p>If checked, RBAR deletes any instance of "Destination-Host" AVPs in the message when performing "Realm only" resolution.</p>	<p>Format: Check box</p> <p>Range: Checked, unchecked</p> <p>Default: Unchecked</p>
Realm	<p>Value to be placed in the Origin-Realm AVP of the Answer message generated by RBAR</p> <p>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.</p> <p>If not configured, the local node Realm for the egress connection is used to populate Origin-Realm AVP.</p>	<p>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.</p>
Fully Qualified Domain Name	<p>Value to be placed in the Origin-Host AVP of the Answer message generated by RBAR</p> <p>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.</p> <p>If not configured, the local node FQDN for the egress connection is used to populate the Origin-Host AVP.</p>	<p>Range: A valid Realm or FQDN. A label consists up to 63 characters and a Realm or FQDN up to 255 characters</p>
Resource Exhaustion Result-Code	<p>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</p>	<p>Format:</p> <ul style="list-style-type: none"> • Selection text box; numeric

Field	Description	Data Input Notes
	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.	<ul style="list-style-type: none"> • Selection pulldown list Range: <ul style="list-style-type: none"> • 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
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: <ul style="list-style-type: none"> • 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.	Format: <ul style="list-style-type: none"> • Selection Text box; numeric

Field	Description	Data Input Notes
	<p>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.</p> <p>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.</p>	<ul style="list-style-type: none"> Selection pulldown list <p>Range:</p> <ul style="list-style-type: none"> Selection box: 1000–5999 Pulldown list: available Code values <p>Default: 3002</p>
Application Unavailable Error Message	<p>Error-Message AVP value to be returned in an Answer message when a message is not successfully routed because RBAR is not available.</p> <p>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.</p>	<p>Format: Alphanumeric, underscore (_), and period (.)</p> <p>Range: 0–64 characters</p> <p>Default: RBAR Unavailable</p>
Application Unavailable Vendor-Id	<p>Vendor-Id AVP value to be returned in an Answer message when a message is not successfully routed because RBAR is not available.</p> <p>A vendor-Id must be entered if the Send Answer with Experimental Result-Code AVP option is selected as the Application Unavailable Action.</p>	<p>Format: Text box; numeric</p> <p>Range: 1–4294967295</p>

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 Common User's Guide*,
- **Help > Diameter Common > DSR Bulk Import**
- **Help > Diameter Common > 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, PDRA, GLA, MAPIWF, or CPA and SBR DSR Applications; IPFE; and the Diameter components). "Diameter" includes Diameter Configuration components and Diameter Common Network Identifiers and MPs 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 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 Common User's Guide* or the **Diameter Common > 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.

Chapter 4

Maintenance

Topics:

- [Overview.....56](#)

This section describes maintenance functions and information that can be used with the RBAR application.

Overview

The RBAR application has no maintenance GUI pages of its own. The following Diameter > Maintenance GUI pages provide functions and information that can be used with the RBAR application:

- The **Diameter > Maintenance > Applications** page displays RBAR status information including Admin State, Operational Status, and Operational Reason. The page also provides functions to enable and disable the application. Refer to the *Diameter User Guide* and Help for explanations of the page and the status information.
- The **Diameter > Maintenance > DA-MPs** page displays status and connectivity information for the DA-MP that is running the RBAR application. Refer to the *Diameter User Guide* and Help for explanations of the page and the status information.

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.

N

NOAM

Network Operations, Administration, and Maintenance

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.

Policy DRA

Policy Diameter Relay Agent. A scalable, geo-diverse DSR application that creates a binding

P

between a subscriber and a PCRF, and routes all policy messages for a given subscriber to the PCRF that currently hosts that subscriber's policy rules. Policy DRA is capable of performing Topology Hiding to hide the PCRF from the Policy Client.

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

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

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.