Oracle® Communications Diameter Signaling Router

Diameter Mediation User's Guide

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Oracle Communications Diameter Signaling Router Diameter Mediation User's Guide

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Chapter 1

Introduction

Topics:

This chapter contains an overview of *Diameter Mediation*. The contents include sections on the scope, audience, and organization of the documentation, and how to contact Oracle for assistance.

Overview

The *Diameter Mediation* manual provides information about how to use the Mediation GUI.

The manual provides the following types of information:

- Creation and modification of Rule Templates
- Provision rules and data in Rule Sets

Scope and Audience

The Diameter Mediation feature can make the routable decisions to end the reply, drop the message or set the destination-realm.

This manual contains procedures for performing the creation and modification of Rule Templates tasks using the Mediation GUI.

Diameter Mediation helps to solve interoperability issues by using rules to manipulate header parts and Attribute-Value Pairs (AVPs) in an incoming routable message and peer to peer messages, when data in the message matches some specified conditions at a specified point of message processing.

The Administrator privileges can be deactivated later, so that the Rule Templates folder does not appear under the Mediation folder. This prevents unauthorized modification of the created Rule Templates in the system.

Manual Organization

This document is organized into the following chapters:

- *Introduction* contains general information about the Mediation help documentation, the organization of this manual, and how to get technical assistance.
- *User Interface Introduction* describes the organization and usage of the application user interface. In it you can find information about how the interface options are organized, how to use widgets and buttons, and how filtering and other page display options work.
- *Diameter Mediation* contains information about how to use Diameter Mediation to solve interoperability problems by creating rules to manipulate header parts and Attribute-Value Pairs (AVPs) in incoming routed messages.

Documentation Admonishments

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

Table 1: Admonishments

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

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 Help Center (OHC) site. See *Locate Product Documentation on the Oracle Help Center Site* for more information.

Locate Product Documentation on the Oracle Help Center Site

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

1. Access the Oracle Help Center site at *http://docs.oracle.com*.
2. Click **`Industries`**.
3. Under the Oracle Communications subheading, click the **`Oracle Communications documentation`** link.
   The Communications Documentation page appears. Most products covered by these documentation sets will appear under the headings “Network Session Delivery and Control Infrastructure” or “Platforms.”
4. Click on your Product and then the Release Number.
   A list of the entire documentation set for the selected product and release appears.

5. To download a file to your location, right-click the **PDF** link, select **Save target as** (or similar command based on your browser), and save to a local folder.

Customer Training

Oracle University offers training for service providers and enterprises. Visit our web site to view, and register for, Oracle Communications training:

http://education.oracle.com/communication

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

www.oracle.com/education/contacts

My Oracle Support (MOS)

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

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

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

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

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

Emergency Response

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

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

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

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

Chapter 2

User Interface Introduction

Topics:

This section describes the organization and usage of the application's user interface. In it you can find information about how the interface options are organized, how to use widgets and buttons, and how filtering and other page display options work.

User Interface Organization

The user interface is the central point of user interaction within an application. It is a Web-based graphical user interface (GUI) that enables remote user access over the network to an application and its functions.

The core framework presents a common set of Main Menu options that serve various applications. The common Main Menu options are:

- Administration
- Configuration
- Alarm & Events
- Security Log
- Status & Manage
- Measurements
- Help
- Legal Notices
- Logout

Applications, such as DSR, build upon this framework to present features and functions. For example, the DSR Network OAM GUI may present the following Main Menu options in addition to the common options:

- Communication Agent
- Diameter Common
- Diameter
- Policy and Charging
- MAP-Diameter IWF
- SBR
- RADIUS

The DSR System OAM GUI may present even more Main Menu options as listed below. The end result is a flexible menu structure that changes according to the application needs and features activated.

- Transport Manager
- SS7/Sigtran
- RBAR
- FABR
- IPFE
- GLA
- Policy and Charging
- MAP-Diameter IWF
- SBR
- RADIUS
- Mediation

Note that the DSR System OAM Main Menu options differ from the Network OAM options. Some Main Menu options are configurable from the DSR Network OAM server and view-only from the System OAM server. This remains true for other applications.

User Interface Elements

Table 2: User Interface elements describes elements of the user interface.

Table 2: User Interface elements

Element	Location	Function
Identification Banner	Top bar across the web page	Displays the company name, product name and version, and the alarm panel.
Session Banner	Next bar across the top of the web page	The left side of the banner just above the Main Menu provides the following session information: • The name of the machine to which the user is connected, and whether the user is connected via the VIP or directly to the machine. • The HA state of the machine to which the user is connected. • The role of the machine to which the user is connected. The right side of the banner: • Shows the user name of the currently logged-in user. • Provides a link to log out of the GUI.
Main Menu	Left side of screen, under banners	A tree-structured menu of all operations that can be performed through the user interface. The plus character (+) indicates a menu item contains subfolders. • To display submenu items, click the plus character, the folder, or anywhere on the same line. • To select a menu item that does not have submenu items, click on the menu item text or its associated symbol.
Work Area	Right side of panel under status	Consists of three sections: Page Title Area, Page Control Area (optional), and Page Area. • Page Title Area: Occupies the top of the work area. It displays the title of the current page being displayed, date and time, and includes a link to context-sensitive help. • Page Control Area: Located below the Page Title Area, this area shows controls for the Page Area (this area is optional). When available as an option, filter controls display in this area. The Page Control Area contains the optional layout element toolbar, which displays different elements depending on which GUI page is selected. For more information, see *Optional Layout Element Toolbar*. • Page Area: Occupies the bottom of the work area. This area is used for all types of operations. It displays all options, status, data, file, and query screens. Information

Element	Location	Function
		or error messages are displayed in a message box at the top of this section. A horizontal and/or vertical scroll bar is provided when the displayed information exceeds the page area of the screen. When a user first logs in, this area displays the application user interface page. The page displays a user-defined welcome message. To customize the message, see *Customizing the Login Message*.

Main Menu Options

Table 3: Main Menu Options describes all main menu user interface options.

Note: The menu options can differ according to the permissions assigned to a user's log-in account. For example, the Administration menu options do not appear on the screen of a user who does not have administrative privileges.

Note: Some menu items are configurable only on the Network OAM and view-only on the System OAM; and some menu options are configurable only on the System OAM.

Note: Some features do not appear in the main menu until the features are activated.

Table 3: Main Menu Options

Menu Item	Function
Administration	The Administration menu allows the user to: • General Options. Configure options such as password history and expiration, login message, welcome message, and the number of failed login attempts before an account is disabled • Set up and manage user accounts • Configure group permissions • View session information • Manage sign-on certificates • Authorize IP addresses to access the user interface • Configure SFTP user information • View the software versions report • Upgrade management including backup and reporting • Authenticate LDAP servers • Configure SNMP trapping services • Configure an export server • Configure DNS elements
Configuration	On the NOAM, allows the user to configure: • Network Elements • Network Devices • Network Routes

Menu Item	Function
	• Services • Servers • Server Groups • Resource Domains • Places • Place Associations • Interface and Port DSCP
Alarms and Events	Allows the user to view: • Active alarms and events • Alarm and event history • Trap log
Security Log	Allows the user to view, export, and generate reports from security log history.
Status & Manage	Allows the user to monitor the individual and collective status of Network Elements, Servers, HA functions, Databases, KPIs, system Processes, and Tasks. The user can perform actions required for server maintenance, database management, data, and ISO file management.
Measurements	Allows the user to view and export measurement data.
Transport Manager (optional)	On the SOAM, allows the user to configure adjacent nodes, configuration sets, or transports. A maintenance option allows the user to perform enable, disable, and block actions on the transport entries.
Communication Agent (optional)	Allows the user to configure Remote Servers, Connection Groups, and Routed Services. The user can perform actions to enable, disable, and block connections. Also allows the user to monitor the status of Connections, Routed Services, and HA Services.
SS7/Sigtran (optional)	On the SOAM, allows the user to configure various users, groups, remote signaling points, links, and other items associated with SS7/Sigtran; perform maintenance and troubleshooting activities; and provides a command line interface for bulk loading SS7 configuration data.
Diameter Common (optional)	Allows the user to view or configure: • Dashboard, configure on the NOAM; view on both OAMs • Network Identifiers on the SOAM - MCC Ranges • Network Identifiers on the NOAM - MCCMNC and MCCMNC Mapping • MPs (on the SOAM) - editable Profile parameters and Profile Assignments The DSR Bulk Import and Export functions are available on both OAMs for the data configured on that OAM.
Diameter (optional)	Allows the user to configure, modify, and monitor Diameter routing: • On the NOAMP, Diameter Topology Hiding and Egress Throttle List configuration

Menu Item	Function
	• On the SOAM, Diameter Configuration, Maintenance, Reports, Troubleshooting with IDIH, AVP Dictionary, and Diameter Mediation configuration
RBAR (Range-Based Address Resolution) (optional)	Allows the user to configure the following Range-Based Address Resolution (RBAR) settings: • Applications • Exceptions • Destinations • Address Tables • Addresses • Address Resolutions • System Options This is accessible from the SOAM only.
FABR (Full Address Based Resolution) (optional)	Allows the user to configure the following Full Address Based Resolution (FABR) settings: • Applications • Exceptions • Default Destinations • Address Resolutions • System Options This is accessible from the SOAM only.

Policy and Charging (optional)	On the NOAMP, allows the user to perform configuration tasks, edit options, and view elements for:
	• General Options
	• Access Point Names
	• Policy DRA
	  • PCRF Pools
	  • PCRF Sub-Pool Selection Rules
	  • Network-Wide Options
	• Online Charging DRA
	  • OCS Session State
	  • Realms
	  • Network-Wide Options
	• Alarm Settings
	• Congestion Options
	Additionally on the NOAMP, users are allowed to perform maintenance tasks, edit options, and view elements for:
	• Maintenance
	  • SBR Database Status

Menu Item	Function

	• SBR Status
	• SBR Database Reconfiguration Status
	• Policy Database Query
	
	On the SOAM, allows the user to perform configuration tasks, edit options, and view elements for:
	• General Options
	• Access Point Names
	• Policy DRA
	  • PCRFs
	  • Binding Key Priority
	  • PCRF Pools
	  • PCRF Pool to PRT Mapping
	  • PCRF Sub-Pool Selection Rules
	  • Policy Clients
	  • Suspect Binding Removal Rules
	  • Site Options
	• Online Charging DRA
	  • OCSs
	  • CTFs
	  • OCS Session State
	  • Realms
	• Error Codes
	• Alarm Settings
	• Congestion Options

Gateway Location Application (optional)	On the SOAM, allows the user to perform configuration tasks, edit options, and view elements for: • Exceptions • Options GLA can deploy with Policy DRA (in the same DA-MP or a separate DA-MP).
IPFE (optional)	Allows the user to configure IP Front End (IPFE) options and IP List TSAs. This is accessible from the SOAM server only.
MAP-Diameter Interworking (optional)	On the SOAM, allows the user to perform configuration tasks, edit options, and view elements for the DM-IWF DSR Application: • DM-IWF Options • Diameter Exception On the NOAMP, allows the user to perform configuration tasks, edit options, and view elements for the MD-IWF SS7 Application:

Menu Item	Function
	• MD-IWF Options • Diameter Realm • Diameter Identity GTA • GTA Range to PC • MAP Exception • CCNDC Mapping
RADIUS (optional)	Allows the user to performance configuration tasks, edit system options, and view elements for: • Network Options • Message Authenticator Configuration Sets • Shared Secret Configuration Sets • Ingress Status Server Configuration Sets • Message Conversion Configuration Sets • NAS Node

SBR (optional)	Allows the user to performance configuration tasks, edit system options, and view elements for:
	• SBR Databases
	• SBR Database Resizing Plans
	• SBR Data Migration Plans
	Additionally, on the NOAMP, users are allowed to perform maintenance tasks, edit options, and view elements for:
	• Maintenance
	  • SBR Database Status
	  • SBR Status
	  • SBR Database Reconfiguration Status

Help	Launches the Help system for the user interface
Legal Notices	Product Disclaimers and Notices
Logout	Allows the user to log out of the user interface

Missing Main Menu options

Permissions determine which Main Menu options are visible to users. Permissions are defined through the **Group Administration** page. The default group, **admin**, is permitted access to all GUI options and functionality. Additionally, members of the **admin** group set permissions for other users.

Main Menu options vary according to the group permissions assigned to a user's account. Depending on your user permissions, some menu options may be missing from the Main Menu. For example, Administration menu options do not appear on your screen if you do not have administrative

permissions. For more information about user permissions, see *Group Administration* in the OAM section of the online help, or contact your system administrator.

Common Graphical User Interface Widgets

Common controls allow you to easily navigate through the system. The location of the controls remains static for all pages that use the controls. For example, after you become familiar with the location of the display filter, you no longer need to search for the control on subsequent pages because the location is static.

Supported Browsers

This application supports the use of Microsoft® Internet Explorer 8.0, 9.0, or 10.0.

System Login Page

Access to the user interface begins at the System Login page. The System Login page allows users to log in with a username and password and provides the option of changing the password upon login. The System Login page also features a date and time stamp reflecting the time the page was last refreshed. Additionally, a customizable login message appears just below the **Log In** button.

The user interface is accessed via HTTPS, a secure form of the HTTP protocol. When accessing a server for the first time, HTTPS examines a web certificate to verify the identity of the server. The configuration of the user interface uses a self-signed web certificate to verify the identity of the server. When the server is first accessed, the supported browser warns the user that the server is using a self-signed certificate. The browser requests confirmation that the server can be trusted. The user is required to confirm the browser request to gain access.

Customizing the Login Message

Before logging in, the **System Login** page appears. You can create a login message that appears just below the **Log In** button on the **System Login** page.

Figure 1: Oracle System Login

1. From the **Main Menu**, select **Administration** > **General Options**.
   The **General Options Administration** page appears.
2. Locate **LoginMessage** in the **Variable** column.
3. Enter the login message text in the **Value** column.
4. Click **OK** or **Apply** to submit the information.
   A status message appears at the top of the Configuration Administration page to inform you if the operation was successful.

The next time you log in to the user interface, the login message text displays.

Accessing the DSR Graphical User Interface

In a DSR, some configuration is done at the NOAM server, while some is done at the SOAM server. Because of this, you will access the DSR graphical user interface (GUI) from two servers. Certificate Management (Single Sign-On) can be configured to simplify accessing the DSR GUI on the NOAM and the SOAM.

For information on configuring Single Sign-On certificates, see **OAM** > **Administration** > **Access Control** > **Certificate Management** in the DSR online help.

After the certificates have been configured, you can log into the DSR GUI on any NOAM or SOAM, and then access the DSR GUI on other servers (NOAM or other SOAMs) without having to re-enter your login credentials.

1. In the browser URL field, enter the fully qualified hostname of the NOAM server, for example https://dsr-no.yourcompany.com.

   When using Single Sign-On, you cannot use the IP address of the server.
2. When prompted by the browser, confirm that the server can be trusted.

   The System Login page appears.
3. Enter the Username and Password for your account.

   The DSR GUI for the NOAM appears.
4. To access the DSR GUI for the SOAM, open another browser window and enter the fully qualified hostname of the SOAM.

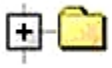
   The DSR GUI for the SOAM appears

You can toggle between the DSR GUI on the NOAM and the DSR GUI on the SOAM as you perform configuration tasks.

Main Menu Icons

This table describes the icons used in the **Main Menu**.

Table 4: Main Menu icons

Icon	Name	Description
	Folder	Contains a group of operations. If the folder is expanded by clicking the plus (+) sign, all available operations and sub-folders are displayed. Clicking the minus (-) collapses the folder.
	Config File	Contains operations in an Options page.
	File with Magnifying Glass	Contains operations in a Status View page.
	File	Contains operations in a Data View page.
	Multiple Files	Contains operations in a File View page.
	File with Question Mark	Contains operations in a Query page.

Icon	Name	Description
	User	Contains operations related to users.
	Group	Contains operations related to groups.
	Help	Launches the Online Help.
	Logout	Logs the user out of the user interface.

Work Area Displays

In the user interface, tables, forms, tabbed pages, and reports are the most common formats.

Note: Screen shots are provided for reference only and may not exactly match a specific application's GUI.

Tables

Paginated tables describe the total number of records being displayed at the beginning and end of the table. They provide optional pagination with **First | Prev | Next | Last** links at both the beginning and end of this table type. Paginated tables also contain action links on the beginning and end of each row. For more information on action links and other page controls, see *Page Controls*.

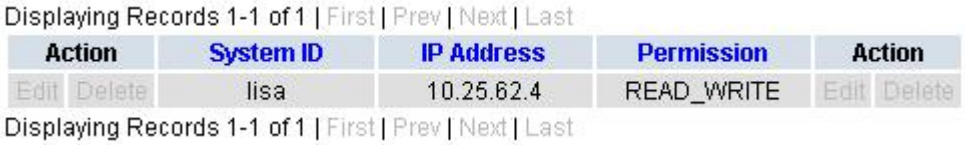
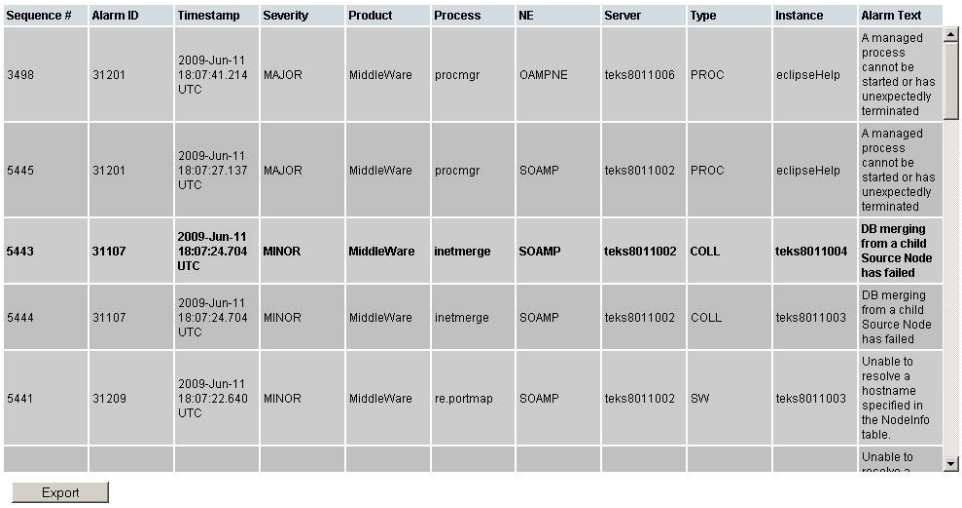


Figure 2: Paginated table

Scrollable tables display all of the records on a single page. The scroll bar, located on the right side of the table, allows you to view all records in the table. Scrollable tables also provide action buttons that operate on selected rows. For more information on buttons and other page controls, see *Page Controls*.



Sequence #	Alarm ID	Timestamp	Severity	Product	Process	NE	Server	Type	Instance	Alarm Text
3498	31201	2009-Jun-11 18:07:41.214 UTC	MAJOR	MiddleWare	procmgr	OAMPNE	teks8011006	PROC	eclipseHelp	A managed process cannot be started or has unexpectedly terminated
5445	31201	2009-Jun-11 18:07:27.137 UTC	MAJOR	MiddleWare	procmgr	SOAMP	teks8011002	PROC	eclipseHelp	A managed process cannot be started or has unexpectedly terminated
5443	**31107**	**2009-Jun-11 18:07:24.704 UTC**	**MINOR**	**MiddleWare**	**inetmerge**	**SOAMP**	**teks8011002**	**COLL**	**teks8011004**	**DB merging from a child Source Node has failed**
5444	31107	2009-Jun-11 18:07:24.704 UTC	MINOR	MiddleWare	inetmerge	SOAMP	teks8011002	COLL	teks8011003	DB merging from a child Source Node has failed
5441	31209	2009-Jun-11 18:07:22.640 UTC	MINOR	MiddleWare	re.portmap	SOAMP	teks8011002	SW	teks8011003	Unable to resolve a hostname specified in the NodeInfo table.
										Unable to

Export

Figure 3: Scrollable table

Note: Multiple rows can be selected in a scrollable table. Add rows one at a time using CTRL-click. Add a span of rows using SHIFT-click.

Forms

Forms are pages on which data can be entered. Forms are typically used for configuration. Forms contain fields and may also contain a combination of pulldown lists, buttons, and links.

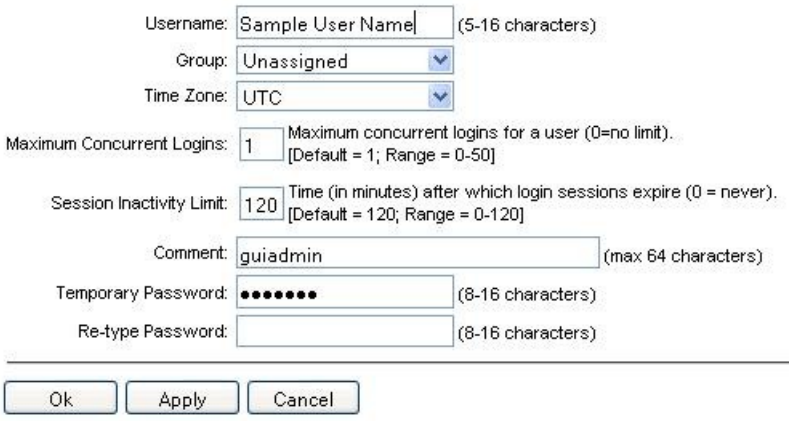
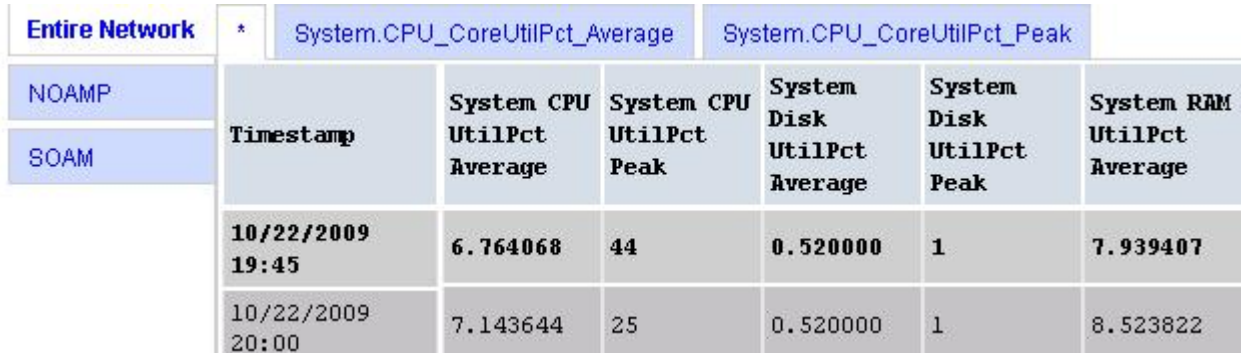


Figure 4: Form page

Tabbed pages

Tabbed pages provide collections of data in selectable tabs. Click on a tab to see the relevant data on that tab. Tabbed pages also group Retrieve, Add, Update, and Delete options on one page. Click on the relevant tab for the task you want to perform and the appropriate fields populate on the page. Retrieve is always the default for tabbed pages.



Timestamp	System CPU UtilPct Average	System CPU UtilPct Peak	System Disk UtilPct Average	System Disk UtilPct Peak	System RAM UtilPct Average
10/22/2009 19:45	6.764068	44	0.520000	1	7.939407
10/22/2009 20:00	7.143644	25	0.520000	1	8.523822

Figure 5: Tabbed pages

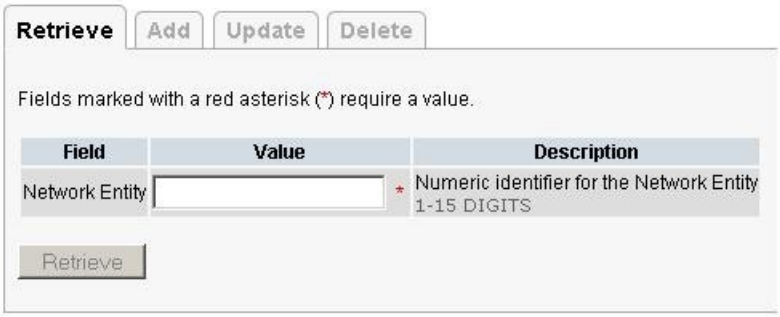


Figure 6: Tabbed pages

Reports

Reports provide a formatted display of information. Reports are generated from data tables by clicking the **Report** button. Reports can be viewed directly on the user interface, or they can be printed. Reports can also be saved to a text file.

```
================================================================================

User Account Usage Report

================================================================================

Report Generated: Fri Jun 19 19:30:55 2009 UTC
From: Unknown Network OAM&P on host teks5001701
Report Version: 1.0
User: guiadmin

--------------------------------------------------------------------------------

Username          Date of Last Login    Days Since Last Login   Account Status
----------------  --------------------  ----------------------  ---------------
guiadmin          2009-06-19 19:00:17   0                       enabled

--------------------------------------------------------------------------------

End of User Account Usage Report

================================================================================
```

Figure 7: Report output

Customizing the Splash Page Welcome Message

When you first log in to the user interface, the splash page appears. Located in the center of the main work area is a customizable welcome message. Use this procedure to create a message suitable for your needs.

1. From the **Main Menu**, select **Administration** > **General Options**.

   The **General Options** page appears.

2. Locate **WelcomeMessage** in the **Variable** column.
3. Enter the desired welcome message text in the **Value** column.
4. Click **OK** to save the change or **Cancel** to undo the change and return the field to the previously saved value.
   A status message appears at the top of the page to inform you if the operation was successful.

The next time you log in to the user interface, the new welcome message text is displayed.

Column Headers (Sorting)

You can sort a table by a column by clicking the column header. However, sorting is not necessarily available on every column. Sorting does not affect filtering.

When you click the header of a column that the table can be sorted by, an indicator appears in the column header showing the direction of the sort. See *Figure 8: Sorting a Table by Column Header*. Clicking the column header again reverses the direction of the sort.

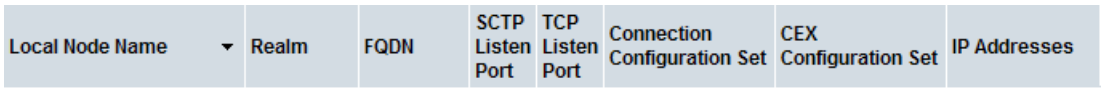


Figure 8: Sorting a Table by Column Header

Page Controls

User interface pages contain controls, such as buttons and links, that perform specified functions. The functions are described by the text of the links and buttons.

Note: Disabled buttons are grayed out. Buttons that are irrelevant to the selection or current system state, or which represent unauthorized actions as defined in **Group Administration**, are disabled. For example, **Delete** is disabled for users without Global Data Delete permission. Buttons are also disabled if, for example, multiple servers are selected for an action that can only be performed on a single server at a time.

Table 5: Example Action buttons contains examples of Action buttons.

Table 5: Example Action buttons

Action button	Function
Insert	Inserts data into a table.
Edit	Edits data within a table.

Action button	Function
Delete	Deletes data from table.
Change	Changes the status of a managed object.

Some Action buttons take you to another page.

Submit buttons, described in *Table 6: Submit buttons*, are used to submit information to the server. The buttons are located in the page area and accompanied by a table in which you can enter information. The Submit buttons, except for **Cancel**, are disabled until you enter some data or select a value for all mandatory fields.

Table 6: Submit buttons

Submit button	Function
OK	Submits the information to the server, and if successful, returns to the View page for that table.
Apply	Submits the information to the server, and if successful, remains on the current page so that you can enter additional data.
Cancel	Returns to the View page for the table without submitting any information to the server.

Clear Field Control

The clear field control allows you to clear the value from a pulldown list. The clear field control is available only on some pulldown fields.

Click the **X** next to a pulldown list to clear the field.

Figure 9: Clear Field Control X

Optional Layout Element Toolbar

The optional layout element toolbar appears in the Page Control Area of the GUI.

Figure 10: Optional Layout Element Toolbar

The toolbar displays different elements depending on which GUI page is selected. The elements of the toolbar that can appear include:

- Filter – Allows you to filter data in a table.
- Errors – Displays errors associated with the work area.
- Info – Displays information messages associated with the work area.
- Status – Displays short status updates associated with the main work area.

- Warning – Displays warnings associated with the work area.

Notifications

Some messages require immediate attention, such as errors and status items. When new errors occur, the Errors element opens automatically with information about the error. Similarly, when new status items are added, the Status element opens. If you close an automatically opened element, the element stays closed until a new, unacknowledged item is added.

Figure 11: Automatic Error Notification

Note: Viewing and closing an error does not clear the Errors element. If you reopen the Errors element, previously viewed errors are still in the list.

When new messages are added to Warning or Info, the styling of the element changes to indicate new messages are available. The styling of the Task element changes when a task changes state (such as, a task begins or ends).

Opening an Element in the Toolbar

Use this procedure to open an element in the optional layout element toolbar.

1. Click the text of the element or the triangle icon to open an element.
   The selected element opens and overlays the work area.
2. Click **X** to close the element display.

Filters

Filters are part of the optional layout element toolbar and appear throughout the GUI in the Page Control Area. For more information about optional layout element toolbar functionality, see *Optional Layout Element Toolbar*.

Filters allow you to limit the data presented in a table and can specify multiple filter criteria. By default, table rows appear unfiltered. Three types of filters are supported, however, not all filtering options are available on every page. The types of filters supported include:

- Network Element – When enabled, the Network Element filter limits the data viewed to a single Network Element.

  Note: Once enabled, the Network Element filter will affect all pages that list or display data relating to the Network Element.

- Collection Interval – When enabled, the collection interval filter limits the data to entries collected in a specified time range.

- Display Filter – The display filter limits the data viewed to data matching the specified criteria.

Once a field is selected, it cannot be selected again. All specified criteria must be met in order for a row to be displayed.

The style or format of filters may vary depending on which GUI pages the filters are displayed. Regardless of appearance, filters of the same type function the same.

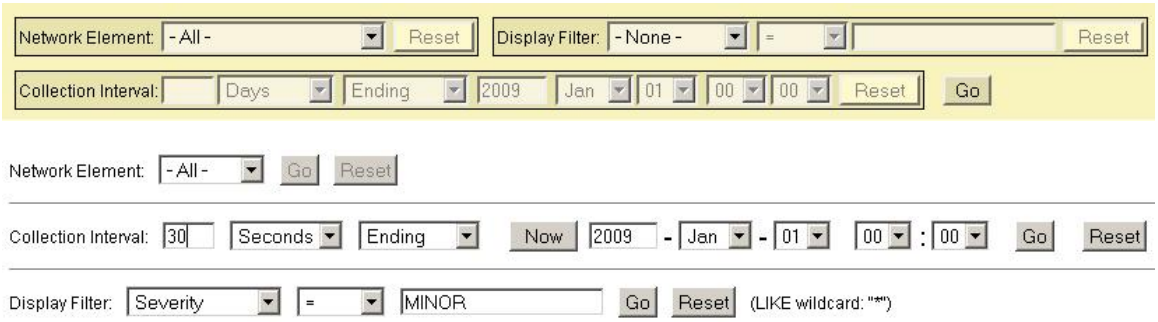


Figure 12: Examples of Filter Styles

Filter Control Elements

This table describes filter control elements of the user interface.

Table 7: Filter Control Elements

Operator	Description
=	Displays an exact match.
!=	Displays all records that do not match the specified filter parameter value.
>	Displays all records with a parameter value that is greater than the specified value.
>=	Displays all records with a parameter value that is greater than or equal to the specified value.
<	Displays all records with a parameter value that is less than the specified value.
<=	Displays all records with a parameter value that is less than or equal to the specified value.
Like	Enables you to use an asterisk (*) as a wildcard as part of the filter parameter value.
Is Null	Displays all records that have a value of **Is Null** in the specified field.

Note: Not all filterable fields support all operators. Only the supported operators will be available for you to select.

Filtering on the Network Element

The global Network Element filter is a special filter that is enabled on a per-user basis. The global Network Element filter allows a user to limit the data viewed to a single Network Element. Once

enabled, the global Network Element filter affects all sub-screens that display data related to Network Elements. This filtering option may not be available on all pages.

1. Click **Filter** in the optional layout element toolbar.
   The filter tool appears.
2. Select a Network Element from the **Network Element** pulldown menu.
3. Click **Go** to filter on the selection, or click **Reset** to clear the selection.

Records are displayed according to the specified criteria.

Filtering on Collection Interval

The Collection Interval filter allows a user to limit the data viewed to a specified time interval. This filtering option may not be available on all pages.

1. Click **Filter** in the optional layout element toolbar.
   The filter tool appears.
2. Enter a duration for the **Collection Interval** filter.
   The duration must be a numeric value.
3. Select a unit of time from the pulldown menu.
   The unit of time can be seconds, minutes, hours, or days.
4. Select **Beginning** or **Ending** from the pulldown menu.
5. Click **Go** to filter on the selection, or click **Reset** to clear the selection.

Records are displayed according to the specified criteria.

Filtering Using the Display Filter

Use this procedure to perform a filtering operation. This procedure assumes you have a data table displayed on your screen. This process is the same for all data tables. However, all filtering operations are not available for all tables.

1. Click **Filter** in the optional layout element toolbar.
   The filter tool appears.
2. Select a field name from the **Display Filter** pulldown menu.
   This selection specifies the field in the table that you want to filter on. The default is **None**, which indicates that you want all available data displayed.
   The selected field name displays in the **Display Filter** field.
3. Select an operator from the operation selector pulldown menu.
   The selected operator appears in the field.
4. Enter a value in the value field.
   This value specifies the data that you want to filter on. For example, if you specify Filter=Severity with the equals (=) operator and a value of MINOR, the table would show only records where Severity=MINOR.
5. For data tables that support compound filtering, click **Add** to add another filter condition. Then repeat steps 2 through 4.

Multiple filter conditions are joined by an AND operator.

6. Click **Go** to filter on the selection, or click **Reset** to clear the selection.

Records are displayed according to the specified criteria.

Pause Updates

Some pages refresh automatically. Updates to these pages can be paused by selecting the **Pause updates** checkbox. Uncheck the **Pause updates** checkbox to resume automatic updates. The **Pause updates** checkbox is available only on some pages.

Max Records Per Page Controls

Max Records Per Page is used to control the maximum number of records displayed in the page area. If a page uses pagination, the value of Max Records Per Page is used. Use this procedure to change the Max Records Per Page.

1. From the **Main Menu**, select **Administration** > **General Options**.

   The **General Options Administration** page appears.

2. Change the value of the **MaxRecordsPerPage** variable.

   Note: Maximum Records Per Page has a range of values from 10 to 100 records. The default value is 20.

3. Click **OK** or **Apply**.

   OK saves the change and returns to the previous page.

   Apply saves the change and remains on the same page.

The maximum number of records displayed is changed.

Chapter 3

Diameter Mediation

Topics:

The **Diameter** > **Mediation** allows you to manage the Mediation feature.

Diameter Mediation helps to solve interoperability issues. The Mediation feature uses rules to manipulate header parts and Attribute-Value Pairs (AVPs) in an incoming routable message, when data in the message matches some specified conditions at a specified point of message processing then actions that are applied to modify the message on the routing decisions. Tasks of the "if condition matches, then do some action" type can be solved in the most efficient way.

Mediation overview

Diameter Mediation helps to solve interoperability issues. Mediation uses rules to manipulate header parts and Attribute-Value Pairs (AVPs) in incoming routable messages and peer to peer messages, when data in the message matches some specified conditions at a specified point of message processing. Tasks of the "if condition matches, then do some action" type can be solved in the most efficient way.

The Diameter Mediation feature can make routable decisions such as a send reply, drop the message or set the destination-realm.

Rule Templates are created to define the **Condition** Sets that must be matched in a message and the **Actions** set that are applied to modify the message on the routing decisions.

- A **Condition** defines a part of the message that is used in the comparison, an operator for the type of comparison, and a type that must match in the message part. Up to five (5) Conditions in the same Rule Template are collectively referred to as a Condition Set; the **Condition Set** are **`ANDed`**, **`ORed`** or apply User specified **`Complex Expression`** in the comparison process.
- An **Action** for example, can add, alter, or delete AVPs; modifying the message header **Version**, **Command-Code**, or **Application-ID** Diameter components. Two or more Actions in a Rule Template are collectively referred to as an Action Set.

After a Rule Template definition is complete, a **Rule Set** can be generated from the Rule Template by moving the rule template to Test or Active state. The data needed for the Condition Sets and the Actions Set is provisioned in the generated Rule Set.

A Mediation rule is an instance of data needed for the execution of Mediation logic. The actual data needed for the Condition Sets and the Actions set is provisioned in one or more rules in the generated Rule Set. All of the rules associated with one Mediation Rule Template are collectively referred to as the Rule Set for the Rule Template. See *Rule Sets*.

Rule Sets can be associated with pre-defined Request or Answer Trigger Points in the message processing logic. When message processing reaches a Trigger point and the Condition Sets in an associated Rule Sets are met, the Action sets for that Rule Set are applied to the message. The changes to the message content can result in modifying the message processing behavior and the routing decision at that **Trigger** point in the processing logic. See *Triggers*.

The available Diameter Mediation Triggers Points are the:

- Diameter Routing Function, which supports RTP1, RTP10, ATP1, ATP10 and RTP11 triggers.
- Diameter Connection Function, which supports CER, CEA, DWR, DWA, DPR and DPA triggers.
- Application Function, which supports RTP4, RTP6, ATP4, and ATP6 triggers.

Diameter Mediation provides a Rule Templates interface, a Rule Sets interface, and other GUI screens:

- The Mediation Administrator can activate and deactivate the feature to prevent unauthorized users to modify the Rule Templates.

  The designated Administrator can perform the following tasks:

  - Add, edit, and delete **Enumeration** types and **Internal Variables** that are used in creating Rule Templates (see *Enumerations* and *Internal Variables*).
  - Create, modify, delete, copy, import, and export Rule Sets (see *Rule Templates*).
  - Add help text to a Rule Template; the help text will be available for the Rule Set that is generated from the Rule Template (see *Rule Templates*).

- Associate **Rule Sets** with **Triggers**, and remove Rule Set associations with Triggers (see *Triggers*).
- Set the **Action Error Handling** property of a Rule Set (see *State and Properties*).
- Change the state of a Rule Template (see *State and Properties*)

  When a Rule Template is being created or modified, it is in the **`Development`** state.

  The Rule Template state can be changed from **`Development`** to **`Test`** to allow its Rule Set to be tested or to allow the Rule Template to be exported.

  The Rule Template state can be changed to **`Active`** to enable use of its generated Rule Set for live traffic.

  The Rule Template state can be changed from **`Test`** or **`Active`** back to **`Development`** to allow modification of the Rule Template (all existing rule provisioning for its associated Rule Sets will be deleted).

- The **Rule Sets** interface is used primarily for the provisioning of rules and actual data in Rule Sets.

  After a **Rule Template** is created and activated, the generation of the Rule Set from the Rule Template creates an entry in the **Rule Sets** GUI folder.

  A user, who is designated as the Administrator with the restricted access to the Mediation Folder cannot access the Rule Templates GUI screen, but can use the **Rule Sets**, **Enumerations**, **Triggers**, **State & Properties Internal Variables** and **Measurements** GUI screens, and other GUI screens to perform the following tasks, but cannot create, modify, copy, or export Rule Templates:

  - Add a rule to a Rule Set, and provision the actual data that is used by the rule in the message matching process (see *Rule Sets*)
  - Import/Export Rules that are provisioned in the rule templates in the "Test" or "Active" State (see *Rule Sets*).
  - Edit and delete rules in Rule Sets (see *Rule Sets*)
  - Delete Rule Sets (see *Rule Sets*)
  - Change the state of a Rule Template (see *State and Properties*)

    Change the Rule Template state to Test for testing its Rule Sets or to Active for enabling its Rule Sets for use with live traffic.

    If the Administrator privileges are deactivated, the Development state cannot be changed.

  - Set the Action Error Handling property of a Rule Set (see *State and Properties*)
  - Enable the Status of Rule Counters to display the Rule Counters (see *State and Properties*).
  - Test a Rule Set

    A Diagnostics Tool is available to test Mediation rules before there is live traffic in the network from the SOAM. The Diagnostics Tool logs the rules applied, Actions taken, and other diagnostics information when a test message is injected into the system. The tool generates traffic and sends Diameter Messages on a test connection. As a test message traverses the system, the application logic generates diagnostics messages at Trigger points. View the diagnostics log reports in the **Diameter > Reports > Diagnostics Tool** GUI. See Reports in the Diameter User's Guide.

  - Associate Rule Sets with Triggers, and remove Rule Set associations with Triggers (see *Triggers*)
  - Import previously exported Rule Templates (see *State and Properties*)

    The state of an imported Rule Template is set to Test by default.

  - View, create, edit and delete the Internal Variables used in the rules (see *Internal Variables*)

- View, create, edit and delete the Enumeration types used in the rules (see *Enumerations*)
- View, create, edit and delete the Vendors-specific AVPs used in Rule Templates (see Vendors in the Diameter User's Guide)

Mediation features

A few examples of Mediation features are the:

- Triggers for a Redirected Request
- Triggered Diameter Message Copy
- Process Decorated NAI Action

Mediation Triggers for a Redirected Request

The system supports request redirection based on the redirect-host and redirect-realm notifications received from a redirect agent.

When the user assigns a template to any DRL Mediation request trigger (RTP1, RTP4, RTP6, RTP10, RTP11) the template can trigger for either the normal request, redirected request or both scenarios.

Mediation Triggered Diameter Message Copy

The Message Copy Action triggers Diameter Message Copy, and specifies the Message Copy Configuration Set (MCCS) that contains the Request/Answer content criteria to be used by the Message Copy function to copy the message to a DAS. The Message Copy Configuration Set specifies a Route List for the DAS. See Configuration in the Diameter User's Guide.

If Message Copy is triggered for the same message from multiple locations, the Message Copy Configuration Set for the latest Message Copy triggering prevails.

In the case of Request re-route due to invalid Result-Code, only the Message Copy Configuration Set that is associated with the Answer that completes the transaction at ATP1 is considered.

The Message Copy is performed after the completion of the original transaction. The copy of the message is not processed by the Mediation Triggering Points.

Mediation Process Decorated NAI Action

Decorated NAIs are used in order to force the routing of request messages through a predefined list of mediating realms.

The Process Decorated NAI action will parse a decorated NAI, if it is present in the request of the "User-Name" AVP. This action performs the following steps:

1. Inspects the User-Name AVP for the presence of Decorated NAI; if not present then the action stops. The request will continue processing.
2. If present, extracts the realm value from the Decorated NAI and populates the Destination-Realm AVP. For more information see RFC 5729 and RFC 4282.
3. Modifies accordingly the User-Name AVP value. For more information see RFC 4282.

The *Figure 13: Example of Processing Decorated NAI* shows an action outcome.

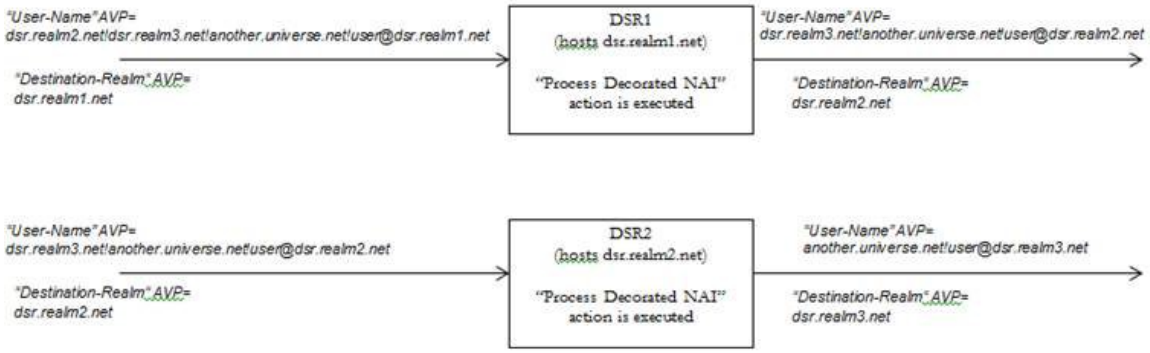


Figure 13: Example of Processing Decorated NAI

Rule Templates

Rule Templates are created by:

- Formulating the **Conditions** against which to match incoming requests or responses.
- Defining the **Actions** that are applied to the message when the Conditions match.

Note: The full-access Administrator privileges must be activated for the Diameter Mediation feature before the Rule Templates GUI screens can be accessed to create and modify Rule Templates.

All **Rule Templates** are listed on the Rule Templates GUI with check boxes by each row. To automatically check all the Rule Templates, check the box by Rule Template Name.

A **Rule Template** is created by configuring Settings, Conditions, and Actions.

Settings

Settings are the main Rule Template properties:

- **Rule Template Name**: A placeholder for meaningful text to describe the purpose of the Rule Template and Rule Set.
- **Message type support**: The type of message processing that is supported by a Rule Template; either a **Request**, an **Answer**, or both. In Diameter Mediation, both **Request** and **Answer** are supported, and the element value cannot be changed.

Conditions

One or more (up to 5) matching **Conditions** can be defined in a **Rule Template**. The expressions are combined into one logical expression with **`ANDed`**, **`ORed`** or **`Complex Expression`** operators, so that the request or response matches the condition set if all of the expressions are true. If no matching expression is defined, the message unconditionally matches.

Each matching expression consists of a left-hand value or operand, an operator, and a right-hand value or operand.

- **Left value**: Allows accessing any part of a message, any information stored by the previous Rule Template, and any information that the application resolves runtime.
- **Operator**: Allows comparison of the Left value and the Right value.

- **Right value**: Allows performing the syntax check for the entered data on the generated **Rule Sets** page.
- **Condition Set**: Allows defined matching expressions to combine into one logical expression to set up multiple Rule Templates with **`ANDed`**, **`ORed`** or **`Complex Expression`** operators.

Conditions can be configured to cause Mediation to use fast database look-ups of the rule data. See *Fast Search*.

Actions

One or more (up to 5) **Actions** indicate what to do when the conditions match (such as modify the part of a message, forward a message, send a reply, insert or remove headers, or set attributes for further processing). Actions implement the mediation of a message.

When the message processing reaches a selected triggering point, the Conditions of the Rule Template are examined for the message. If the Conditions match, Actions are applied to the message. The **Actions** allow manipulation of some particular part of the message, adding or deleting information in the message, forwarding the message to a specific destination, or triggering of Diameter Message Copy to send a copy of the message to a DAS.

The **Actions** to take when a Mediation operation is triggered and its **Condition Set** is matched are defined in the Rule Template. Actions belonging to the same Rule Template form an Action Set. See *Rule Template elements* for the Actions available in Rule Templates.

On the **Diameter > Mediation > Rule Templates** page, you can perform the following actions:

- Filter the list of Rule Template Names to display only the desired Rule Templates.
- Click the **Insert** button.

  The **Diameter Mediation Rule Templates [Insert]** page opens. You can add a new Rule Templates and its values. See *Adding a Rule Template*. If the maximum number of Rule Templates (100) already exist in the system, the **Rule Templates [Insert]** page will not open, and an error message is displayed.

- Click the **Import** button.

  The **Diameter > Mediation > Rule Templates [Import]** page opens. You can import a Rule Template from a location outside the Diameter system, to which the Rule Template was previously exported from Mediation. See *Importing a Rule Template*. If the maximum number of Rule Templates (100) already exist in the system, the **Rule Templates [Import]** page will not open, and an error message is displayed.

- Select a Rule Template Name in the list, and click the **Copy** button.

  The **Diameter > Mediation > Rule Templates [Copy]** page opens. You can change the information for the copied Rule Template to create a new Rule Template. See *Copying a Rule Template*. If the maximum number of Rule Templates (100) already exist in the system, the **Rule Templates [Copy]** page will not open, and an error message is displayed.

- Select a Rule Template Name in the list, and click the **Edit** button.

  The **Diameter > Mediation > Rule Templates [Edit]** page opens. You can edit the selected Rule Template. See *Changing a Rule Template*.

- Select a Rule Template Name in the list, and click the **Delete** button to remove the selected Rule Template. See *Deleting a Rule Template*.
- Select a Rule Template Name in the list, and click the **Export** button.

The **Diameter > Mediation > Rule Templates [Export]** page opens. You can export one or more Rule Template(s) to a location outside of the Diameter system. See *Exporting a Rule Template*.

- Select a Rule Template Name in the list, and click the **Set Help** button.

  The **Diameter > Mediation > Rule Templates [Set Help]** page opens. You can create online help for the selected Rule Template. See *Adding online help to a Rule Template*.

Fast Search

The **Fast Search** option is used to cause Mediation to use fast database lookups. If Fast Search is not used, the values of each condition are checked one-by-one until the first match is found.

The **Fast Search** option appears as the first element for each condition that is defined in the **Conditions** section for a Rule Template. The **Fast Search** option is not editable; it serves only to indicate whether Fast Search will or will not be used for the condition:

All of the conditions with the **Fast Search** option enabled must precede any conditions without Fast Search enabled in the Rule Set list. If any conditions without Fast Search enabled precede conditions with Fast Search enabled, a database lookup could fall back to slow search because of the order of the conditions.

The **Condition Set** layout is the alphabetical order of displaying the conditions on the **Rule Templates** screen. The Condition evaluation order is the order in which the conditions are evaluated. For simple **`ANDed`** or **`ORed`** Condition Sets, the evaluation order matches with the alphabetical order of the layout. For the **`Complex Expressions`**, condition sets are evaluated in the order they appear in the expression from left to right.

The Fast Search value is either the “Yes” (check mark) sign or the “No”(red circle with a red line through it) sign. The fast-search first depends on the content of the condition and then on the condition evaluation order and condition grouping method in the following order:

1. **Fast search** dependency on the operator , right value type and the default value are:
   a. "**yes**" sign if one of the operators "**`==`**", "**`=^^`**", "**`=^`**", "**`=$$`**", "**`=$`**", "**`is within`**", "**`exists`**", "**`does not exist`**", "**`is true`**", "**`is false`**" is selected and the right hand operand type is not "**`xl-value`**"
   b. "**yes**" sign if the default value is fixed regardless of the selected operator and the right value type
   c. "**no**" sign for other case
2. "**Fast search**" dependency on the condition evaluation order and condition grouping method:
   - **Conditions** are **`ANDed`**:
     - "**yes**" sign if the condition is the first on the condition set layout or all the conditions above also have "yes" sign under the "fast search" label.
     - "**no**" sign for other case.
   - **Conditions** are **`ORed`**:
     - "**no**" sign for all condition.
   - **Conditions** form a **`Complex Expression`** with mixed **`ANDed`**s /**`ORed`**s:

- "**yes**" sign if the condition is the first condition evaluated in the expression or all the conditions before in the expression also have "yes" sign under the "fast search" label + the condition is simply ANDed to the rest of expression.
- "**no**" sign if the condition is ORed.
- "**no**" sign for other cases.

- Regardless of the Operator, the **Fast Search** option is not supported if the "**`xl-value`**" Right value type is selected without a Fixed value.

Case-sensitive lookup depends on the **Fast Search** option; the check box is unchecked and disabled if Fast Search is also disabled. The **Case-sensitive** check box is enabled only for the Octet-String and UTF8String Right value types.

Rule Template elements

A Rule Template is created by configuring *Table 8: Settings*, *Table 9: Conditions*, and *Table 11: Actions*.

Settings

The Settings are the main Rule Template properties.

Table 8: Settings

Element	Description	Data Input Notes
Rule Template Name	Name used to label this Rule Template in this application. This field is required.	Format: a-z, A-Z, 0-9, -, ., @, and _ ("Unset" cannot be used as a Rule Template Name.) Range: 1-255 characters
Message type support	Indicates the type of message processing that is supported by the Rule Template (Request, Answer, or both). The Message Support Type depends on the selected conditions and actions.	Format: Check marks Range: Request, Answer, or both are checked. Default: Both are checked This field cannot be edited.

Conditions

The Conditions define a set of one to five matching expressions.

All conditions are supported by both requests and replies. Each condition is marked with a letter in the alphabetical order (A, B, C, D, E, etc.). The "Up" and "Down" buttons move the conditions within the Condition Set, however the letters that label the conditions stay in the alphabetical order.

Table 9: Conditions

Element	Description	Data Input Notes
Fast Search	If check marked, fast database lookup is used. Otherwise, the values of the specified field are checked one-by-one until the first match is found. See *Fast Search*.	Format: Check mark (Yes) or red circle with red line through it (No); not editable Range: Yes sign or No sign Default: Yes sign All Conditions with the Fast Search option checked must precede the others to maintain the Fast Search. When the Default value is Fixed, Fast Search is enabled regardless of the selected Operator and Right value type.
Name	The name for the Left value to display for a Condition on the Rule Set page. This field is required.	Format: Text Range: 1 to 64 characters
Description	The description that appears for a Condition on the **Rule Sets** page. If possible, provide information such as the format to be used (such as text string or telephone number format) and the range of values (such as 1 to 255 characters).	Format: Text Range: 1 to 255 characters string
Left value	The left-hand value in a Condition. The Left value typically refers to a regular or grouped AVP component (AVP header parts or value) or a Diameter Header component. The grouped AVP can be up to 8 levels deep. Grouped AVPs that have a depth of one are supported (one or more AVPs at the same level within an AVP). This field is required. The value can be defined using the *Formatting String Wizard Specifiers* .	Format: Text Range: See *Formatting String Wizard Specifiers*
Operator	Operator is used to compare Left value and Right value in a Condition.	Format: Drop-down list Range: See *Table 15: Rule Template Condition Operators*

Element	Description	Data Input Notes
	"Exist" and "not exist" operators are used to check the presence of the specified Left-hand value. "Is true" and "is not true" operators are used to verify whether the specified Left value is not 0 or equals 0 (is empty in the case of a string type).	Default: equals (==)
Case Sensitive	Case-sensitive search is possible only together with Fast Search. Without Fast Search, the lookup is always case-insensitive. The checkbox is enabled for the UTF8String Right value.	Format: checkbox Range: Checked or not checked Default: Not checked (not case-sensitive)
Right Value	The type of data that is compared to the field in the message (specified by the Left value) in a Condition to determine if there is a match and Mediation should be performed. The Right value can be: • Empty - the Optional checkbox is checked (it can be left empty in the rule provisioning in a Rule Set), or the Right value is not used by the selected Operator (such as "exists"). • One of the Right value types shown in the Range list. Actual data of the specified type is entered in a rule in the Rule Set that is generated from the Rule Template, to use in the comparison. • An actual data value of the selected Right value type, provisioned in the Default value field of the Condition in the Rule Template.	Format: Drop-down list Range: Right value types are: • Integer32 • Integer64 • Unsigned32 • Unsigned64 • Float32 • Float64 • Address (IPv4 or IPv6 IP address) • Time (number of seconds since 0h on 1 January 1900) • UTF8string • DiameterIdentity (FQDN or Realm) • DiameterURI • IP/Netmask (IPv4 or IPv6 Netmask) • Enumerated (available Enum values; prefaced by "enum:") • OctetString • xl-value (references to AVPs, LAVPs, or parts of the Diameter message) • Regular expression (Perl 5 regular expression) • Unsigned64Range enter two numbers (the lower and upper limit of the range inclusive) that fit into Unsigned64, separated by a dash "-". • Connection provisioned connection

Element	Description	Data Input Notes
		• Peer provisioned peer nodes Default: Integer32 All previously provisioned Enumerated Types shall be listed prefixed with “enum:”. For example: “enum: xyz”.
Default value	An actual data value to display for the Right value of a Condition on the Rule Set page. When the Default value is Fixed, Fast Search is enabled regardless of the selected Operator and Right value type.	Format: Text Range: Data value that is valid for selected Right value type. When OctetString or UTF8String is selected, any human-readable character is valid. When the "xl-value" type is selected, all Default value entries must be xl-values.
Optional	The Optional checkbox can be checked so that the Right value data could be deleted or left empty in the Rule Set rule, or unchecked indicating that the Right value data must be entered and can be changed in the Rule Set rule.	Format: checkbox Range: Check mark or no check mark Default: Checked
Fixed	Indicates that the Right value data that is entered in the Default value in the Rule Template Condition is actual data, and cannot be changed in the Rule Set rule.	Format: checkbox Range: Check mark or no check mark Default: Not checked

Condition Set

The Condition Set specifies whether the conditions are logically ANDed, ORed or they form a Complex Expression.

Table 10: Condition Set

Element	Description	Data Input Notes
Condition Set	The defined matching expressions (Conditions) are combined in one logical expression (Condition Set) and can be ANDed, ORed or represent Complex Expression operators, so the set matches on the message if all the expressions are true.	Format: Options Range: ANDed, ORed or Complex Expression.

Element	Description	Data Input Notes
	If no matching expression is defined, the message unconditionally matches.	

Actions

The Actions specify the possible settings for each action to be taken for this Rule Template.

The "Up" and "Down" buttons move the order of the Actions.

Table 11: Actions

Action	Description	Data Input Notes
New Action	Add a new Action to the list that is applied when the conditions of the Rule Template match on the message.	Format: Drop-down list Range: Actions listed in this section of this table.

The Actions performed on the Diameter Header allows the Diameter Header and Set Command Flags to be modified.

Table 12: Actions performed on the Diameter Header

Action	Description	Data Input Notes
Modify Diameter Header Parts	Allows modifying or overwriting of the Version, Command Code, and Application ID components of the Diameter Header. **Note:** Modifying values in the Diameter Header can result in incompatibility with the standard defined in IETF RFC3588bis (draft-ietf_dime_rfc3588bix-26.txt) *Diameter Base Protocol*.	**Header Part** - the component to modify Format: Drop-down list Range: Version, Command Code, Application ID Default: Version **Overwrite to** - the new value of the component Format: Integer Range: New value; 8-bit, 24-bit, or 32-bit unsigned integer **Optional** Format: Checkbox Range: Check mark or no check mark
Set Command Flags	Allows modifying of one or more Command Flags in the processed message, including the reserved flags: • Set Command Flag • Clear Command Flag • Keep Original value	**Set Command Flag**: **Clear Command Flag**: **Keep original**: Default: Keep original Format: Options

Action	Description	Data Input Notes
	Flags R, P, E, and T are supported; r4, r5, r6, and r7 are reserved for future use: • R - Request; shows whether the message is a Request or a Response. • P - Proxiable; shows if the message can be proxied, relayed, or redirected, or it must be locally processed. • E - Error; shows if the message contains protocol or semantic errors. • T - Shows that a message can potentially be a retransmitted message after a link fail-over, or is used to aid removal of duplicate messages.	Range: **R**, **P**, **E**, **T**, **r4**, **r5**, **r6**, **r7** **Optional** is not available

The Actions performed on the Diameter Payload (AVPs) can be applied to a regular AVP, to a Grouped AVP, or to an AVP within the Grouped AVP.

To perform the action on a regular or Grouped AVP, the supported AVP definition from the dictionary and the instance number or value must be specified. The value is valid only for some of the actions.

For actions that are performed on an AVP within a Grouped AVP, the parent AVP and its instance number must be specified.

If an AVP is not present in the dictionary, it is unknown by the Mediation feature and must be defined in the dictionary before the specified action can be performed.

Many of the actions allow xl-values, which can be defined using the *Formatting String Wizard Specifiers*.

Table 13: Actions performed on the Diameter Payload (AVPs)

Action	Description	Data Input Notes
Add AVP	This action can support up to 8 levels deep AVPs. **Note:** The action will fail, if the specified instance of the parent AVP is also added but the previous instances of this AVP do not exist in the message. The Flags and the Value must be set for the new AVP. For Grouped AVPs, • If the AVP is added within a Grouped AVP, the Parent AVP	**Add parent AVP if it is not present:** Format: Checkbox Range: Check mark or no check mark Default: No check mark **AVP:** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list

Action	Description	Data Input Notes
	and its Instance must be specified. • A Parent AVP can be added if it not present in the message; Flags for the added Parent AVP must be set. • If the Parent AVP is not found in the message and is not added to the message, the action will fail. Flags V, M and P are supported; r3, r4, r5, r6 and r7 are reserved for future use. • V - Vendor-Specific; indicates whether the optional Vendor-ID field is present in the AVP header. When set, the AVP Code belongs to the specific vendor code address space. • M - Mandatory; indicates whether support of the AVP is required. If an AVP with the M bit set is received by a Diameter client, server, proxy, or translation agent and either the AVP or its value is unrecognized, the message MUST be rejected. Diameter Relay and Redirect Agents MUST NOT reject messages with unrecognized AVPs. AVPs with the M bit cleared are informational only. A receiver of a message with an AVP that is not supported, or whose value is not supported, can simply ignore the AVP. • P - Indicates the need for encryption for end-to-end security. Diameter base protocol specifies which AVPs must be protected by end-to-end security measures (encryption) if the message is to pass through a Diameter agent. If a message includes any of those AVPs, the message must not be sent unless there is end-to-end	Range: First, Second, Third, Fourth, Fifth, all internal variables of Integer32, Integer64, Unsigned32, Unsigned64 type. **Set Flags**: Format: checkbox for each flag Range: V, M, P, r3, r4, r5, r6, r7 **Set Value:** Format: Specify the AVP value in *Formatting String Wizard Specifiers*. **Optional** Format: Checkbox Range: Check mark or no check mark

Action	Description	Data Input Notes
	security between the originator and the recipient of the message.	
Set/Add AVP	The action allows changing the value of an AVP if it is found in the message or adding an AVP if it is not found in the message This action can support up to 8 levels deep AVPs. It searches for the specific instance of an AVP in the message, overwriting its value when this AVP is found or appending this AVP (adding it as a last instance) when it's not present. The AVP can be looked up in the message either by the instance number or by the value. If the AVP is not found in the message it can be appended, which requires setting the Flags and specifying the Value of the AVP that is to be added. If a non existing AVP that was looked up in the message by the specific instance number is about to be added to the message with the different instance number, the action will fail.	**AVP:** Format: Drop-down list Range: Available AVPs **Instance** Format: Drop-down list Range: First, Second, Third, Fourth, Fifth, all internal variables of Integer32, Integer64, Unsigned32, Unsigned64 type. Default: First **Set Flags** Flag definitions in Add AVP: • If the flag must be set, the flag is checked and disabled. • If the flag must not be set, the flag is unchecked and disabled. • If the flag can be set, the checkbox is available to be changed. Format: checkboxes for the flags Range: V, M, P, r3, r4, r5, r6, r7 **If the AVP is found set its value (all specified flags will be ignored)** Format: Options Range: **`Search by the instance`** or **`Search by the value`** **Else append the AVP to the message (all specified flags will be considered.) Add parent AVP if it is not present** Format: checkbox Range: Checked or unchecked **Set/Add Value** Format: Value entered Range: Specify the AVP value in *Formatting String Wizard Specifiers*

Action	Description	Data Input Notes
		Optional Format: Checkbox Range: Check mark or no check mark
Delete AVP	Delete a specified AVP in the message. This action can support up to 8 levels deep AVPs. If the Instance of the specified AVP is All, the action is applied to all instances of the AVP or Grouped AVP in the message. If the specified AVP is within a Grouped AVP, the Parent AVP and its Instance must be specified. If the specified AVP is the last AVP within the Grouped AVP, the action can be defined to delete the Parent AVP. If the specified AVP is a Grouped AVP, the Grouped AVP and all of the AVPs within the group are deleted. If the deleted AVP has been the last AVP within the Grouped AVP, then **Delete parent AVP if it is empty** can be checked to delete the Parent AVP as well. If the specified AVP is not found in the message, the Delete AVP action is considered successful.	**Delete parent AVP if it is empty:** Format: Checkbox Range: Check mark or no check mark Default: Checked **AVP:** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third, Fourth, Fifth, all internal variables of Integer32, Integer64, Unsigned32, Unsigned64 type. **With the value:** Specify the AVP value in (see *Formatting String Wizard Specifiers*) Format: Checkbox **Optional** Format: Checkbox Range: Check mark or no check mark
Save AVP	A saved AVP is stored in the buffer as long as the transaction exists. Saved AVPs can be accessed through the *Formatting String Wizard Specifiers* as corresponding Linking-AVPs with the same AVP and instance number. If the Instance of the specified AVP is All, the action saves all instances of the AVP in the message. **Note:** A grouped AVP can be saved and restored, but sub-AVPs	**Save AVP:** Format: Drop-down list Range: Available AVPs **Instance:** First, Second, Third, Fourth, Fifth, All, all internal variables of integer32, integer64, unsigned32, unsigned64 type. **With the value:**

Action	Description	Data Input Notes
	within the stored or restored grouped AVP cannot be retrieved (such as with @msg.avp["name"][index].avp["name"][index]), modified, or removed. If the same AVP is saved multiple times (the action is applied multiple times), the saved value is overwritten each time the AVP is saved. If the specified AVP is not found in the message, the Save AVP action is considered to have failed.	Specify the AVP value in (see *Formatting String Wizard Specifiers*) Format: checkbox **Optional** Format: checkbox Range: Check mark or no check mark
Restore AVP	AVPs can be restored in the message by either appending each AVP to the message or by replacing all of the same existing AVPs. The instance number of the saved AVP must be specified, to find the appropriate Linking-AVP (LAVP) that was stored. **Note:** A Grouped AVP can be saved and restored, but sub-AVPs within the stored or restored Grouped AVP cannot be retrieved (such as with @msg.avp["name"][index].avp["name"][index]), modified, or removed.	**Delete before restore:** Format: checkbox Range: Checked, unchecked; default is unchecked. **Restore AVP:** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third, Fourth, Fifth, All, all internal variables of integer32, integer64, unsigned32, unsigned64 type. **Optional** Format: Checkbox Range: Check mark or no check mark
Set LAVP	Allows constructing a top-level non-Grouped AVP by setting the Flags and specifying the value, and placing it into the buffer associated with the Diameter transaction. The AVP can be accessed as a Linking-AVP through the *Formatting String Wizard Specifiers*. The value is stored in the buffer as long as the transaction exists. The LAVP can be used for the Restore AVP action.	**Set LAVP** Format: Drop-down list Range: All non-Grouped AVPs from the dictionary Default: First non-Grouped AVP definition from the dictionary **Instance** Format: Drop-down list

Action	Description	Data Input Notes

	• Instance - Specify the instance number of the AVP within the buffer of the transaction. The new AVP specification always overwrites the existing if there is already one with the same instance number.
	• Set Value
	  • The Input field is available when the selected LAVP has a data format other than "Enumerated".
	  • The drop-down list is available when the selected LAVP has the data format "Enumerated".
	  • An error message appears if the entered value of the Input field is not an x1-value and does not correspond to the data format required by the selected AVP.
	• Delete: Click to delete an existing Linking-AVP.
		Range: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type.
		Default: First
		Set Flags
		Flag definitions in Add AVP:
		• If the flag must be set, the flag is checked and disabled.
		• If the flag must not be set, the flag is unchecked and disabled.
		• If the flag can be set, the checkbox is available to be changed.
		Format: checkboxes for the flags
		Range: V, M, P, r3, r4, r5, r6, r7
		Default: From the dictionary
		Set Value:
		Specify the AVP value in (see *Formatting String Wizard Specifiers*)
		Optional
		Format: Checkbox
		Range: Check mark or no check mark

Actions that modify an AVP

If the specified AVP is not found in the message, the action is considered to have failed.

Table 14: Actions that modify an AVP

Action	Description	Data Input Notes
Change AVP Code	Replace an AVP definition with a new one, keeping the original AVP value and flag that are not strictly defined in the dictionary (that can be set). This action can support up to 8 levels deep AVPs. Allows changing the Code of the specified AVP and modifying its Flags.	**Parent AVP:** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type.

Action	Description	Data Input Notes
		AVP: Format: Drop-down list Range: Available AVPs Instance: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type **With the value:** Specify the AVP value in (see *Formatting String Wizard Specifiers*) Format: Checkbox **New AVP** Format: Drop-down list Range: Available AVPs **Optional** Format: Checkbox Range: Check mark or no check mark
Change AVP Flags	Allows setting, clearing, and keeping the original value of AVP flags. This action can support up to 8 levels deep AVPs. Flags V, M and P are supported; r3, r4, r5, r6 and r7 are reserved for future use. • V - Vendor-Specific; indicates whether the optional Vendor-ID field is present in the AVP header. When set, the AVP Code belongs to the specific vendor code address space. • M - Mandatory; indicates whether support of the AVP is required. If an AVP with the M bit set is received by a Diameter client, server, proxy, or translation agent and either the ABP or its value is unrecognized, the message MUST be rejected. Diameter Relay and Redirect Agents MUST NOT reject messages	**Parent AVP** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type. **AVP:** Format: Drop-down list. Range: Available AVPs **With the value:** Specify the AVP value in (see *Formatting String Wizard Specifiers*) Format: Checkbox **Set Command Flag**: **Clear Command Flag**: **Keep original**:

Action	Description	Data Input Notes
	with unrecognized AVPx. AVPs with the M bit cleared are informational only. A receiver of a message with an AVP that is not supported, or whose value is not supported, can simply ignore the AVP. • P - Indicates the need for encryption for end-to-end security. Diameter base protocol specifies which AVPs must be protected by end-to-end security measures (encryption) if the message is to pass through a Diameter agent. If a message includes any of those AVPs, the message must not be sent unless there is end-to-end security between the originator and the recipient of the message.	Default: Keep original Format: Options Range: **R**, **P**, **E**, **T**, **r4**, **r5**, **r6**, **r7** **Optional** Format: Checkbox Range: Check mark or no check mark
Set AVP Value	Allows overwriting of the value of an AVP. This action can support up to 8 levels deep AVPs.	**Parent AVP:** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type. **AVP:** Format: Drop-down list. Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type. **With the value:** Specify the AVP value in (see *Formatting String Wizard Specifiers*)

Action	Description	Data Input Notes
		Format: Checkbox **Set Value:** Specify the AVP value in *Formatting String Wizard Specifiers*. **Optional** Format: Checkbox Range: Check mark or no check mark
Strip from AVP Value	Strips the defined number of characters from either the beginning or the ending of the AVP value. This action can be used in combination with the Prefix/Suffix to AVP Value action. This action can support up to 8 levels deep AVPs.	**Parent AVP:** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type **AVP:** Format: Drop-down list Range: Available AVPs Instance: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type. **With the value:** Specify the AVP value in (see *Formatting String Wizard Specifiers*) Format: Checkbox **Strip from:** Format: Options Range: Beginning of the value or End of the AVP value in (see *Formatting String Wizard Specifiers* **Optional** Format: Checkbox Range: Check mark or no check mark
Prefix/Suffix to AVP Value	Add the defined data as a prefix or suffix to the AVP value. This action	**Parent AVP:** Format: Drop-down list

Action	Description	Data Input Notes
	can be used in combination with the Strip for AVP Value action. This action can support up to 8 levels deep AVPs.	Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type **AVP:** Format: Drop-down list Range: Available AVPs Instance: First, Second, Third, Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type. **With the value:** Specify the AVP value in the (see *Formatting String Wizard Specifiers*) Format: Checkbox Options: Prefix to the value, Suffix to the value **Prefix to the value or Suffix to the value:** Specify the AVP value in the (see *Formatting String Wizard Specifiers*) **Optional** Format: Checkbox Range: Check mark or no check mark
Substitute in AVP Value	Use a defined pattern to locate a field in the AVP value, and replace the data in the field with the specified new data. This action can support up to 8 levels deep AVPs.	**Parent AVP:** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third Fourth, Fifth, all internal variables of integer32, integer64, unsigned32, unsigned64 type **AVP:** Instance: First, Second, Third, Fourth, Fifth, all internal variables of integer32,

Action	Description	Data Input Notes
		integer64, unsigned32, unsigned64 type. **With the value:** Specify the AVP value in the (see *Formatting String Wizard Specifiers*) Format: Checkbox **Pattern:** Format: Text Range: Pattern to locate the field **Replacement:** Format: Text Range: Specify the AVP value in the (see *Formatting String Wizard Specifiers*) **Optional** Format: Checkbox Range: Check mark or no check mark
Bit Set/Reset	Allows setting/resetting the specified bit of the AVP. This action can support up to 8 levels deep AVPs.	**Parent AVP:** Format: Drop-down list Range: Available AVPs **Instance:** Format: Drop-down list Range: First, Second, Third Fourth, Fifth and all internal variables of integer32, integer64, unsigned32, unsigned64 type. Default: First non-Grouped AVP definition from the dictionary **Bit Position:** **Note:** Disabled unless the AVP is selected. Format: Drop-down list Range: Bit indexes between 0-31 or 0-63 depending on the format of an AVP. Default: First non-Grouped AVP definition from the dictionary Range: First, Second, Third Fourth, Fifth and all internal variables of

Action	Description	Data Input Notes
		integer32, integer64, unsigned32, unsigned64 type. **Set/Reset Value:** **Note:** Disabled unless the AVP is selected. Format: Drop-down list Range: 1 or 0 - Default a 1 **Note:** If the name of the selected AVP is too long and does not fit on the screen, the hint message is available; it displays the entire name. **Optional** Format: Checkbox Range: Check mark or no check mark
Set internal variable	Allows setting the value for an internal variable that is valid for the entire duration of a transaction.	**Internal variable** Format: Drop-down list Range: Available configured Internal Variables. **Set Value** Specify the AVP value in (see *Formatting String Wizard Specifiers*) **Optional** Format: Checkbox Range: Check mark or no check mark
Message Copy	Trigger Diameter Message Copy for the message, based on the values in the Message Copy Configuration Set that is specified for the Action. See Configuration in the Diameter User's Guide.	**Select Message Copy Configuration Set** Format: Drop-down list Range: Default or Message Copy Default: Blank **Optional** Format: Checkbox Range: Check mark or no check mark
Set Request Priority	Allows setting the Priority of a Request to 0,1 or 2, which can then be used by the congestion control subsystem if needed. The action is applicable only at "Diameter	**Request Priority** Format: Drop-down list Range: No change, 0,1,2

Action	Description	Data Input Notes
	request message received from connection" trigger point and is ignored at all other trigger points. If the request priority has been previously set to 3, the action will be ignored.	**Note: Set Request Priority** is mutually exclusive with this action. **Optional** Format: Checkbox Range: Check mark or no check mark
Set Route List	Allows setting the Route List to bypass the PRT. This is used when the Request has to be routed based on AVPs that are beyond the ones accessible via the Peer Route Tables. The action can also enforce skipping the Application Route Tables matching. The action is applicable only at "Diameter request message received from connection" trigger point and is ignored at all other trigger points. **Note:** If the ART is not skipped, it is possible that an application can specify a PRT which can then result in the overwriting of the Route List specified by mediation.	**Set Route List** Format: Drop-down list Range: Pre-defined route list based on the list in **Diameter** > **Configuration** > **Route Lists**. **Skip Application Route Tables** Format: checkbox Range: Check mark or no check mark **Note: Abandon Message** and **Send Answer** are mutually exclusive with this action. **Optional** Format: Checkbox Range: Check mark or no check mark
Peg Counter	Allows the user to peg the pre-defined measurements from the list in **Diameter** > **Mediation** > **Measurements**. A report is generated from **Measurements** > **Report**.	**Measurement** Format: Drop-down list Range: Pre-defined measurements based on the list in **Diameter** > **Mediation** > **Measurements**. **Optional** Format: Checkbox Range: Check mark or no check mark
Send Answer	Allows answering the request with a configurable Result-Code. The action enables specifying the Result-Code or Experimental-Result-Code and Vendor-ID. The action is supported by Requests only	**Answer Result-Code Value** Format: Options **Vendor-ID** Format: Text Range: 1 - 4294967295 **Answer Error Message** Format: Text

Action	Description	Data Input Notes
		Range: N/A or specify the message placed in the Error-Message AVP in Answer message. **Note: Abandon Message** and **Send Answer** are mutually exclusive with this action. **Exit from Execution Trigger** Bypasses any subsequent Rule Template in it. **Optional** is not available for this Action.
Abandon Message	Allows to silently drop the request. The action is supported by Requests and Answers at the DCL trigger points. The DRL answer triggers (ATP1, ATP4, ATP6 and ATP10) ignore this action.	Format: Blank Range: Blank **Note: Send Answer** and **Set Route List** are mutually exclusive with this action. **Exit from Execution Trigger** Bypasses any subsequent Rule Template in it. **Optional** is not available for this Action.
Set Destination-Realm	This action populates Destination-Realm AVP based on the IMSI value present in the Request.	Format: Blank Range: Blank **Note: Process Decorated NAI** is mutually exclusive with this action. **Exit from Execution Trigger** Bypasses any subsequent Rule Template in it. **Optional** is not available for this Action.
Process Decorated NAI	Performs the following actions: • Inspects the User-Name AVP for the presence of Decorated NAI, if not present then the action stops. The request will continue processing. • If present, extracts the realm value from the Decorated NAI and populates the	Format: Blank Range: Blank **Note: Set Destination-Realm** is mutually exclusive with this action. **Optional** is not available for this Action.

Action	Description	Data Input Notes
	Destination-Realm AVP. For more information see RFC 5729 and RFC 4282. • The action also modifies the "User-Name" AVP value. For more information see RFC 4282. If "Destination-Realm" is deleted/absent during request processing, the action will add it back. For an example, see *Figure 13: Example of Processing Decorated NAI*.	
Redirect Request-Host	This action generates an Answer message with a Result-Code value of 3006 and the (E(rror)) 'E' bit set. The user can specify one of the following options for the Redirect-Host AVP: • Do not include the "Redirect-Host" AVP • The "Redirect-Host" AVP is prefixed with an "aaa://" and set to the value of "Destination-Host" AVP from the request or populated manually. If the "Destination-Host" AVP is not present in the request, the "Redirect-Host" AVP will be not included in the 3006 response • Include the Redirect-Host AVP with a user provisioned value (String Wizard available) Two additional redirect avps can be added to the generated Answer message by checking the **Add** box: • Redirect-Host-Usage - if the user selects any non-zero value for this AVP the redirection should be cached (zero = DON'T_CACHE) • Redirect-Max-Cache-Time - number of seconds to cache the redirection (if Redirect-Host-Usage equals	**Do not include "Redirect-Host" AVP** Format: Option Range: No Range available **Include "Redirect-Host" AVP with the value of "Destination-Host" from the request with the "aaa://" prefix** Format: Option Range: No Range available **Include "Redirect-Host" AVP with the value:** Format: Option Range: Specify the AVP value in *Formatting String Wizard Specifiers*. **Add** Specify if the extra AVPs have to be added to 3006 response. Format: checkbox Range: Check to disable or no check mark Default: Unchecked **"Redirect-Host-Usage" AVP** Format: Drop-down Range: DONT_CACHE, ALL_SESSION, ALL_REALM, REALM AND APPLICATION, ALL_APPLICATION, ALL_HOST, AND ALL_USER

Action	Description	Data Input Notes
	zero, then it recommended that this AVP be zero). **Note:** If either of the Additional AVPs exist, then both AVPs must exist. **Note:** If the Redirect-Host is not included in the response, then the Redirect-Host-Usage and Redirect-Max-Cache-Time will not be included **Note:** If "Do not include Redirect-Host" is selected, then the **Add** checkbox will be disabled.	Default: DONT_CACHE **"Redirect-Max-Cache-Time" AVP** Format: Text Range: Specify the AVP value in *Formatting String Wizard Specifiers* Default: 0 **Exit from Execution Trigger** Bypasses any subsequent Rule Template in it. **Optional** is not available for this Action.
Redirect Request-Realm	This action generates an Answer message with a Result-Code value of 3011 and the (E(rror)) 'E' bit set. The user can specify one of the following options for the Redirect-Realm AVP: • Do not include the "Redirect-Realm" AVP • Include the "Redirect-Realm" AVP with the value of "Destination-Realm" AVP from the Request or populated manually. If the "Destination-Realm" AVP is not present in the request, the "Redirect-Realm" AVP will be not included in the 3011 response. • Include the Redirect-Realm AVP with a user provisioned value (String Wizard available) Two additional redirect avps can be added to the generated Answer message by checking the **Add** box: • Redirect-Realm-Usage - if the user selects any non-zero value for this AVP the redirection should be cached (zero = DON'T_CACHE) • Redirect-Max-Cache-Time - number of seconds to cache the	**Do not include "Redirect-Realm" AVP** Format: Option Range: No Range available **Include "Redirect-Realm" AVP with the value of "Destination-Realm" from the request** Format: Option Range: No Range available **Include "Redirect-Realm" AVP with the value:** Format: Option Range: See *Formatting String Wizard Specifiers* **Add** - Specify if the extra AVPs have to be added to 3011 response. Format: checkbox Range: Check to disable or no check mark Default: Unchecked **"Redirect-Realm-Usage" AVP** Format: Drop-down Range: DONT_CACHE, ALL_SESSION, ALL_REALM, REALM AND APPLICATION,

Action	Description	Data Input Notes
	redirection (if Redirect-Realm-Usage equals zero, then it recommended that this AVP be zero). **Note:** If either of the Additional AVPs exist, then both AVPs must exist. **Note:** If the Redirect-Realm is not included in the response, then the Redirect-Realm-Usage and Redirect-Max-Cache-Time will not be included **Note:** If "Do not include Redirect-Realm" is selected, then the **Add** checkbox will be disabled.	ALL_APPLICATION, ALL_HOST, AND ALL_USER Default: REALM AND APPLICATION **"Redirect-Max-Cache-Time" AVP** Format: checkbox Range: Specify the AVP value in *Formatting String Wizard Specifiers* Default: 3600 **Exit from Execution Trigger** Bypasses any subsequent Rule Template init. **Optional** Format: Checkbox Range: Check mark or no check mark
Assert Alarm/Event	Define the severity of the alarm at template action. Allows the user to cause an Alarm or Event based on the Condition. The alarm instance value is automatically set to the Template-ID: Rule-ID. The alarms are throttled and auto cleared after 300 seconds.	**Alarm/Event** Format: Drop-down list Range: Mediation Generic Event, Mediation Generic Alarm - Minor, Mediation Generic Alarm - Major, Mediation Generic Alarm - Critical **Additional info** - Write a short explanation to distinguish between different problems. Type in the text box or use Wizard to write xl-expressions, which will be resolved at the run time. **Optional** Format: Checkbox Range: Check mark or no check mark
Execute Rule template	The value needs to be set at the time the new Rule Template is defined. Only Rule Templates in **Test** or **Active** state are listed in the drop-down list. This field is displayed on **Diameter Mediation Rule Template** Insert	Format: Drop-down list Range: Available Rule Templates in **Test** and **Active** states. **Optional** is not available for this Action.

Action	Description	Data Input Notes
	and Edit pages, but not on the View page.	
Exit from Execution Trigger	Exits from the Execution Trigger, bypassing any subsequent Rule Set associated with it.	**Optional** is not available for this Action.
Execute Perl subroutine	The Execute perl subroutine can query the Diameter message headers and AVPs and change the Diameter message content, for example add, delete, change AVPs and get and set Internal Variables or Linking AVPs.	**Script** Format: Text Range: Name of the perl script **Subroutine** Format: Text Range: Specify the subroutine to execute. **Optional** is not available for this Action.

Rule Template Condition Operators

The*Table 15: Rule Template Condition Operators* describes the Operators that can be used between the Left Value and the Right value in a Rule Template Condition.

The value can be an AVP, another part of a Diameter message, a constant, or an internal variable.

Table 15: Rule Template Condition Operators

Operator	Operator Type	Returns true when... Example of use
equals (==)	Generic	Value exists AND equals... @msg.command.code==316
does not equal (!=)	Generic	Value does not exist OR does not equal... @msg.command.code!=316
begins with (longest match) (=^^)	String	Value exists AND begins with (longest match)... @msg.avp["Destination-Realm"]=^^test
begins with (=^)	String	Value exists AND begins with... @msg.avp["Destination-Realm"]=^testlb
does not begin with (!=^)	String	Value does not exist OR does not begin with... @msg.avp["Destination-Realm"]!=^testlb
ends with (longest match) (=$$)	String	Value exists AND ends with (longest match) @msg.avp["Origin-Host"][1]=$$entity.com

Operator	Operator Type	Returns true when... Example of use
ends with (=$)	String	Value exists AND ends with... @msg.avp["Origin-Host"][1]=$entity.com
does not end with (!=$)	String	Value does not exist OR does not end with... @msg.avp["Origin-Host"][1]!=$entity.com
regular expression match (=~)	String	Value exists AND matches the regular expression... @msg.avp[Session-Id]!=~.*\.example\..*
regular expression does not match (!=~)	String	Value does not exist OR does not match the regular expression... @msg.avp["Session-Id"]!=~.*\example\..*
less than (<)	Numeric	Value exists AND is less than... @msg.avp["Validity-Time"]<30
greater than (>)	Numeric	Value exists AND is greater than... @msg.avp["Validity-Time"]>30
less than or equal to (<=)	Numeric	Value exists AND is less than or equal to... @msg.avp["Validity-Time"]<=30
greater than or equal to (>=)	Numeric	Value exists AND is greater than or equal to... @msg.avp["Validity-Time"]>=30
is within	Subnet	Value exists AND is within... @msg.avp["Served-Party-IP-Address] is within 192.168.0.0/24
is not within	Subnet	Value does not exist OR is not within... @msg.avp["Served-Party-IP-Address] is not within 192.168.0.0/24
exists		AVP specified as Left value exists... @msg.avp["Vendor-Specific-Application"] exists
does not exist		AVP specified as Left value does not exist... @msg.avp["Vendor-Specific-Application"] does not exist
is true		AVP specified as Left value exists AND it is not empty/non-zero... @msg.avp["Disconnect-Cause"] is true
is false		AVP specified as Left value does not exist OR it is empty/0...

Operator	Operator Type	Returns true when... Example of use
		@msg.avp["Disconnect-Cause"] is false

The "is true" and "is false" work only on numbers (Integer32, Integer32, Unsigned32, Unsigned64, Float32, Float64, Enumerated, Time) and strings (OctetString, UTF8String, DiameterIdentity, DiameterURI).

For an IP Address, "is true" always succeeds; the address can be converted to a string that is never empty.

If the condition cannot be evaluated (for example, the AVP does not exist or the xl-value is incompatible), then "is true" will fail and "is false" will succeed.

Rule Template Condition Conversion Rules

Based on the type of operator selected, the Left value and the Right value are converted according to the rules in *Table 16: Rule Template Condition Conversion Rules*.

Table 16: Rule Template Condition Conversion Rules

Left value Type	Operator Type	Right Value Type	Conversion
-	String	-	Convert Left value and Right value to strings.
-	Numeric	-	Convert Left value and Right value to numbers.
-	Subnet	-	Convert Left value to an IP address. Convert Right value to a subnet
String	Generic	String	No conversion is needed.
Numeric	Generic	Numeric	No conversion is needed.
IP address	Generic	IP address	No conversion is needed.
String	Generic	Numeric	Convert Left value to a number.
Numeric	Generic	String	Convert Right value to a number.
IP address	Generic	String	Convert Right value to an IP address.
String	Generic	IP address	Convert Left value to an IP address.
None of these cases			Conversion cannot be done.
Operators by Type (see also *Table 15: Rule Template Condition Operators*)			
String	=~, !=~, =^, =^^, !=^, =$$, =$, !=$		
Numeric	<, >, <=, >=		
Subset	is within, is not within		
Generic	==, !=		

The conversion fails if the input value is reasonably not convertible to the new format (such as the numeric input cannot be converted to an IP Address).

If the conversion is impossible or fails, the condition is evaluated to false unless the operator is negated (begins with !, or "is not within").

For float to string conversion, the double argument is rounded and converted to decimal notation in the style [-]ddd.dddddd, with 6 characters of precision. If the conversion does not fit into 21 characters, then it will fail.

For IPv6 to string conversion, the following rules apply:

- Leading zeros are ignored (01->1)
- Lowercase to uppercase (ffff->FFFF)
- 1:0:0:0:0:0:0:0->1:0:0:0:0:0:0:0
- 1::2->1:0:0:0:0:0:0:2
- ::ffff->0:0:0:0:0:0:0:FFFF
- ffff::->FFFF:0:0:0:0:0:0:
- ::->0:0:0:0:0:0:0:0

Viewing Rule Templates

Use this procedure to view all existing Rule Templates.

Select **Diameter** > **Mediation** > **Rule Templates**.

The **Diameter > Mediation > Rule Templates** page appears.

Adding a Rule Template

Use this procedure to define a new **Rule Template**.

There are three sections of the **Diameter > Mediation > Rule Templates [Insert]** page: **Settings**, **Conditions**, and **Actions**. For a list of Rule Template elements and their definitions, see *Rule Template elements*.

After the definition is complete and the Rule Template State is set to **`Active`** or **`Test`**, this Rule Template appears as a Rule Set in the **Diameter** > **Mediation** > **Rule Sets** menu folder.

1. If Mediation - Triggered Message Copy is used (the Message Copy Action is selected in one or more Rule Templates), the following **Diameter** > **Configuration** is required before the Actions can be configured.
   a) Configure one or more **Route Groups** that is used for one or more **Route Lists** for the Message Copy DAS.
   b) Configure one or more **Route Lists** for the DAS.
   c) Configure one or more **Configuration Sets** > **Message Copy** that can be assigned to one or more Message Copy Actions.
2. Verify that the required **Enumeration** types, **Internal Variables**, **Measurements**, **AVP Dictionary entries**, and **Vendors** have been defined in the system.

   Use the following GUI pages to view the entries, and to access the GUI pages to enter, change, or delete entries as needed:

   - *Internal Variables*

- *Enumerations*
- *Measurements*
- All-AVP Dictionary in the Diameter User's Guide
- Vendors in the Diameter User's Guide

3. Select **Diameter** > **Mediation** > **Rule Templates**.

   The **Diameter > Mediation > Rule Templates** page opens.

4. Click the **Insert** button.

   The **Diameter > Mediation > Rule Templates [Insert]** page opens.

   If the maximum number of Rule Templates (100) already exists in the system, the **Rule Templates [Insert]** page will not open, and an error message is displayed.

5. Enter the **Settings** values for the Rule Template. See *Table 8: Settings*.
   a) Enter the name for the Rule Template in the **Rule Template Name** text box.

      The Name describes the purpose of the Rule Template.

   b) The **Message type support** for the Rule Template cannot be provisioned.

      Request and **Answer** are both supported.

6. Enter the values to define up to 5 Conditions in the Rule Template. The grouped AVPs can be up to 8 levels deep.

   Note: A Rule Template can be defined with no Conditions. It will unconditionally match for all processed messages.

   See *Fast Search* for more information.

   The order the conditions appear on the **Diameter > Mediation > Rule Templates** page are marked with a letter A, B, C, D, E, etc.. The **Up** and **Down** arrows are used to change the order of processing.

   A check mark in **Optional** indicates that a matching expression is optional. This means that the user can leave this condition's **Value** field blank on the **Diameter > Mediation > Rule Set** page, and this condition will then not be used during message processing. See *Table 9: Conditions*.

   a) Enter a **Name** for the condition. This name appears on the generated **Rule Set** page after this Rule Template is saved.
   b) Enter a **Description** for the condition. This description that appears for a Condition on the **Rule Sets** page. If possible, provide information such as the format to be used (such as text string or telephone number format) and the range of values (such as 1 to 255 characters).
   c) Enter a **Left value** in the text box, or use the *Formatting Value Wizard* to select the components of the Left value.

      The Left value appears in the text box.

   d) Select an **Operator** from the drop down menu. If you hover over the down arrow, an explanation list will appear. See *Table 15: Rule Template Condition Operators*.
   e) Select a **Right value** from the drop down list. If you hover over the down arrow, an explanation list will appear.
   f) Provide a **Default value** for the Right value that will appear on the **Rule Set** page that is generated from the Rule Template.
   g) Click the appropriate check boxes to display a check mark in the boxes that apply for this Rule Template.

Click the **Case sensitive** check box to indicate that the values must match in case as well as content.

Click the **Optional** check box to indicate that the user can decide to exclude the matching expression form the condition set by leaving the Right value empty.

Click the **Fixed** check box to indicate that the Right value cannot be changed in the rule.

h) To add another condition, click **Add** and repeat the substeps in this step for each additional condition.

7. Select the **Condition Set**. See *Table 10: Condition Set*.

   The three buttons available are **ANDed**, **ORed**, and **Complex Expression**.

8. Enter the values to define one or more Actions in the Rule Template. See *Table 11: Actions*.

   When any defined Conditions are met, the Actions specified in this section of the page are taken. At least one Action must be specified for a Rule Template.

   a) From the **New Action** drop down list, select an Action to take for this Rule Template.
   b) Click **[Add]** to open the GUI fields for the selected Action.
   c) Enter the information in the fields. The fields are described in *Rule Template elements*.

9. When the Rule Template definition is complete, click:

   - **OK** to save the Rule Template and return to the **Diameter > Mediation > Rule Templates** page. The Rule Template Name appears in the list on the page.
   - **Apply** to save the Rule Template and remain on the **Diameter > Mediation > Rule Templates [Insert]** page for additional changes.
   - **Cancel** to return to the **Diameter > Mediation > Rule Templates** page without saving the Rule Template.

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

   - Any of the Default value fields in the Conditions contain a value that cannot fit into the range of the selected Right value with a supported Operator.
   - Any of the Default value fields in the Conditions contain a value that is not valid or is not the correct format for the selected Right value with a supported Operator.
   - Adding the new Rule Template would cause the maximum number (100) of Rule Templates allowed in the system to be exceeded.

10. If you want to add online help to describe this Rule Template in its generated Rule Set, perform the *Adding online help to a Rule Template* procedure. Then continue with *Step 11*.

11. When the Rule Template definition is complete, go to the **Diameter** > **Mediation** > **State & Properties** page.

    a) Change **State** from **`Development`** to either **`Test`** or **`Active`**.
    b) Set **Action Error Handling** to **`Ignore the error`**, **`Immediately exit from the rule template`**, **`Immediately exit from the trigger point`**.

    After the Rule Template definition is completed and saved, the State and Properties can be changed to make the Rule Template available for testing and to generate the **Rule Set** from the Rule Template.

    The **Rule Template** State can be changed to **`Test`** to allow testing, provisioning of the Rule Set data, and associating the Rule Set with a Trigger (see *Triggers*) before the Rule Set is used in live traffic.

The state can be changed to **Active** after the testing is successful, the Rule Set data is provisioned, the Rule Set is associated with a Trigger, and the Rule Set is ready to use in live traffic.

12. If one or more Rule Template Actions for Message Copy have been configured, go to the **Diameter > Configuration > System Options** page, select the **Message Copy Options** tab, and select the **Enabled** radio button for the **Message Copy Feature** element.

Adding online help to a Rule Template

When a **Rule Template** is created, online help can be added to the Rule Template to describe it in its generated **Rule Set**.

After online help is added, when the user clicks the context-sensitive help icon in the upper right corner of the associated **Diameter > Mediation > Rule Sets {name}** page, this online help explains how to use the **Diameter > Mediation > Rule Sets {name}** page to configure the Rule Set.

This help is standalone, and is not part of the online help provided by Customer Care Center as part of the Mediation feature.

Use this procedure to add context-sensitive online help to an existing Rule Template:

1. Select **Diameter** > **Mediation** > **Rule Templates**.

   The **Diameter > Mediation > Rule Templates** page appears.
2. Select the **Rule Template Name** to which online help will be added.
3. Click **Set Help**.

   The **Diameter > Mediation > Rule Templates [Set Help]** page appears.
4. Change the contents of the **Title** box to an appropriate title for this help.

   The Rule Template Name appears in the **Title** box as the default.
5. In the **Text** field, add specific details on how to configure a rule using this Rule Set, such as a procedure and result. You can also add detail on how the various fields interrelate, and provide any cautions to prevent loss of data.
6. To see how the help text you have entered will look from the **Rule Set** page, click **Preview**.

   A separate window opens and displays the help text. Close the preview window when you are finished previewing the help text.
7. When the help page is complete, click:

   - **OK** to save the help page and return to the **Diameter > Mediation > Rule Templates** page.
   - **Apply** to save the changes and remain on the **Diameter > Mediation > Rule Templates [Set Help]** page for additional changes.
   - **Cancel** to return to the **Diameter > Mediation > Rule Templates** page without saving any changes.

   The new help text is now available from the help icon on the **Diameter > Mediation > Rule Sets {name}** page for this Rule Template.

Rule Templates Help elements

When **Set Help** is clicked for an existing Rule Template on the **Diameter Mediation Rule Templates** page, the following information appears:

Table 17: Rule Templates Help elements

Element	Description	Data Input Notes
Title	Title to appear at the top of the Help page. This field is required when providing Help.	Format: Text string Range: 1-64 characters
Text	Detailed explanation of this Rule Set: how to use it and description of any interrelated features.	Format: Text string (HTML tags allowed) Range: 1 - 1500 characters
Path	(Generated and used by software)	

Copying a Rule Template

Use this procedure to copy an existing **Rule Template** and save it as a new Rule Template. For a list of Rule Template elements and their definitions, see *Rule Template elements*.

1. Select **Diameter** > **Mediation** > **Rule Templates**.
   The **Diameter > Mediation > Rule Templates** page appears.
2. Select the **Rule Template** that you want to copy.
3. Click **Copy**.
   The **Diameter > Mediation > Rule Templates [Copy]** page appears.
   If the maximum number of Rule Templates (100) already exists in the system, the **Rule Templates [Copy]** page will not open, and an error message is displayed.
4. Enter a different **Rule Template Name** for the new Rule Template.
5. Make any changes as needed.
6. Click:
   - **OK** to save the definition and return to the **Diameter > Mediation > Rule Templates** page.
   - **Apply** to save the definition and remain on the **Diameter > Mediation > Rule Templates [Copy]** page.
   - **Cancel** to return to the **Diameter > Mediation > Rule Templates** page without saving any changes.

Changing a Rule Template

Use this procedure to change values for an existing **Rule Template** (for a list of Rule Template elements and their definitions, see *Rule Template elements*).

When a Rule Template is in the **`Development`** state, all elements can be changed.

After the Rule Template state has been changed to **`Test`** or **`Active`**, only the following elements can be changed. The Rule Template state must be set back to **`Development`** to change any other elements (all provisioning of rules for the Rule Template will be lost when the state is changed back to **`Development`**). (See *State and Properties*.)

- Rule Template Name

- Name of the Conditions
- Default value of the Conditions (except when the Fixed box has been checked)
- Description of the Condition
- Default value of the Actions (except for the value of the **`Execute Rule Template`**)

1. Select **Diameter** > **Mediation** > **Rule Templates**.

   The **Diameter > Mediation > Rule Templates** page appears.

2. Click **Edit** on the Rule Template row to be changed.

   The **Diameter > Mediation > Rule Templates [Edit]** page appears.

3. Change **Conditions** and **Actions** as needed.
4. Click:

   - **OK** to save the changes and return to the **Diameter > Mediation > Rule Templates** page.
   - **Apply** to save the changes and remain on the **Diameter > Mediation > Rule Templates [Edit]** page.
   - **Cancel** to return to the **Diameter > Mediation > Rule Templates** page without saving any changes.

Importing a Rule Template

A Rule Template can be imported into the system using the **Import** function on the **Diameter > Mediation > Rule Templates** page.

Existing Rule Templates can be imported. Existing Rule Templates are previously defined Rule Templates that have been exported from Diameter Mediation using the **Export** function.

The Mediation version in the file selected for importing must be compatible with the system release into which the file is imported.

A successfully imported Rule Template file appears in the list on the **Diameter > Mediation > Rule Templates** page, the **Diameter > Mediation > State & Properties** page, and as a Rule Set in the **Diameter** > **Mediation** > **Rule Sets** menu folder (no Rule Set is generated if the only Action is **`Execute Rule Template`**).

The imported Rule Template is automatically set to the **`Test`** state.

The Enumeration types that are used in the Rule Template are imported, if they do not already exist in the system.

If the selected Rule Template references another Rule Template (as an **`Execute Rule Template`** action) that is not already present in the system, the referenced Rule Template is also imported (unless there is already a Rule Template with the same Name but a different definition).

Use the following procedure to import an existing Rule Template that is located outside of the file system:

1. Select **Diameter** > **Mediation** > **Rule Templates**.

   The **Diameter > Mediation > Rule Templates** page appears.

2. Click **Import**.

   The **Diameter > Mediation > Rule Templates [Import]** page appears.

If the maximum number of Rule Templates (100) already exist in the system, the **Diameter > Mediation > Rule Templates [Import]** page will not open, and an error message is displayed.

3. Click **Browse** to open the **Choose File** popup window.
4. Navigate to the location of the Rule Template file you want to import, and select the file.
5. With the Rule Template filename displayed in the **File name** field, click **Open**.

   The filename appears in the **Choose a file to import** field.

6. Click **Import File**.

   If the Import File button is clicked and any of the following conditions exist, the file is not imported and an error message appears:

   - The selected file does not exist.
   - The selected file is larger than 1 MB.
   - The selected file has wrong .xml structure or missing data.
   - The Mediation version of the file is not compatible with the system into which the file is being imported.
   - The Name field of the imported Rule Template is empty.
   - Any Operator field in a Condition contains an operator that is not valid.
   - Any Right value field in a Condition is invalid.
   - A value type specifies an Enumerated Type that is not defined either in the system or in the imported file.
   - A Condition or Action in the selected file includes an Enumerated Type that is already present in the system, but that contains different Enumerated Type values.
   - The selected file contains an Action that is not defined in the system.
   - The selected file contains more than the allowed maximum number of Conditions (5).
   - A Condition in the selected file includes a Right value that is not supported by the selected Operator.
   - The Right value of a Condition in the file is not a supported value type.
   - The selected file contains more than the allowed maximum number of Actions (5), unless the maximum number is exceeded because of automatically added final actions (some actions actually result in multiple actions).
   - Importing the file would cause the allowed maximum number of Rule Templates (100) in the system to be exceeded.
   - The selected Rule Template references another Rule Template (as an Execute Rule Template action) that is not present in the system.
   - The selected file contains mutually exclusive Actions (that cannot be used together in the same Rule Template).

Exporting a Rule Template

Use this procedure to export a Rule Template from within the system to an external location.

The saved .xml file contains the following information:

- The **Rule Template** without any provisioned data
- All of the **Enumeration** type definitions with the possible values to which the Rule Template refers
- Mediation version number

- Help pages related to the Rule Template

Note: The Export button is not available (grayed out) for the Rule Set that is in the **Development** state (see the **Diameter > Mediation > State and Properties** page).

1. Select **Diameter** > **Mediation** > **Rule Templates**.
   The **Diameter > Mediation > Rule Templates** page appears.
2. Select the **Rule Template Name** row(s) for the Rule Template to be exported by checking the check boxes beside each Rule Template Name.
3. Click the **Export** button.
   A **File Download** popup window appears.
4. Click **Browse** to pop up the **Choose File** window.
5. Navigate to the location to which you want to export the Rule Template.
6. Click **Export File**.
   The selected file is saved to the specified location.

Deleting a Rule Template

When a Rule Template is deleted, it is removed from the entire system, including the **Diameter > Mediation > State and Properties** page, the **Diameter > Mediation > Triggers** page, and the **Diameter > Mediation > Rule Sets** page.

Any **Rule Sets** that were generated from this **Rule Template** are also deleted automatically.

If a Rule Set belonging to the selected Rule Template is enabled for live traffic (**Active** state on the **State and Properties** page), an error message appears indicating that the Rule Template cannot be deleted as long as it is being used by the system for live traffic.

Use this procedure to delete an existing Rule Template.

1. Select **Diameter** > **Mediation** > **Rule Templates**.
   The **Diameter > Mediation > Rule Templates** page appears.
2. Select the **Rule Template Name** of the Rule Template to be removed.
3. Click **Delete**.
4. A popup window appears to confirm the delete when the selected Rule Template is in the **Development** state or the **Test** state (see the **State and Properties** page).
   - Click **OK** to confirm the delete.
   - Click **Cancel** to cancel the delete function and return to the **Diameter > Mediation > Rule Templates** page.
5. If the selected Rule Template has any data provisioned, another confirmation popup window appears indicating that all of the provisioned data that belongs to any Rule Set generated from the Rule Template will be deleted.
   - Click **OK** to confirm the delete of the provisioned data.
   - Click **Cancel** to cancel the delete function and return to the **Diameter > Mediation > Rule Templates** page.

Formatting Value Wizard

The Formatting Value **Wizard** is a popup window available from both the **Diameter** > **Mediation** > **Rule Templates** Insert/Edit/Copy pages and the **Diameter** > **Mediation** > **Rule Sets** Insert/Edit pages. The wizard simplifies entry of xl-formatted strings, which require specific syntax coding.

An xl-formatted string can contain references to the state of the server, or to the message being processed. For example, `%@ruri.user` refers to the user part of the `Request URI` within an xl-formatted string. The references are replaced with their actual values during a condition validation or an action execution.

Accessing request content during an Answer processing feature provides a read only access to all AVPs in the request message while processing an answer message to all answer trigger points.

Formatting String Wizard elements

When **[wizard]** is clicked, the information shown in Formatting Value Wizard elements appears:

Table 18: Formatting String Wizard elements

Element	Description
Value	The value of the variable in xl-format. The components of this value can be entered manually, by clicking on one or more specifiers, or both.
Specifiers	List of elements that can be part of an xl-formatted string. A specifier is either a single item, or a group of items forming a sub-list. Every specifier that is selected is put into the Value field where the cursor is currently located. The specifiers are described in *Formatting String Wizard Specifiers*.
Preview	The readable description of the xl-formatted string in the Value field.

Formatting String Wizard Specifiers

The **Specifiers** can be used to create or update the variables in the **Value** field.

Note: [Index] that is either a [<number>] or [any] can be excluded from all of the expressions that refer to the first instance of the **AVP**.

The instance number any can be present in the Left value of the Condition only once.

The instance number any can be present in the Right value of the Condition only once.

Table 19: Formatting Value Wizard Specifiers

Specifier			
New Line	Sub-Items	xl-formatted Value	Preview Value

Specifier			
		\r\n	This causes a line break on the GUI screen.
String Constant	Type the string constant	***"string constant"***	{"string constant"}
Diameter Header	Sub-Items	xl-formatted Value	Preview Value
	From the current messages being processed		
	Version	**@msg.version**	{Msg Version}
	Message Length	**@msg.length**	{Message Length}
	Command Flags: R	**@msg.command.flags.R**	{Msg R Command Flag}
	Command Flags: P	**@msg.command.flags.P**	{Msg P Command Flag}
	Command Flags: E	**@msg.command.flags.E**	{Msg E Command Flag}
	Command Flags: T	**@msg.command.flags.T**	{Msg T Command Flag}
	Command Flags: r4	**@msg.command.flags.r4**	{Msg r4 Command Flag}
	Command Flags: r5	**@msg.command.flags.r5**	{Msg r5 Command Flag}
	Command Flags: r6	**@msg.command.flags.r6**	{Msg r6 Command Flag}
	Command Flags: r7	**@msg.command.flags.r7**	{Msg r7 Command Flag}
	Command Code	**@msg.command.code**	{Msg Command Code}
	Application ID	**@msg.application_id**	{Msg Application ID}
	Hop-by-Hop Identifier	**@msg.hbh_id**	{Msg Hop-to-Hop Identifier}
	End-to-End Identifier	**@msg.e2e_id**	{Msg End-to-End Identifier}
	From the request during the answer processing		
	Version	**@req.version**	{Req Version}
	Message Length	**@req.length**	{Request Length}
	Command Flags: R	**@req.command.flags.R**	{Req R Command Flag}

Specifier			
	Command Flags: P	**@req.command.flags.P**	{Req P Command Flag}
	Command Flags: E	**@req.command.flags.E**	{Req E Command Flag}
	Command Flags: T	**@req.command.flags.T**	{Req T Command Flag}
	Command Flags: r4	**@req.command.flags.r4**	{Req r4 Command Flag}
	Command Flags: r5	**@req.command.flags.r5**	{Req r5 Command Flag}
	Command Flags: r6	**@req.command.flags.r6**	{Req r6 Command Flag}
	Command Flags: r7	**@req.command.flags.r7**	{Req r7 Command Flag}
	Command Code	**@req.command.code**	{Req Command Code}
	Application ID	**@req.application_id**	{Req Application ID }
	Hop-by-Hop Identifier	**@req.hbh_id**	{Req Hop-to-Hop Identifier }
	End-to-End Identifier	**@req.e2e_id**	{Req End-to-End Identifier}
AVP	Sub-Items		
	AVP Drop down list containing all AVP definitions from the base and custom dictionaries. If the AVP selected is of Type Group, then the drop down list will contain only those AVPs belonging to the ParentAVP.		
	AVP Component Drop down list containing the following components: • *Data* • *Data_Length* • *AVP Code* • *Flag V* • *Flag M* • *Flag P* • *Flag r3* • *Flag r4* • *Flag r5* • *Flag r6* • *Flag r7*		

Specifier	
	• *Vendor-ID* Flags V, M, and P are supported; flags r3, r4, r5, r6, and r7 are reserved for future use.
	AVP Instance number Drop down list the indexes of AVP (*First*, *Second*, *Third*, *Fourth*, *Fifth*, *Any*). If "*Any*" is selected in the**AVP instance number** drop-down list, the **Store matched instance into** drop-down list will appear. It contains all provisioned internal variables that are of *integer32*, *integer64*, *unsigned32* and *unsigned64* type.
	Sub-type Specifically used with AVP **`Visited-PLMN-Id`** Drop down list containing types: • *mccmnc* • *mcc* • *mnc*
	Sub-type Specifically used with AVP **`User-Name`** Drop down list containing types: • *realm* • *user* • *realm_decoration* • *user_decoration* • *stripped_decoration* • *proper_user* • *imsi* • *imsi.mccmnc* • *imsi.mcc* • *imsi.mnc*
	Store matched instance into The matching instance value can be saved into any if the *integer types*, *signed/unsigned 32/64 bit*.
	Table 20: From the current messages being processed

xl-formatted Value	Preview Value
`@msg.avp[“name”][index].data`	`{Msg AVP:avp [“Name”][Index].Data}`
`@msg.avp[“name”][index].data_length`	`{Msg AVP:avp [“Name”][Index].Data_Length}`

Specifier	

xl-formatted Value	Preview Value
@msg.avp["*name*"][*index*].*code*	{Msg AVP:avp [“*Name*”][*Index*].*Code*}
@msg.avp["*name*"][*index*].*flags.V*	{Msg AVP:avp [“*Name*”][*Index*].*Flag V*}
@msg.avp["*name*"][*index*].*flags.M*	{Msg AVP:avp [“*Name*”][*Index*].*Flag M*}
@msg.avp ["*name*"][*index*].*flags.P*	{Msg AVP:avp [“*Name*”][*Index*].*Flag P*}
@msg.avp ["*name*"][*index*].*flags.r3*	{Msg AVP:avp [“*Name*”][*Index*].*Flag r3*}
@msg.avp ["*name*"][*index*].*flags.r4*	{Msg AVP:avp [“*Name*”][*Index*].*Flag r4*}
@msg.avp ["*name*"][*index*].*flags.r5*	{Msg AVP:avp [“*Name*”][*Index*].*Flag r5*}
@msg.avp ["*name*"][*index*].*flags.r6*	{Msg AVP:avp [“*Name*”][*Index*].*Flag r6*}
@msg.avp ["*name*"][*index*].*flags.r7*	{Msg AVP:avp [“*Name*”][*Index*].*Flag r7*}
@msg.avp ["*name*"][*index*].*vendor_id*	{Msg AVP:avp [“*Name*”][*Index*].*Vendor-ID*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*data*	{Msg AVP:avp[“*ParentAVP Name*”] [*Index*].avp["*AVP Name*"][*Index*].*Data*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*data_length*	{Msg AVP:avp[“*ParentAVP Name*”] [*Index*].avp["*AVP Name*"][*Index*].*Data_Length*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*code*	{Msg AVP:avp[“*ParentAVP Name*”] [*Index*].avp["*AVP Name*"][*Index*].*Code*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.V*	{Msg AVP:avp[“*ParentAVP Name*”] [*Index*].avp["*AVP Name*"][*Index*].*Flag V*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.M*	{Msg AVP:avp[“*ParentAVP Name*”][*Index*].avp["*AVP Name*"][*Index*].*Flag M*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.P*	{Msg AVP:avp[“*ParentAVP Name*”][*Index*].avp["*AVP Name*"][*Index*].*Flag P*}

Specifier	

xl-formatted Value	Preview Value
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r3*	{Msg AVP:avp[“*ParentAVP Name*”][*Index*].avp["*AVP Name*"][*Index*].*Flag r3*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r4*	{Msg AVP:avp[“*ParentAVP Name*”][*Index*].avp["*AVP Name*"][*Index*].*Flag r4*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r5*	{Msg AVP:avp[“*ParentAVP Name*”][*Index*].avp["*AVP Name*"][*Index*].*Flag r5*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r6*	{Msg AVP:avp[“*ParentAVP Name*”][*Index*].avp["*AVP Name*"][*Index*].*Flag r6*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r7*	{Msg AVP:avp[“*ParentAVP Name*”][*Index*].avp["*AVP Name*"][*Index*].*Flag r7*}
@msg.avp[“*name*”][*index*].avp [“*name*”][*index*].*vendor_id*	{Msg AVP:avp[“*ParentAVP Name*”][*Index*].avp["*AVP Name*"][*Index*].*Vendor-ID*}

Depending on the trigger point, when the processed message being retrieved by the **@msg** xl-formatted values, the following message data is accessible:

Table 21: Trigger Point for message data

Trigger Points	What is returned by the select @msg
RTP1	Header/AVP components from the previously modified (at RTP1) incoming request.
RTP4	Header/AVP components from the previously modified request prior to the application invocation.
RTP6	Header/AVP components from the previously modified request after the application invocation. (If an application, for ex. MAP-Diameter IWF generates request) Header/AVP component from the request generated by the application.
RTP10	Header/AVP components from the previously modified request that is ready to be forwarded by the system.
RTP11	Header/AVP components from the previously modified re-routed request that is ready to be forwarded by the system.
ATP1	Header/AVP components from the previously modified(at ATP1) incoming answer.

Specifier

Trigger Points	What is returned by the select @msg
ATP4	Header/AVP components from the previously modified answer prior to the application invocation.
ATP6	Header/AVP components from the previously modified answer after the application invocation. (If the application, for ex. Map-Diameter IWF generates answer)Header/AVP component from the answer generated by the application.
ATP10	Header/AVP components from the modified answer ready to be forwarded by the system.
DCL triggers	Header/AVP components from the system request/answer being processed.

Table 22: From the request during the answer processing

xl-formatted Value	Preview Value
@req.avp[“*name*”][*index*].*data*	{Req AVP:avp [“*Name*”][*Index*].*Data*}
@req.avp[“*name*”][*index*].*data_length*	{Req AVP:avp [“*Name*”][*Index*].*Data_Length*}
@req.avp[“*name*”][*index*].*code*	{Req AVP:avp [“*Name*”][*Index*].*Code*}
@req.avp[“*name*”][*index*].*flags.V*	{Req AVP:avp [“*Name*”][*Index*].*Flag V*}
@req.avp[“*name*”][*index*].*flags.M*	{Req AVP:avp [“*Name*”][*Index*].*Flag M*}
@req.avp[“*name*”][*index*].*flags.P*	{Req AVP:avp [“*Name*”][*Index*].*Flag P*}
@req.avp[“*name*”][*index*].*flags.r3*	{Req AVP:avp [“*Name*”][*Index*].*Flag r3*}
@req.avp[“*name*”][*index*].*flags.r4*	{Req AVP:avp [“*Name*”][*Index*].*Flag r4*}
@req.avp[“*name*”][*index*].*flags.r5*	{Req AVP:avp [“*Name*”][*Index*].*Flag r5*}
@req.avp[“*name*”][*index*].*flags.r6*	{Req AVP:avp [“*Name*”][*Index*].*Flag r6*}
@req.avp[“*name*”][*index*].*flags.r7*	{Req AVP:avp [“*Name*”][*Index*].*Flag r7*}

Specifier	

xl-formatted Value	Preview Value
@req.avp[“*name*”][*index*].*vendor_id*	{Req AVP:avp [“*Name*”][*Index*].*Vendor-ID*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*data*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Data*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*data_length*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Data_Length*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*code*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Code*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.V*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Flag V*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.M*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Flag M*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.P*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Flag P*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r3*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Flag r3*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r4*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Flag r4*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r5*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Flag r5*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r6*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Flag r6*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r7*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Flag r7*}
@req.avp[“*name*”][*index*].avp [“*name*”][*index*].*vendor_id*	{Req AVP:avp[“*ParentAVP Name*”][*Index*].avp[*AVP Name*"][*Index*].*Vendor-ID*}

<table>
<tr><td>Specifier</td><td></td></tr>
<tr><td></td><td>Depending on the trigger point, when the request is retrieved by using the "<code>@req</code>" xl-formatted values and based on the origin of the answer message, the following request data is accessible:

Table 23: Trigger Point for request data
<table>
<tr><th>Trigger Points</th><th>Answer is received</th><th>Answer is generated</th></tr>
<tr><td>RTP1</td><td colspan="2">N/A</td></tr>
<tr><td>RTP4</td><td colspan="2">N/A</td></tr>
<tr><td>RTP6</td><td colspan="2">N/A</td></tr>
<tr><td>RTP10</td><td colspan="2">N/A</td></tr>
<tr><td>RTP11</td><td colspan="2">N/A</td></tr>
<tr><td>ATP1</td><td>Header/AVP components from the modified request forwarded by the system</td><td>N/A</td></tr>
<tr><td>ATP4</td><td>Header/AVP components from the modified request forwarded by the system</td><td>N/A or Header/AVP components from the modified request.</td></tr>
<tr><td>ATP6</td><td>Header/AVP components from the modified request forwarded by the system</td><td>N/A or Header/AVP components from the modified request.</td></tr>
<tr><td>ATP10</td><td>Header/AVP components from the modified request forwarded by the system</td><td>Header/AVP components from the modified request.</td></tr>
<tr><td>DCL triggers</td><td colspan="2">N/A</td></tr>
</table>
Note: A condition/action will fail at the DCL triggers, when using "<code>@req</code>" xl-formatted values in the conditions and actions.</td></tr>
<tr><td>Linking AVP</td><td>Sub-Items</td></tr>
<tr><td></td><td>Linking-AVP

Drop down list containing all AVP definitions from the dictionary (except for the case where the selected Parent AVP is grouped; then only those AVPs that belong to the group are available).

Note: Sub-LAVPs within a grouped LAVP cannot be retrieved (such as with <code>@store.avp[“name”][index].avp[“name”][index]</code>), modified, or removed.</td></tr>
<tr><td></td><td>Linking-AVP Instance number

Drop down list containing the indexes of the ParentAVP (First, Second, Third, Fourth, Fifth, Any).</td></tr>
</table>

Specifier	
	Linking-AVP Component Drop down list containing the following components: • *Data* • *Data Length* • *AVP Code* • *Flag V* • *Flag M* • *Flag P* • *Flag r3* • *Flag r4* • *Flag r5* • *Flag r6* • *Flag r7* • *Vendor ID* Flags V, M, and P are supported; flags r3, r4, r5, r6, and r7 are reserved flags.

Table 24: Linking-AVP xl-formatted value

xl-formatted Value	Preview Value
@store.avp[“*name*”][*index*].*data*	{LAVP:avp[“*Name*”][*Index*].*Data*}
@store.avp[“*name*”][*index*].*data_length*	{LAVP:avp [“*Name*”][*Index*].*Data_Length*
@store.avp[“*name*”][*index*].*code*	{LAVP:avp[“*Name*”][*Index*].*code*}
@store.avp[“*name*”][*index*].*flags.V*	{LAVP:avp[“*Name*”][*Index*].*Flag V*}
@store.avp[“*name*”][*index*].*flags.M*	{LAVP:avp[“*Name*”][*Index*].*Flag M*}
@store.avp[“*name*”][*index*].*flags.P*	{LAVP:avp[“*Name*”][*Index*].*Flag P*}
@store.avp[“*name*”][*index*].*flags.r3*	{LAVP:avp[“*Name*”][*Index*].*Flag r3*}
@store.avp[“*name*”][*index*].*flags.r4*	{LAVP:avp[“*Name*”][*Index*].*Flag r4*}
@store.avp[“*name*”][*index*].*flags.r5*	{LAVP:avp[“*Name*”][*Index*].*Flag r5*}
@store.avp[“*name*”][*index*].*flags.r6*	{LAVP:avp[“*Name*”][*Index*].*Flag r6*}
@store.avp[“*name*”][*index*].*flags.r7*	{LAVP:avp[“*Name*”][*Index*].*Flag r7*}

Specifier			
	xl-formatted Value	**Preview Value**	
	@store.avp[“*name*”][*index*].*vendor_id*	{LAVP:avp [“*Name*”][*Index*].*Vendor-ID*	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*data*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Data*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*data_length*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Data_Length*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*code*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Code*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.V*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Flags.V*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.M*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Flags.M*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.P*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Flags.P*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r3*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Flags.r3*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r4*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Flags.r4*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r5*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Flags.r5*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r6*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Flags.r6*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*flags.r7*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Flags.r7*}	
	@store.avp[“*name*”][*index*].avp [“*name*”][*index*].*vendor-id*	{LAVP:avp[“*ParentLAVP Name*”][*Index*].avp["*LAVP Name*"][*Index*].*Vendor-ID*}	
Functions	Sub-Items	xl-formatted Value	Preview Value

Specifier			
	Length of	**strlen(*STRING*)**	{Length of (*STRING*)}
	Used to determine the length of a number and then to determine if additional digits should be added or removed. For example, if a 7-digit number is received, a default area code might have to be added to the number. "Length of" always works on string types. If the parameter happens to be a number, then it will be automatically treated as a string by these functions. Hence, strlen(123) will work the same as strlen("123"), and return 3. The input of the function "string" might include other xl-values such as constants, Diameter Header parts, AVP or LAVP parts, or other functions.		
	Hash	**hash(*STRING*, *RANGE*)**	{Hash (*STRING*, *RANGE*)}
	Used for making a routing decision based on the hash generated on the "session-id" AVP. This AVP is present in charging messages such as ACR and CCR. For example, if session-id hashes to 1, then set dest-host to host1, if it hashes to 2, then set dest-host to host2. Because all messages in a session need to go to the same host and they all have the same session-id, the mechanism can be used to send them to the same host without maintaining state. The input of the function "string" might include other xl-values such as contents, Diameter Header parts, AVP or LAVP parts, or other functions.		
	Substring	**substr(*STRING*,*POSITION*, *LENGTH*)** Position can be negative, (counted from the end).	Substring (*STRING*,*POSITION*, *LENGTH*)}
	Used to inspect a part of a string or number and make changes if needed. For example, if the first 4 characters match "+011", then delete the characters. "Substring" works always on string types. The input of the function "position" specifies the position(character) at which the counting of the substring will start. Position 0 indicates the first character of the string. -1 indicates the last character of the string. The input of the function "length" specifies the number of characters to include in the substring. The specified substring will be extracted. For example: substr(@msg.avp["APN-OI-Replacement"][1],0,5)		
	X hours	**hour2sec(*HOURS*)**	{HOURS hours}
	Y minutes	**min2sec(*MINUTES*)**	{MINUTES minutes}

Specifier			
	GMT	**time()**	{GMT time}
	Can be used to perform time of day routing. Certain AVPs carry time, which can be compared against a specified hour and minute to perform time of day routing. The inputs "hours" or "minutes" might include other xl-values.		
	TBCD_decode	**TBCD_decode (*OCTETSTRING*)**	{TBCD_decode (*OCTETSTRING*)}
	TBCD_encode	**TBCD_encode (*STRING*)**	TBCD_encode (*STRING*)}
	TBCD (Telephony Binary Decimal String) is used to represent the digits from 0 to 9, *,#, a,b,c. TBCD is of an octet string type, includes two digits per octet, each digit encoded between 0000 to 1001(0-9), 1010(*), 1011(#), 1100(a), 1101(b) or 1110 (c); 1111 is used as a filler in case of an odd number of digits. The bits 8765 of octet n are encoding digits 2n The bits 4321 of octet n are encoding digits 2(n-1) +1 TBCD_decode function(TBCD_decode(octetstring)): Decode digits(0-9) and specific telephony characters(*, #, a,b,c) from a TBCD-string and return an UTF8String. The input of the function "octetstring" includes AVP or LAVP xl-values. TBCD_encode function(TBCD_encode(string)): Encode digits(0-9) and specific telephony characters(*, #,a,b,c) to a TBCD-string and return an octet string. The input of the function "string" includes other xl-values (constants, Diameter header parts, AVP or LAVP parts, other functions, etc).		
	Position	**Position Integer32 (*value*)**	{Position (*SUBSTRING*,*STRING*)}
	Position function(position(substring,string)) is used to search for a substring in a string and return the position of the first occurrence of a substring. "Position" works always on string and octet string types. The input of the function "substring" and "string" includes other xl-values (constants, Diameter header parts, AVP or LAVP parts, other functions, etc). The corresponding position is returned. Position 0 indicates the first character of the string. Example: position(om,Thomas) will return 2.		
	Get Bit	**getBit (*AVP*,*position*)**	{Get Bit (*AVP*, *Position*)}
	Get Bit function (getBit (AVP, Position)): The function allows retrieving a particular bit from the AVP value in the rule condition part.		

<table>
<tr><td>Specifier</td><td colspan="3"></td></tr>
<tr><td></td><td colspan="3">The input of the function shall include an AVP value and the position index of the bit.

The function works only with the AVPs of Unsigned32 ,Unsigned64, Integer32, Integer64 data types.</td></tr>
<tr><td></td><td>Convert to Integer32</td><td>Integer32 (<<i>value</i>>)</td><td>{Convert to Integer32 (<<i>value</i>>)}</td></tr>
<tr><td></td><td>Convert to Integer64</td><td>Integer64 (<<i>value</i>>)</td><td>{Convert to Integer64 (<<i>value</i>>)}</td></tr>
<tr><td></td><td>Convert to Unsigned32</td><td>Unsigned32 (<<i>value</i>>)</td><td>{Convert to Unsigned32 (<<i>value</i>>)}</td></tr>
<tr><td></td><td>Convert to Unsigned64</td><td>Unsigned64 (<<i>value</i>>)</td><td>{Convert to Unsigned64 (<<i>value</i>>)}</td></tr>
<tr><td></td><td>Convert to Float32</td><td>Float32 (<<i>value</i>>)</td><td>{Convert to Float32 (<<i>value</i>>)}</td></tr>
<tr><td></td><td>Convert to Float64</td><td>Float64 (<<i>value</i>>)</td><td>{Convert to Float64 (<<i>value</i>>)}</td></tr>
<tr><td></td><td>Convert to String</td><td>String (<<i>value</i>>)</td><td>{Convert to String (<<i>value</i>>)}</td></tr>
<tr><td></td><td>Convert to OctetString</td><td>OctetString (<<i>value</i>>)</td><td>{Convert to OctetString (<<i>value</i>>)}</td></tr>
<tr><td></td><td>Convert to Address</td><td>Address (<<i>value</i>>)</td><td>{Convert to Address (<<i>value</i>>)}</td></tr>
<tr><td></td><td colspan="3">Usually the entered xl -formatted values are cast automatically. In some cases, the Administrator might need to enforce the certain interpretation for the entered xl-data. The purpose for Explicit casting is to enable the conversion of an xl-value to the certain DIAMETER protocol format (type), the Administrator shall type "Type", where Type is one of the DIAMETER data types in front of the entered data.

Example: String (@msg.avp["Value-Digits"][1].data)

The conversion is not possible when the value is reasonably non convertible to some specific format, for example, an integer cannot be converted to an IP address. See "no" scenarios in Table 25: Explicit Casting.

The conversion may be possible if the certain conditions are met. For example, an OctetString can be converted to any other format in case, the encoded data fits into the specified enforced format. See Table 25: Explicit Casting.</td></tr>
</table>

Specifier			
	While converting intereger64 to integer32, (the same for unsigned integer 32/64, float32/64) the check is performed to verify if the data loss occurs. In such case the conversion fails.		
	Call Perl Subroutine	**perlsub (*script*, *subroutine*)**	{Call Perl Subroutine(*script*, *subroutine*,*$)}*
	The script is used in the left or right side of the conditions or in the actions and executes an existing perl subroutine in a Condition (See *Table 9: Conditions*) or Action (See Execute Perl Subroutine in the *Actions that modify an AVP*.)		
Operators	Provide the ability to perform mathematical operations on the AVP. • **Plus** • **Minus**	• **+** • **-**	• + • - The connection is on which the request was received.
Connections	**DSR Ingress Connection** is the connection id on which the request was received.	**@dsr.ingress. connection**	{DSR Ingress Connection}
	DSR Egress Connection is the connection ID from which the request is sent.	**@dsr.egress. connection**	{DSR Egress Connection}
	DSR Ingress Connection-Name is the connection name (UTF8String) on which the request was received.	**@dsr.ingress. connection.name**	{DSR Ingress Connection-Name}
	DSR Egress Connection-Nameis the connection name (UTF8String) from which the request is sent.	**@dsr.egress. connection.name**	{DSR Egress Connection-Name}
Peers	**DSR Ingress Peer** is the peer node id from which the request was received.	**@dsr.ingress. peer**	{DSR Ingress Peer}
	DSR Egress Peer is the peer node ID to which the request is sent.	**@dsr.egress.peer**	{DSR Egress Peer}
	DSR Ingress Peer-Name is the peer node name (UTF8String) from which the request was received.	**@dsr.ingress. peer.name**	{DSR Ingress Peer-Name}
	DSR Egress Peer-Name is the peer node name	**@dsr.egress. peer.name**	{DSR Egress Peer-Name}

Specifier			
	(UTF8String) to which the request is sent.		
Internal Variables	Drop down containing all internal variables specified in the system on the screen	**$*name***	{Internal Variable:*name*}
Message	Message Priority is the corresponding priority shall be returned, if the specified xl-value contains the function	**@msg.priority**	{Message Priority}
Back Reference	Number of occurrence of the back reference: input field for one digit; default is 0.	**\<*number*>**	\<*number*>
	Because Back Reference can be part of only a replacement string, this specifier is presented only for the **Substitute in AVP Value** Action.		

Table 25: Explicit Casting

Convert to	Yes	Maybe	No
Integer32 to Integer32			x
Integer32 to Unsigned32	x		
Integer32 to Integer64	x		
Integer32 to Unsigned64	x		
Integer32 to Float32	x		
Integer32 to Float64	x		
Integer32 to String	x		
Integer32 to OctetString	x		
Integer32 to Address			x
Unsigned32 to Integer32	x		
Unsigned32 to Unsigned32			x
Unsigned32 to Integer64	x		
Unsigned32 to Unsigned64	x		
Unsigned32 to Float32	x		
Unsigned32 to Float64	x		
Unsigned32 to String	x		

Convert to	Yes	Maybe	No
Unsigned32 to OctetString	x		
Unsigned32 to Address			x
Integer64 to Integer32		x	
Integer64 to Unsigned32		x	
Integer64 to Integer64			x
Integer64 to Unsigned64	x		
Integer64 to Float32	x		
Integer64 to Float64	x		
Integer64 to String	x		
Integer64 to OctetString	x		
Integer64 to Address			x
Unsigned64 to Integer32		x	
Unsigned64 to Unsigned32		x	
Unsigned64 to Integer64	x		
Unsigned64 to Unsigned64			x
Unsigned64 to Float32	x		
Unsigned64 to Float64	x		
Unsigned64 to String	x		
Unsigned64 to OctetString	x		
Unsigned64 to Address			x
Float32 to Integer32		x	
Float32 to Unsigned32		x	
Float32 to Integer64		x	
Float32 to Unsigned64		x	
Float32 to Float32			x
Float32 to Float64	x		
Float32 to String		x	
Float32 to OctetString	x		
Float32 to Address			x

Convert to	Yes	Maybe	No
Float64 to Integer32		x	
Float64 to Unsigned32		x	
Float64 to Integer64		x	
Float64 to Unsigned64		x	
Float64 to Float32		x	
Float64 to Float64			x
Float64 to String		x	
Float64 to OctetString	x		
Float64 to Address			x
String to Integer32		x	
String to Unsigned32		x	
String to Integer64		x	
String to Unsigned64		x	
String to Float32		x	
String to Float64		x	
String to String			x
String to OctetString	x		
String to Address		x	
OctetString to Integer32		x	
OctetString to Unsigned32		x	
OctetString to Integer64		x	
OctetString to Unsigned64		x	
OctetString to Float32		x	
OctetString to Float64		x	
OctetString to String		x	
OctetString to OctetString			x
OctetString to Address		x	
Address to Integer32			x
Address to Unsigned32			x
Address to Unsigned64			x

Convert to	Yes	Maybe	No
Address to Integer64			x
Address to Float32			x
Address to Float64			x
Address to String	x		
Address to OctetString	x		
Address to Address			x

Enumerations

An Enumeration Type (Enum Type) consists of a name and a set of values. The purpose of the Enum Type is to define the possible values of a data input field.

The allowed values are comma-separated items, which might optionally contain colons. If an item contains a colon, then everything before the colon is a label and everything after the colon is a value. If an item does not contain a colon, then the value and the label are the same.

Pre-defined Enum Types are provided with the Diameter Mediation feature. New Enum Types can be defined with their possible values. When a new Enum Type is created, it automatically appears in the **Conditions** section of the **Diameter > Mediation > Rule Templates** Insert, Copy, and Edit pages, within the list of Right value types. The Enum Type must be created before a Rule template Condition or Action can use it. The values of the Enum Type used by the Mediation Rule Set can be modified after the Rule Template has been created.

When a Right value of a Rule Template Condition is set to an Enum Type, the actual value can be set in a rule only to one of the valid values of the specified Enum Type. This is enforced by presenting a drop down list instead of an input field on the **Diameter > Mediation > Rule Sets** [Insert] and [Edit] pages.

Mediation Enumerations elements

Table 26: Mediation Enumeration elements describe the fields on the **Diameter > Mediation > Enumerations** View, Insert, and Edit pages. Data Input Notes apply only to the Insert and Edit pages; the View page is read-only.

Table 26: Mediation Enumeration elements

Element	Description	Data Input Notes
Name	Name used to label this Enumeration Type in the system. A unique value is required in this field.	Format: String, with valid characters a-z, A-Z, 0-9, dash (-), period (.), @, and underscore (_) Range: 1-64 characters

Element	Description	Data Input Notes
Values	Comma-separated list of possible values. The allowed values are comma-separated items, which might optionally contain colons. If an item contains a colon, then everything before the colon is a label and everything after the colon is a value. If an item does not contain a colon, then the value and the label are the same. A value is required in this field.	Format: List of values that can be separate items (a,b,c) or in the form of <label>:<value> (a:1, b:2,c:3). Range: 1-2048 characters

Viewing Enumerations

Use this task to view all configured **Enumerations**.

The use of Mediation Enumerations is described in *Enumerations*.

Select **Diameter** > **Mediation** > **Enumerations**.

The **Diameter > Mediation > Enumerations** page appears with a list of configured **Enumerations** and their values. The fields are described in *Mediation Enumerations elements*.

Adding an Enumeration

The following procedure can be used to configure a new **Enumeration** type.

A new Enumeration type can be used when defining **Rule Template Conditions** and **Linking-AVPs**.

The fields are described in *Mediation Enumerations elements*.

1. Select **Diameter** > **Mediation** > **Enumerations**.
   The **Diameter > Mediation > Enumerations** page appears.
2. Click **Insert**.
   The **Diameter > Mediation > Enumerations [Insert]** page appears.
3. Enter a unique **Name** for the Enumeration type that is being added.
4. Enter one or more **Values** to associate with this Enumeration **Name**. Use a comma to separate multiple values.
5. Click:
   - **OK** to save the changes and return to the **Diameter > Mediation > Enumerations** page.
     OK is not available until a **Name** is entered.
   - **Apply** to save the changes and remain on the **Diameter > Mediation > Enumerations [Insert]** page.
     Apply is not available until a **Name** is entered.

- **Cancel** to return to the **Diameter > Mediation > Enumerations** page without saving any changes.

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

- The **Name** or **Value** contains characters that are not valid
- The **Value** is empty (not entered)
- The **Name** is not unique
- Creating this new Enumeration type will cause the allowed maximum number of Enumeration types (64) to be exceeded

Editing an Enumeration

Use this procedure to change the Enumeration **Name**, or **Values**, or both.

An item cannot be removed from the comma-separated list of values that is already used by the configured data of a Rule Template or by the Rule Template.

The fields are described in *Mediation Enumerations elements*.

1. Select **Diameter** > **Mediation** > **Enumerations**.
   The **Diameter > Mediation > Enumerations** page appears.
2. Select the row containing the Enumeration to be changed.
3. Click the **Edit** button.
   The **Diameter > Mediation > Enumerations [Edit]** page appears.
4. Change the **Name** or **Values**, or both, associated with the selected Enumeration.
5. Click:
   - **OK** to save the changes and return to the **Diameter > Mediation > Enumerations** page.
     OK is not available if the **Name** field is empty.
   - **Apply** to save the changes and remain on the **Diameter > Mediation > Enumerations [Edit]**.
     Apply is not available if the **Name** field is empty.
   - **Cancel** to return to the **Diameter > Mediation > Enumerations** page without saving any changes.

   If **OK** or **Apply** is clicked and any of the following conditions exist, an error message appears:
   - The **Name** or **Value** contains characters that are not valid
   - The **Name** is not unique
   - An item has been removed from the comma-separated list of values that is already used by the configured data of a Rule Template or by the Rule Template

Deleting an Enumeration

Use the following procedure to delete an Enumeration.

An Enumeration type cannot be deleted if any Rule Templates refer to the **Enumeration** type.

1. Select **Diameter** > **Mediation** > **Enumerations**.
   The **Diameter > Mediation > Enumerations** page appears.

2. Select the **Name** of the Enumeration type to be deleted.
3. Click the **Delete** button.

   A popup window appears to confirm the delete.
4. Click **OK**.

   - **OK** delete the Enumeration type and return to the **Diameter > Mediation > Enumerations** page.
   - **Cancel** to cancel the delete function and return to the **Diameter > Mediation > Enumerations** page.

   When **OK** is clicked and any configured Rule Templates refer to the Enumeration type that is being deleted, the Enumeration type is not deleted and an error message appears.

Triggers

An execution trigger defines a Triggering Point within the message processing logic. When the triggering point is reached, the mediation operations (Rule Sets) associated with that triggering point are executed. The type of the Trigger defines whether the triggering point is part of the request or the answer processing. The Rule Set can be defined to be executed as a part of the Actions of another Rule Set, or it can be triggered at some specific point of the message processing. A Trigger is executed during an ingress and egress message.

Associations of a Trigger with new Rule Sets can be added, existing associations can be removed, and the sequence of the Rule Set Name list can be changed to modify the MP behavior based on the Rule Set execution. The behavior of an MP is the same with and without a Trigger if no Rule Set is associated with the Trigger.

Rule Sets that are associated with a Trigger are executed in the sequence in which they are listed under the Trigger name on the **Diameter > Mediation > Triggers** page.

A Trigger is created by setting a specific point at the Diameter Routing Layer (DRL), Diameter Connection Layer (DCL) or Diameter Application Layer (DAL).

Diameter Routing Layer (DRL) Triggers

Diameter Routing Layer (DRL) Triggers, which enable request and answer messaging using RTP1, RTP10, ATP1, ATP10 and RTP11 trigger points. The Triggers described in *Diameter Routing Layer (DRL) Triggers* are available for Diameter Mediation.

Table 27: Diameter Mediation Routing Layer Triggers

Execution Trigger Name	Message Type	Triggering Point
Diameter request message received from connection	Request	Request Trigger Point 1; occurs upon receipt of a request (RTP1)
Diameter request message ready to be forwarded to connection	Request	Request Trigger Point 10; occurs just before forwarding the request upstream (RTP10)

Execution Trigger Name	Message Type	Triggering Point
Diameter answer message received from connection	Response	Answer Trigger Point 1; occurs upon receipt of an answer (ATP1)
Diameter answer message ready to be forwarded to connection	Response	Answer Trigger Point 10; occurs just before forwarding the answer downstream (ATP10)
Diameter request message attempted for re-route	Request	Request Trigger Point 11 (RTP11); occurs just prior to re-routing the request upstream.

Diameter Connection Layer (DCL)

Diameter Connection Layer (DCL) Triggers enable peer-to-peer messaging using CEx, DWx, DPx trigger points.

The data stored as an Internal Variable or a linking AVP at one of the DCL triggers is valid only inside of the current trigger and can not be accessed by other triggers. The Triggers described in *Diameter Connection Layer (DCL)* are available for Diameter Mediation.

Table 28: Diameter Mediation Connection Layer Triggers

Execution Trigger Name	Message Type	Triggering Point
CER message received from connection	Request	Capabilities- Exchange-Request Trigger Point 1; occurs upon receipt of a CER message (CER1)
CER message ready to be sent	Request	Capabilities- Exchange-Request Trigger Point 10; occurs just prior to sending the CER message (CER10)
CEA message received from connection	Response	Capabilities- Exchange-Answer Trigger Point 1; occurs upon receipt of a CEA message (CEA1)
CEA message ready to be sent	Response	Capabilities- Exchange-Answer Trigger Point 10; occurs just prior to sending the CEA message(CEA10)
DWR message received from connection	Request	Device-Watchdog-Request Trigger Point 1; occurs upon receipt of a DWR message (DWR1)
DWR message ready to be sent	Request	Device-Watchdog-Request Trigger Point 10; occurs just prior to sending the DWR message (DWR10)
DWA message received from connection	Response	Device-Watchdog-Answer Trigger Point 1; occurs upon receipt of a DWA message (DWA1)

Execution Trigger Name	Message Type	Triggering Point
DWA message ready to be sent	Response	Device-Watchdog-Answer Trigger Point 10; occurs just prior to sending the DWA message (DWA10)
DPR message received from connection	Request	Disconnect-Peer-Request Trigger Point 1; occurs upon receipt of a DPR message (DPR1)
DPR message ready to be sent	Request	Disconnect-Peer-Request Trigger Point 10; occurs just prior to sending the DPR message (DPR10)
DPA message received from connection	Response	Disconnect-Peer-Answer Trigger Point 1; occurs upon receipt of a DPA message (DPA1)
DPA message ready to be sent	Response	Disconnect-Peer-Answer Trigger Point 10; occurs just prior to sending the DPA message(DPA10)

Diameter Application Layer (DAL)

Diameter Application Layer (DAL) Triggers can modify the requests and answers based on the condition of the message forwarded to an application or in case the message exits an application. The application can be verified before the template / rule set's execution, when the trigger points are assigned. The **Diameter > Mediation > Triggers [Insert]** screen provides an association between the template (rule set) and the application, with the options to:

- Execute the template (rule set), if the involved application is "name of the application".
- Execute the template (rule set) unconditionally, in other words, for all involved applications.

The Triggers described in *Diameter Application Layer (DAL)* are available for Diameter Mediation.

Table 29: Diameter Mediation Application Triggers

Execution Trigger Name	Message Type	Triggering Point
Diameter request message ready to be forwarded to application	Request	Request Trigger Point 4; occurs just prior to the invocation of an application (RTP4)
Diameter request message received from application	Request	Request Trigger Point 6; occurs immediately after exiting an application (RTP6)
Diameter answer message ready to be forwarded to application	Response	Answer Trigger Point 4; occurs just prior to the invocation of an application (ATP4)
Diameter answer message received from application	Response	Answer Trigger Point 6; occurs immediately after exiting an application (ATP6)

Templates will not be executed if:

- A template (rule set) is assigned to a specific application and the application is disabled, the associated templates (rule sets) will not be executed.
- An application generates an Answer, the templates at RTP6 and ATP4 will not be executed.
- An application generates a Request, the templates at RTP4 and ATP6 will not be executed.
- An application does not stay in the loop for answer processing, the templates at ATP4 or ATP6 will not be executed.

Mediation Triggers elements

Table 30: Mediation Triggers elements describes the fields on the **Diameter > Mediation > Triggers** and **Diameter > Mediation > Triggers [Insert]** pages. The Triggers page is read-only.

Table 30: Mediation Triggers elements

Element	Description
Rule Set Name	The name of each Rule Set that is associated with a Trigger and executed by the triggering point.
Live	A yes sign (check mark) indicates that the Rule Set has been set to the "Active" state (enabled for the live traffic).
DSR Application	The DSR Application is present, when an application Trigger is selected.
Request	The Request drop down is present, when RTP1, RTP4, RTP6, RTP10 or RTP11 is selected on the Triggers Insert screen. If a non-request trigger is selected, the Request drop down is not present.
Scope	The Scope allows activating a template (Rule Set) on either all MPs or a specific MP(s) under the SO.

Insert Triggers elements

Table 31: Adding Triggers elements

Element	Description	Data Input Notes
Rule Set Name	Name of the Rule Set that is to be executed by the triggering point.	Format: Drop down list Range: The Rule Sets (supported by the Trigger and in the "Active" or "Test" state) are listed in the **Rule Set Name** drop down list. Default: First Rule Set that is supported by the Trigger and is in the "Active" or "Test" state.

Element	Description	Data Input Notes
Request	The Request drop down is present, when RTP1, RTP10, RTP11, RTP4, or RTP6 is selected on the Triggers Insert screen. If a non-request trigger is selected, the Request drop down is not present. See *Table 27: Diameter Mediation Routing Layer Triggers* and *Table 29: Diameter Mediation Application Triggers*.	Format: Drop down list Range: Normal Request, Redirected Request, All Default: Normal Request
DSR Application	The DSR Application is present, when an application Trigger is selected. See *Table 29: Diameter Mediation Application Triggers*	Format: Drop down list Range: All enabled DSR Applications Default: All
Scope	The Scope allows activating a template (Rule Set) on either all MPs or a specific MP(s) under the SO.	**Enable on all MPs** Format: Check box Range: Checked or not checked **Available MPs** Format: Drag and drop with **>>** to move the available MPs to **Enable Rule Set on MP(s)**. Range: Available MPs **Enable Rule Set on MP(s)** Format: Drag and drop with **<<** to move the available MPs to **Available MPs**. Range: Enable Rule Set on MP(s)

Viewing Triggers

The operation of Diameter Mediation Triggers is explained in *Triggers*.

To view all existing Mediation Triggers, select **Diameter** > **Mediation** > **Triggers**.

The **Diameter > Mediation > Triggers** page appears, with a list of existing Triggers, and with the Rule Sets that are associated with each Trigger listed under the Trigger name. The fields on the page are described in *Mediation Triggers elements*.

Associating a Rule Set with a Trigger

Use this procedure to associate a Rule Set with a Trigger.

Only Rule Sets with Rule Templates in "Test" or "Active" state can be associated with a Trigger.

The fields are described in *Table 30: Mediation Triggers elements*

1. Select **Diameter** > **Mediation** > **Triggers**.

   The **Diameter > Mediation > Triggers** page appears.

2. The newly assigned Rule Set appears at the bottom of the list of Rule Sets for the Trigger. If the Rule Set sequence needs to be changed, use the **Up** and **Down** buttons to move the Rule Sets to different positions in the list.

   Clicking a Rule Set and the **Up** button moves the selected Rule Set up one position toward the top of the list.

   Clicking a Rule Set and the **Down** button moves the selected Rule Set down one position toward the bottom of the list.

   The **Live** column will show a check mark if the Rule Template for the newly associated Rule Set is in the **`Active`** state for use with live traffic (see the **State & Properties** page).

3. Click **Insert** under the Trigger with which the new Rule Set is to be associated.

   The **Diameter > Mediation > Triggers [Insert]** page opens.

   The **Diameter > Mediation > Triggers [Insert]** page does not open and an error message appears if any of the following conditions exist:

   - There are no Rule Sets that support the Trigger and that are in the **`Active`** or **`Test`** state
   - Associating another Rule Set to the Trigger would cause the total allowed number of associated **`Test`** Rule Sets (10) or **`Active`** Rule Sets (15) to be exceeded

4. Select the desired **Rule Set Name** from the drop down list.

   The default is the first Rule Set in the drop down list.

5. Select the **Request** type for the **Rule Set** from the drop down list.
6. Select the **Scope** of the Rule Set.
7. Click:

   - **OK** to save the new Rule Set association and return to the **Diameter > Mediation > Triggers** page.
   - **Apply** to save the new Rule Set association and remain on the **Diameter > Mediation > Triggers [Insert]** page.

   If **OK** or **Apply** is clicked and the selected Rule Set no longer exists (was deleted by another user), an error message appears.

Removing the Association of a Rule Set with a Trigger

Use the following procedure to remove the association of a **Rule Set** with a **Trigger** and delete the **Rule Set Name** from the list for the Trigger.

1. Select **Diameter** > **Mediation** > **Triggers**.

   The **Diameter > Mediation > Triggers** page appears.

2. Select the **Rule Set Name** in the list under the Trigger name.

3. Click the **Remove** button below the **Rule Set Name** list for the Trigger.

   A popup window appears to confirm the removal.

4. Click:

   - **OK** to remove the association of the Rule Set with the Trigger and delete the Rule Set Name from the list for the Trigger.
   - **Cancel** to cancel the Remove function and return to the **Diameter > Mediation > Triggers** page.

State and Properties

The **Diameter > Mediation > State & Properties** page lists all of the Rule Templates that are configured in the system, and shows the **State**, **Action Error Handling** and **Status of Rule Counters** settings for each Rule Template.

Each Rule Template is in one of the following **State**s at any point of time:

- Development
- Test
- Active

The **Action Error Handling** defines the error handling strategy to be used if any Action in the Rule Template fails.

The **Status of Rule Counters**, when enabled, analyzes the rules and tracks the number of times each rule successfully matches all the conditions in the template. The Rule Template must be in a Test or Active State. See *Editing State and Properties* to enable.

Each Rule Template starts in the “Development” state when it is being created. Rule Templates in the Development state cannot be assigned to Triggers.

After all of the necessary Conditions and Actions are added, the Rule Template must be set to the “Test” State, to indicate that the Rule Template is complete. A Rule Set entry is generated in the Rule Sets left-hand menu folder; the Rule Set can be provisioned with actual data in one or more rules, and can be associated with a Trigger. In the "Test" state, only limited changes can be made to the contents of the Rule Template.(See *Rule Templates*.)

The Rule Template state can be set back to "Development" only when the Administrator privileges are activated for the Diameter Mediation feature. All provisioned data for the Rule Template is lost if the state is set back to "Development".

The Rule Template state can be set to "Test" or the association between the Rule Set and a Trigger can be removed to disable the Rule Set for live traffic.

In the “Test” state a Mediation Rule Set does not affect the live traffic, but the operator can test the newly created, imported, or modified Rule Set that was generated from the Rule Template. The Diagnostics Tool can be used to exercise and test the Rule Templates in the “Test” state, along with Rule Templates in the “Active” state. See Maintenance in the Diameter User's Guide and Reports in the Diameter User's Guide.

When the state of a Rule Template is set to "Active", the Rule Set associated with the Rule Template begins to participate in processing of real traffic messages.

The **Import** function from the **Diameter > Mediation > Rule Templates** page is duplicated on the **Diameter > Mediation > State & Properties** page for use when the Administrator privileges are not activated and the **Diameter > Mediation > Rule Templates** page cannot be accessed. An imported Rule Template is set to "Test" state.

Mediation State & Properties elements

Table 32: Mediation State & Properties elements describes the fields on the **Diameter > Mediation > State & Properties** and **Diameter > Mediation > State & Properties [Edit]** pages. Data Input Notes apply only to the **Diameter > Mediation > State & Properties [Edit]** page; the **Diameter > Mediation > State & Properties** page is read-only.

Table 32: Mediation State & Properties elements

Element	Description	Data Input Notes
Rule Template Name	The name of a configured Rule Template.	The **Diameter > Mediation > State & Properties [Edit]** page shows **Selected Rule Template**; the Name cannot be edited.
State	The state of the Rule Template. "Development" - the Rule Template is disabled for any live or test traffic; it is under development. "Test" - the Rule Sets entry is generated and the Rule Set is enabled only for the special test messages. "Active" - the Rule Template and Rule Set are enabled for any kind of traffic.	Format: Drop down list Range: Development (only for creating and modifying Rule Templates), Test, Active Default: Development
Action Error Handling	Specifies the type of error handling to be used if an Action in a Rule Template fails.	Format: Drop down list Range: ignore the error, immediately exit from the rule template, immediately exit from the trigger point Default: ignore the error
Status of Rule Counters	Enables or disables the rule counters for a specific rule template.	Format: checkbox Range: N/A

Importing a Rule Template

A Rule Template can be imported into the system using the **Import Rule Template** action on the **Diameter > Mediation > State & Properties** page.

Existing Rule Templates can be imported. Existing Rule Templates are previously generated Rule Templates that have been exported from Diameter Mediation using the **Export** action on the **Diameter > Mediation > Rule Templates** page.

Use the following procedure to import a Rule Template located outside of the file system:

1. Select **Diameter** > **Mediation** > **State & Properties**.
   The **Diameter > Mediation > State & Properties** page appears.
2. Click **Import Rule Template**.
   The **Diameter > Mediation > State & Properties [Import]** page appears.
3. Click **Browse** to open the **Choose File** popup window.
4. Navigate to the location of the Rule Template file that you want to import.
5. With the Rule Template filename displayed in the **File name** field, click **Open**.
   The filename appears in the **Choose a file to import** field.
6. Click **Import File**.
   The selected Rule Template file is imported, and appears in the **Rule Template Name** list on the **Diameter > Mediation > State & Properties** page.

Editing State and Properties

Use this procedure to change the State and Properties associated with a Rule Template. The changes take effect immediately after **OK** or **Apply** is clicked.

The state of a Rule Template can be changed to or from the **`Development`** state only when the Administrator privileges are activated for the Diameter Mediation feature.

A Rule Template state cannot be changed from **`Test`** to **`Development`** for a Rule Template that is referenced by another instance such as another Rule Template or the Execution Trigger.

When a Rule Template state is changed back to **`Development`**, any associated Rule Sets will be deleted from the **Rule Sets** folder.

The fields are described in *Mediation State & Properties elements*.

1. Select **Diameter** > **Mediation** > **State & Properties**.
   The **Diameter > Mediation > State & Properties** page appears.
2. Select the row containing the Rule Template to be changed.
3. Click the **Edit** button.
   The **Diameter > Mediation > State & Properties [Edit]** page appears.
4. Change the **State** and **Action Error Handling**, or both, associated with the selected Rule Template.
5. Check or uncheck the **Status of Rule Counters**.
   Checking this box, with the Rule Template Test or Active, sets the **Status of Rule Counters** column to **Active** on the **State & Properties** screen and the following processes are enabled:

1. The Rule Counters associated to the template are enabled, and start counting the number of matches per rule.
2. The Show Counters button is enabled on the related Rule Sets screen.

Unchecked box sets the column to **Stopped** and the following processes are disabled:

1. The Rule Counters associated to the template are disabled, and counting of the number of matches is stopped.
2. The Show Counters button is disabled on the related Rule Sets screen.

6. Click:

- **OK** to save the changes and return to the **Diameter > Mediation > State & Properties** page.
- **Apply** to save the changes and remain on **Diameter > Mediation > State & Properties [Edit]** page.
- **Cancel** to return to the **Diameter > Mediation > State & Properties** page without saving any changes.

If **OK** or **Apply** is clicked, and the Rule Template state was changed to **`Active`**, and the maximum number of Active Rule Templates (15) already exists in the system, an error message appears.

When the state of a Rule Template is changed from **`Test`** to **`Development`** and the Rule Template is not referenced anywhere, a popup window appears to confirm the change to **`Development`** state.

When the state of a Rule Template is changed from Development to **`Test`**, a new Rule Set appears in the left-hand GUI menu **Rule Sets** folder; the Rule Set has the same name as the Rule Template. (If the Rule Template contains only the **`Execute Rule Template`** Action, then a Rule Set is not generated.) If the new Rule Set has help defined in the Rule Template, the **Help** folder in the left-hand GUI menu is updated to include the Rule Set help.

Deleting a Rule Template

Use the following procedure to delete a Rule Template from the **Diameter > Mediation > State & Properties** list.

When a Rule Template is deleted from the **Diameter > Mediation > State & Properties** page, it is deleted from all other pages at the same time.

1. Select **Diameter** > **Mediation** > **State & Properties**.

   The **Diameter > Mediation > State & Properties** page appears.
2. Select the **Rule Template Name** to be deleted.
3. Click the **Delete** button.

   A popup window appears to confirm the delete.
4. Click:

- **OK** to delete the Rule Template and return to the **Diameter > Mediation > State & Properties** page.
- **Cancel** to cancel the delete function and return to the **Diameter > Mediation > State & Properties** page.

Internal Variables

The **Diameter > Mediation > Internal Variables** page lists all of the Internal Variables that are configured in the system, and shows the Variable Name, Type, Default Value and Description available for each Rule Template. Internal variables represent buffers distinguished by the names and can store data of the specified format. The data stored in the buffers can be used both in the conditions and actions (via the Formatting Value Wizard screen) and it is accessible during the whole transaction.

Internal Variables are created by:

- Setting the unique name.
- Selecting the type for enabling syntax checks of the stored values.
- Setting default value (optional). The default value is used in case the user does not provision/assign a new value to the variable. Note: It is also possible to leave the internal variable empty.
- Writing a short description (optional) explaining what is the purpose of the variable and how it is used in the templates/rules.

After the new variable is created it becomes accessible on the *Formatting Value Wizard*. The user can provision/assign the value of the internal variable by means of newly introduced "Set Internal Variable" action. The internal variable is SET when:

- The default value is provisioned and not overwritten by the action "Set Internal variable"
- The action "Set Internal Variable" assigns a value to the internal variable
- Any of the AVPs has matched the criteria and the option "Store matched instance into" has been chosen. The index number of the matched AVP is stored under the specified internal variable.

The value of the variable can be a static value, the value coming from the message, some previously stored value, etc. The next template can contain the condition which uses the previously provisioned internal variable. All newly created variables of integer types (both signed and unsigned) are accessible as AVP instance numbers on the Formatting Value Wizard screen. If the specified xl-value contains an internal variable ($name), the value of the variable set previously shall be used.

Mediation Internal Variables elements

Table 33: Mediation Internal Variables elements describe the fields on the **Diameter > Mediation > Internal Variables** Insert, Edit and Delete pages. Data Input Notes apply only to the Insert and Edit pages.

Table 33: Mediation Internal Variables elements

Element	Description	Data Input Notes
Variable Name	Name used to label this Internal Variable in the system. A unique value is required in this field.	Default = n/a. Range = A 32 character string. A variable name must start with a letter, the rest of the name can consist of letters, numbers and underscore characters. The variable name is case sensitive.

Element	Description	Data Input Notes
Type	The data format of the variable. A value is required in this field.	Default = Integer32. Drop down list of all available AVP data formats are: • Integer32 • Integer64 • Unsigned32 • Unsigned64 • Float32 • Float64 • Address • Time • UTF8String • DiameterIdentity • DiameterURI • OctetString
Default Value	An optional value to initialize the variable in this field.	Default value of the variable. Range is a maximum of 255 character string. If the variable is data type Integer then you cannot enter a 255 character string.
Description	Short description of the variable. A value is not required in this field.	Default = n/a. Range = A 255 character string.

Viewing Internal Variables

Use this task to view all configured **Internal Variables**.

The use of Internal Variables is described in *Internal Variables*.

Select **Diameter** > **Mediation** > **Internal Variables**.

The **Diameter > Mediation > Internal Variables** page appears with a list of configured Internal Variables and their values. The fields are described in *Mediation Internal Variables elements*.

Adding an Internal Variable

The following procedure can be used to configure a new **Internal Variables**.

A new **Internal Variables** can be used when defining **Rule Template Conditions**.

The fields are described in *Mediation Internal Variables elements*.

1. Select **Diameter** > **Mediation** > **Internal Variables**.
   The **Diameter > Mediation > Internal Variables** page appears.

2. Click **Insert**.

   The **Diameter > Mediation > Internal Variables > [Insert]** page appears.
3. Enter a unique name for the **Variable Name** that is being added.
4. Enter a variable **Type** associate with this **Variable Name**.
5. Enter a **Default Value** associate with this **Variable Name**.
   When the **Type** selected is an *OctetString* and the default value does not start with **0x**, it is automatically added. When the **Type** is an *OctetString* the entered default value is automatically down-cased.
6. Enter a short **Description** associate with this **Variable Name**.
7. Click:

   - **OK** to save the changes and return to the **Diameter > Mediation > Internal Variables** page.

     OK is not available until a **Variable Name** and **Type** are entered.
   - **Apply** to save the changes and remain on the **Diameter > Mediation > Internal Variables [Insert]** page.

     Apply is not available until a **Variable Name** and **Type** are entered.
   - **Cancel** to return to the **Diameter > Mediation > Internal Variables** page without saving any changes.

Editing an Internal Variable

Use this procedure to change the Internal Variable **Name**, **Type**, **Default Value** and/or **Description** associated with an **Internal Variables**.

The fields are described in *Mediation Internal Variables elements*.

1. Select **Diameter** > **Mediation** > **Internal Variables**.
   The **Diameter > Mediation > Internal Variables** page appears.
2. Select the row containing the Internal Variable to be changed.
3. Click the **Edit** button.
   The **Diameter > Mediation > Internal Variables [Edit]** page appears.
4. Change the **Default Value** and/or **Description** associated with the selected Internal Variable.
5. Click:

   - **OK** to save the changes and return to the **Diameter > Mediation > Internal Variables** page.

     OK is not available if the **Variable Name** field is empty.
   - **Apply** to save the changes and remain on the **Diameter > Mediation > Internal Variables [Edit]**.

     Apply is not available if the **Variable Name** field is empty.
   - **Cancel** to return to the **Diameter > Mediation > Internal Variables** page without saving any changes.

Deleting an Internal Variable

Use the following procedure to delete an Internal Variable.

An Internal Variable Type cannot be deleted if any Rule Templates refer to the Internal Variable.

1. Select **Diameter** > **Mediation** > **Internal Variable**.
   The **Diameter > Mediation > Internal Variable** page appears.
2. Select the **Name** of the Internal Variable to be deleted.
3. Click the **Delete** button.
   A popup window appears to confirm the delete.
4. Click **OK**.
   - **OK** delete the Internal Variable and return to the **Diameter > Mediation > Internal Variable** page.
   - **Cancel** to cancel the delete function and return to the **Diameter > Mediation > Internal Variable** page.

   When **OK** is clicked and any configured Rule Templates refer to the Internal Variable that is being deleted, the Internal Variable is not deleted and an error message appears.

Measurements

The available Mediation Measurements are:

- Predefined Measurements (pegged automatically)
- Custom Measurements (that can be pegged by the special action)

The **Diameter > Mediation > Measurements** page lists up to 200 custom measurements created by the user. A Peg Counter Action can be set in the Rule Template, once the custom measurement is defined it can be used to set a Peg Counter Action in the Rule Template.

Measurements are set up by:

- Setting the unique name of the measurement.
- Writing a short description (optional) explaining the purpose of the measurement.

For information about how to generate a measurement report, see *Generating a measurements report* in the *Alarms, KPIs and Measurements Reference*. The custom measurements are listed as sub-measurements of the "CAPM_MediationCustomerMeasurements" measurement within the CAPM group in the reports.

Mediation Measurements elements

The *Mediation Measurements elements* describes the fields on the **Diameter > Mediation > Measurements**. Data Input Notes apply only to the Insert and Edit pages.

Table 34: Mediation Measurements elements

Element	Description	Data Input Notes
Measurement Name	Name used to label this Measurement in the system. A unique value is required in this field.	Default = n/a. Range = A 32 character string. A measurement name must start with a letter, the rest of the name can consist of letters, numbers and underscore characters. The measurement name is case sensitive.
Description	Short description of the measurement. A value is not required in this field.	Default = n/a. Range = A 255 character string.

Viewing Measurements

Use this task to view all configured Mediation Measurements.

The use of Mediation Measurements is described in *Mediation Measurements elements*.

Select **Diameter** > **Mediation** > **Measurements**.

The **Diameter > Mediation > Measurements** page appears with a list of configured Measurements.

Adding a Measurement

Use this procedure to configure a new **Measurement**.

The fields are described in *Mediation Measurements elements*.

1. Select **Diameter** > **Mediation** > **Measurements**.
   The **Diameter > Mediation > Measurements** page appears.

   Note: The view screen displays all Measurements provisioned in the system. The column entries shall be **Measurement Name** and **Description**.

   The Measurement Name is in the drop down list of Peg Counter action.

2. Click **Insert**.
   The **Diameter > Mediation > Measurements > [Insert]** page appears.

   Note: An error message will appear, if the maximum number of Mediation Measurements (200) has already been configured in the system.

3. Enter a unique name for the **Measurement Name** that is being added.
4. Enter a short **Description** associated with this Measurement Name.
5. Click:

   - **OK** to save the changes and return to the **Diameter > Mediation > Measurements** page.

     OK is not available until a **Measurement Name** is entered.

- **Apply** to save the changes and remain on the **Diameter > Mediation > Measurements [Insert]** page.

  Apply is not available until a **Measurement Name** is entered.

- **Cancel** to return to the **Diameter > Mediation > Measurements** page without saving any changes.

Editing a Measurement

Use this procedure to change the Measurement Name and Description associated with a **Measurement**.

The fields are described in *Mediation Measurements elements*.

1. Select **Diameter** > **Mediation** > **Measurements**.
   The **Diameter > Mediation > Measurements** page appears.
2. Select the row containing the **Measurement Name** to be changed.
3. Click the **Edit** button.
   The **Diameter > Mediation > Measurements [Edit]** page appears.
4. Change the **Description** associated with the selected Measurement.

   Note: The measurement name cannot be changed.

5. Click:
   - **OK** to save the changes and return to the **Diameter > Mediation > Measurements** page.

     OK is not available if the **Measurement Name** field is empty.
   - **Apply** to save the changes and remain on the **Diameter > Mediation > Measurements [Edit]**.

     Apply is not available if the **Measurement Name** field is empty.
   - **Cancel** to return to the **Diameter > Mediation > Measurements** page without saving any changes.

Deleting a Measurement

Use the following procedure to delete a **Measurement**.

1. Select **Diameter** > **Mediation** > **Measurements**.
   The **Diameter > Mediation > Measurements** page appears.
2. Select the row containing the **Measurement Name** to be deleted.
3. Click the **Delete** button.
   A popup window appears to confirm the delete.
4. Click **OK**.
   - **OK** delete the Measurement and return to the **Diameter > Mediation > Measurements** page.
   - **Cancel** to cancel the delete function and return to the **Diameter > Mediation > Measurements** page.

When **OK** is clicked and any configured Rule Templates or rules refer to the Measurement that is being deleted, the Measurement is not deleted and an error message appears.

Rule Sets

A Rule Set is generated from a Rule Template that was defined on the **Diameter > Mediation > Rule Templates** page, when the Rule Template state is changed from Development to Test or Active. The **Diameter** > **Mediation** > **Rule Sets** GUI folder contains an entry for each generated Rule Set. If no Rule Sets have been generated, the **Rule Sets** folder contains no entries. All rules in a Rule Set are specific to the Rule Template from which the Rule Set was generated. The Rule Set View screen provides up to 8 levels deep AVPs.

Clicking a **Rule Sets** entry opens the **Diameter > Mediation > Rule Sets > {name}** GUI page for the Rule Set ({name} is the name of the Rule Set).

The condition set expression and actions are displayed above the Rule Set in a form of an **IF** (Condition set expression) and **THEN** (Actions).

The **Diameter > Mediation > Rule Sets > {name}** page displays the following columns:

- **Rule Id**

  A **Rule Id** column appears at the left of the rules list that is a unique number from the database table that identifies each rule in the Rule Template.

- **Move the rule**

  A **Move the rule** column appears at the left of Rules ID and at the right of the rules list when there are rules that are allowed to be moved up or down in the list to change the order of rule execution.

  Up and buttons in the **Move the rule** columns can be used to move a rule up one **Down** position in the list or down one position in the list each time the button is clicked.

  Up and **Down** buttons appear in the **Move the rule** columns for a rule or rule group when the order of the rules is allowed to be changed, with the following restrictions:

  - When the **Filter** function or clicking a Condition column heading is used to sort the columns, the **Move the rule** columns are not displayed. The **Restore Order** button can be clicked to return the list to its original order.
  - If all of the conditions in the rule support **Fast Search**, then the **Move the rule** columns are not displayed. See *Fast Search*.
  - If there is at least one condition that does not support **Fast Search**, then the **Up** and **Down** buttons are displayed according to the following rules:
    - All of the rules that support **Fast Search** always appear in the list before any rules that do not support **Fast Search**.
    - The rows that have exactly the same data in the conditions that support **Fast Search** form a group. Rows can be moved only within their group; the **Up** and **Down** buttons are enabled and disabled accordingly.

      Table 35: Example of Default Ordering of Rules in a Rule Set shows an example of default ordering of rules.

Table 35: Example of Default Ordering of Rules in a Rule Set

Fast-search condition 1	Fast-search condition 2	Non fast-search condition 3
abc	1	-
abc	12	-
abc	-	-
abcd	1	-
abcd	1	a1
abcd	-	b1
-	1	a1
-	1	b1
-	-	-

Each row across the columns is inserted (created) in the list when a rule is provisioned. The rules on a **Diameter > Mediation > Rule Sets > {name} page** are looked up in the database in the order in which they are listed on the page. By default, the rules are sorted in the list by condition in the following order:

- First the conditions, in alphabetical order from left to right, that have the **Fast Search** option enabled
- Followed by any conditions, in the order that they were provisioned, that do not have the **Fast Search** option enabled.
- Though all rules in a Rule Set have the same conditions available, rules can be provisioned with one or more of the conditions "empty" (with no values), indicating that the condition is always matched in message processing. The rules with empty conditions are listed after the rules that contain values for the same conditions.

When a Rule Set entry is selected in the **Rule Sets** folder, the **Diameter > Mediation > Rule Sets > {name}** page opens for the selected Rule Set.

On each **Diameter > Mediation > Rule Sets > {name}** page, a user can perform the following actions:

- Filter by the column contents, to display only the rules with the desired contents.
- If the **Move a rule** columns are displayed and contain **Up** and **Down** buttons, move rules up and down in the list to change the order of execution of the rules in the Rule Set.
- Click **Insert** to add a new rule.

  The **Diameter > Mediation > Rule Sets > {name} [Insert]** page opens.

  The **Diameter > Mediation > Rule Sets > {name} [Insert]** page will not open if adding a new rule will cause the allowed maximum number of rules in the Rule Set (250) to be exceeded.

  The **Diameter > Mediation > Rule Sets > {name} [Insert]** page will not open if adding a new rule will cause the allowed maximum total number of rules in the system (3750) to be exceeded.

  Rule Templates without any conditions form a special case, because their provisioned rule unconditionally matches. The Rule Sets generated from these Rule Templates allow only one rule to be provisioned.

- Click **Import** to import rules from an either XML-file (Rule Template) that is in a "Test" or "Active" state.
- Click **Delete All Rules** to delete all of the rules that have been provisioned for this Rule Set.
- Select a rule and click **Edit**.

  The **Diameter > Mediation > Rule Sets > {name} [Edit]** page opens. You can change the Values of the Conditions and Actions for the selected rule.

- Select a rule and click **Delete** to delete the rule from the Rule Set list.
- Click **Export** to export rules to create an XML-file containing the Mediation version number, Template Definition, the provisioned values of the conditions and actions for each rule.
- Select **Show Counters** to open the **Rule Counters** column of the Rule Set. A Total Pegs column displays the number of times the specific rule is matched.

  If **Show Counters** is grayed out the **Rule Counters** will not open. To enable see *Editing State and Properties*.

  When the Rule Sets View screen is expanded with the Rule Counters, the following buttons are available:

  - Click **<<Hide Counters** to hide the Rule Counters column.
  - Click **Expand Counters** expands more sub-columns under the Rule Counters for all MPs under the SO. Each sub-column is MP name and displays the counters for each.
  - Click **Collapse Counters** to hide the MP counters.

- The **Pause Updates** box is unchecked by default. This means the counters refreshes every 30 second to provide the user a printout on the GUI screen. Checking the **Pause Updates** box pauses the counters. To disable the counter, see *Editing State and Properties*.

User-defined Rule Sets

Rule Templates that are defined using the **Diameter > Mediation > Rule Templates** page generate new Mediation Rule Sets when the Rule Template is set to the "Test" or "Active" state. These generated Rule Sets appear in the **Diameter** > **Mediation** > **Rule Sets** GUI menu.

If no Mediation Rule Sets have been generated from Rule Templates, rather than being a menu, **Rule Sets** is a page that displays "NO Rule Sets are defined yet".

Adding a user-defined Rule Set

If no Mediation Rule Sets are defined, **Mediation > Rule Sets** is a page that displays "NO Mediation Rule Sets are defined yet", and no Mediation Rule Sets are available to be added here. To define a Mediation Rule Set, use the **Mediation > Rule Templates** page.

Rule Sets elements - View page

Rule Sets elements - View page describes the elements that appear on each **Diameter > Mediation > Rule Sets > {name}** page.

Table 36: Rule Sets Elements - View Page

Element	Description	Data Notes
IF	The list of Condition names AND, OR, or both appears between each of the Conditions.	Auto generated
THEN	Actions from the Rule Template	Auto generated
Rule ID	A unique number from the database table that identifies each rule in the Rule Template.	Auto generated
Move the rule	If all of the conditions in the rule support **Fast Search**, then the Move the rule columns are not displayed. See *Fast Search*. Used to move a rule up or down in the list, to change the order of execution of the rules. The rules are executed in the order shown in the list, from the top of the list to the bottom of the list. The element appears at the left of and at the right of each rule row.	Format: Buttons in two columns under the heading Range: Up, Down One, both, or no buttons appear in the columns, depending on the rule definition.
All Conditions defined on the Rule Template page for this Rule Set	Each condition name is has a separate column in the list and marked with the letter (A, B, C, D, E, etc) in alphabetical order as provisioned in the Rule Templates.	Format, Range, and Default Value vary depending on the Rule Template that was configured for the Rule Set.
All Actions defined on the Rule Template page for this Rule Set	Each Action defined for this Rule task has a separate column in the list that shows the name of the Action, and one or more sub-columns that show the attributes that were defined for the Action and the current values of the attributes. If the Parent AVP or AVP is indexed, then the index is displayed in the square brackets after the AVP attribute name. If an AVP is looked up in the message by its value, "AVP"	Format, Range, and Default Value vary depending on the Rule Template that was configured for the Rule Set.

Element	Description	Data Notes
	shall contain the value prefixed with "=" (if it is a constant) or an xl-value prefixed with "=" (if it is an xl-value). A value can be prefixed with an appropriate indicator of its type or function (such as =, beginning, end, prefix, or suffix).	
Each rule in the Rule Set is a row in the list. The Values assigned to the Conditions and the Values assigned to each attribute of the Actions for a rule are shown in the row for that rule.		

Rule Sets elements - Insert and Edit Pages

Table 37: Maximum Allowed Rule Sets and Rules indicates the maximum number of Rule Sets and rules that are allowed.

Table 37: Maximum Allowed Rule Sets and Rules

Description	Value
Maximum number of provisioned rules in the system	3750
Maximum number of provisioned rules per Rule Set	250

Table 38: Rule Sets Elements - Insert and Edit Pages describes the elements that are shown on a **Diameter > Mediation > Rule Sets > {name}** [Insert] or [Edit] page.

Table 38: Rule Sets Elements - Insert and Edit Pages

Element	Description	Data Input Notes
Field: These elements are display at the top of the page: IF, condition and THEN. The condition section contains the name for the condition followed by the operator followed by *Rule Template Condition Operators*.		
IF	The list of Condition names ANDed, ORed or both appears between each of the Conditions.	Format: Name of the Condition, followed by its Operator. The name and operator cannot be entered or changed.
Condition	A letter that organizes the template layout for each condition	Format: Letter A, B, C, D, E, etc. and the condition set of either ANDed, ORed or Complex Expression.
THEN	The name of each Action that was defined for the Rule Template.	Format: Name

Element	Description	Data Input Notes
		An Action cannot be deleted and a new Action cannot be defined for the rule.
Value: This element shows the fields for the Condition and Action data Values that can be entered or changed. For the [Insert] page, the fields are either empty or show default values. For the [Edit] page, the fields show the currently defined or default values.		
Condition expression Right value	For each defined Condition in the rule, the data value for the Right value type in the Condition. If the **Optional** check box was checked in the Rule Template for this Rule Set, the Right value can be empty (not provisioned). A red asterisk appears after each data value that is required (not optional) in the rule. If the **Fixed** check box was checked in the Rule Template for this Rule Set, the Right value cannot be changed in the rules. If the selected Right value type was an **Enumerated Type**, then the Value column contains a drop down list with the corresponding Enumerated Type values, unless the selected Operator was "exists", "does not exist", "is true" or "is false".	Format: text box Range: Varies depending on the Right value type Default: Varies depending on the Right value type See *Rule Template elements*. The *Formatting Value Wizard* is available to provision Condition Right values that are xl-formatted values; click **[wizard]** that appears after the data value field.
Action fields	The fields to use to define the data values for Action attributes.	Format: Varies for each type of attribute Range: Varies for each type of attribute See *Rule Template elements*. The *Formatting Value Wizard* is available to provision Action attributes that are xl-formatted values; click **[wizard]** that appears after the data value field.
Description	The description that was defined in the Rule Template for a Condition or an Action on the **Rule Sets** page. The description can provide information such as the format to be used (such as text string or telephone number format) and	Format: descriptive text Range: 1 to 255 characters string

Element	Description	Data Input Notes
	the range of values (such as 1 to 255 characters).	

Adding a Rule to a Rule Set

Use this procedure to define a new rule in a Rule Set. A maximum of 250 rules can be defined in one Rule Set.

There are two sections of a **Diameter > Mediation > Rule Sets > {name} [Insert]** page: **IF** (zero, one, or more Conditions and the condition set of the ANDed, ORed and/or complex expression) and **THEN** (an Action). For a list of the Rule Template elements that appear in a rule and their definitions, see *Rule Template elements*.

When a Rule Template is in the **`Active`** or **`Test`** state, this Rule Template appears as a Rule Set in the **Diameter** > **Mediation** > **Rule Sets** menu folder. The order in which rules appear on a **Diameter > Mediation > Rule Sets > {name}** page determines the order in which the conditions are processed. The **Up** and **Down** buttons next to the rules can be used to change the order of processing.

1. Select **Diameter** > **Mediation** > **Rule Sets** > **{name}**.

   The selected **Diameter > Mediation > Rule Sets > {name}** page opens.

2. Click the **Insert** button.

   The **Diameter > Mediation > Rule Sets > {name} [Insert]** page opens.

   If the maximum number of rules are already defined for the Rule Set (250) , the **Diameter > Mediation > Rule Sets > {name} [Insert]** page will not open, and an error message is displayed.

3. Enter the Value for each condition that appears under **IF** in the **Field** section for the new rule.
4. Enter the Value for each attribute of the Action that appears under **THEN** in the **Field** section for the new rule.
5. When the rule definition is complete, click:

   - **OK** to save the new rule and return to the **Diameter > Mediation > Rule Sets > {name}** page. The rule name appears in the list on the page.
   - **Apply** to save the new rule and remain on the **Diameter > Mediation > Rule Sets > {name} [Insert]** page for additional changes.
   - **Cancel** to return to the **Diameter > Mediation > Rule Sets > {name}** page without saving the changes.

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

   - Any mandatory input fields are empty
   - Any input Value fields in the Conditions or Actions did not conform to the required syntax defined by the Right value type or the Action definition
   - Another rule exists within the Rule Set with the same Values in the Condition section; the rule Condition already exists in the Rule Set
   - Adding the new rule would cause the allowed maximum number (250) of rules in a Rule Set in the system to be exceeded
   - Adding the new rule would cause the allowed maximum number (250000) of rules in the system to be exceeded

6. When the Rule Set definition and testing are complete, go to the **Diameter Mediation State & Properties** page.
   a) Change the Rule Template **State** from Test to Active.
   b) Set the **Action Error Handling** property, if needed.

   The state can be changed to Active after the testing is successful, the Rule Set data is provisioned, the Rule Set is associated with a Trigger, and the Rule Set is ready to use in live traffic.

Deleting All Rules from a Rule Set

Use this procedure to delete all rules from a Rule Set.

1. Select **Diameter** > **Mediation** > **Rule Sets** > **{name}**.

   The selected **Diameter > Mediation > Rule Sets > {name}** page appears.
2. Click **Delete All Rules**.

   A popup window appears to confirm the delete.
3. On the popup window, click:
   - **OK** to delete all rules and return to the **Diameter > Mediation > Rule Sets > {name}** page.
   - **Cancel** to cancel the delete operation and return to the **Diameter > Mediation > Rule Sets > {name}** page.

Changing a Rule in a Rule Set

Use this procedure to change values for a rule in a Rule Set (for a list of Rule Sets elements and their definitions, see *Rule Sets elements - Insert and Edit Pages*):

1. In the **Diameter** > **Mediation** > **Rule Sets** folder, select the Rule Set that contains the rule to be edited.

   The **Diameter > Mediation > Rule Sets > {name}** page appears for the selected Rule Set.
2. Select the rule that needs to be changed.
3. Click **Edit**.

   The **Diameter > Mediation > Rule Sets > {name} [Edit]** page appears.
4. Change values for Conditions under **IF** and Actions under **THEN** as needed.
5. Click:
   - **OK** to save the changes and return to the **Diameter > Mediation > Rule Sets > {name}** page.
   - **Apply** to save the changes and remain on the **Diameter > Mediation > Rule Sets > {name} [Edit]** page.
   - **Cancel** to return to the **Diameter > Mediation > Rule Sets > {name}** page without saving any changes.

Deleting One Rule from a Rule Set

Use this procedure to delete one rule from a Rule Set.

1. Select **Diameter** > **Mediation** > **Rule Sets** > **{name}**.
   The selected **Diameter > Mediation > Rule Sets > {name}** page appears.
2. Select the row for the rule to be deleted.
3. Click **Delete**.
   A popup window appears to confirm the delete.
4. On the popup window, click:
   - **OK** to delete the rule and return to the **Diameter > Mediation > Rule Sets > {name}** page.
   - **Cancel** to cancel the delete operation and return to the **Diameter > Mediation > Rule Sets > {name}** page.

Export / Import Rules

The Rule Template can be provisioned with up to 250 rules and data related to the template. To Export or Import rules from provisioned Rule Templates use the **Export** function on the **Diameter > Mediation > Rule Sets > {name} [Export]** or **Import** function on the **Diameter > Mediation > Rule Sets > {name} [Import]** page.

The **Export**/**Import** function is used to solve the following two scenarios:

1. The rules of template X are imported back to template X. Each template is uniquely identified by a UUID number. With the exported rules, the XML-file contains the UUID number as part of a template definition. If the UUID number is the same, the rules are imported back to the original template and no mapping is necessary for the conditions or actions. The rules are imported even if the user changes the name of the template, while in a **Test** or **Active** state. A new UUID number is assigned to the template, when the user moves the original template to the "development" state and changes in conditions/actions.
2. The rules of template X are imported to template Y. In this case the UUID number of the original template does not match with the UUID number of the target template. The process is performed to import by mapping the conditions and actions as follows:
   a. The *Table 39: Conditions correlated by the condition name* table means that if the condition name of the target template is the same as in the original template, the values from the xml-file are imported for this condition.

Table 39: Conditions correlated by the condition name

Template X	Template Y
A: User-name	A: User-name
B: Host IP	B: Connection
C: Visited-PLMN-Id	C: Visited-PLMN-Id
D: Proxy-Host	D: Host IP

The rules mapping process for the conditions are exported from Template X are imported to Template Y as follows:

- A => A
- B => D

- C => C

The values of condition D of Template X are not used.

Condition B of template Y uses the default value defined in the template since no match was found for it. If no default value was provisioned for the mandatory condition in the template, the error message is expected.

b. The *Table 40: Actions are correlated by their type and order* table means that if the values of the action from the xml--file are imported to the action of the same type and matched columns in the target template.

Table 40: Actions are correlated by their type and order

Template X	Template Y
A: Add AVP	A: Add AVP
B: Change AVP code	B: Add AVP
C: Add AVP	C: Add AVP
D: Add AVP	D: Add AVP
E: Set Route List	E: Set AVP value
F: Set AVP value	F: Set AVP value
G: Set AVP value	G: Set Route List
H: Set AVP value	N/A

The actions are correlated as follows:

- A => A
- C => B (second Add AVP to second Add AVP)
- D => C (third Add AVP to third Add AVP)
- default values => D (there is not fourth Add AVP action in the XML file)
- F => E (first Set AVP value to first Set AVP value)
- G => F (second Set AVP value to second Set AVP value)
- E => G (first Set Route List to first Set Route List)

The failures are logged during the import process.

The Import of Rules is very similar to the Insert of Rules. The difference is the data source (xml file instead of values entered on the web page). During the Import, the same checks are performing as seen *Adding a Rule to a Rule Set*.

Exporting a Rules

Use this procedure to export Rules XML-file from within the system to an external location.

The saved .xml contains the following information:

- The Mediation version number used for compatibility check.
- Rule Template definition

- Provisioned right values of the conditions for each rule (importable back from the file)
- Provisioned values of the actions for each rule (importable back from the file)

Note: The Export button is not available (grayed out) for the Rule Set that is in the **`Development`** state (see the **Diameter > Mediation > State and Properties** page).

1. Select the **Diameter** > **Mediation** > **Rule Sets** > **{name}** to export.

   The **Diameter > Mediation > Rule Templates** page appears.

2. Click the **Export** button.

   A **File Download** popup window appears.

3. Click **Browse** to pop up the **Choose File** window.
4. Navigate to the location to which you want to export the Rule Template.
5. Click **Export File**.

   The selected file is saved to the specified location.

Importing a Rules

Use the following procedure to import existing Rules that is located outside of the file system:

1. In the **Diameter** > **Mediation** > **Rule Sets** > **{name}** folder, select the **Rule Sets** that content the rules to be imported.

   The **Diameter > Mediation > Rule Sets > {name}** page appears.

2. Click **Import**.

   The **Diameter > Mediation > Rule Sets > {name} [Import]** page appears.

   At the top of the page, you will find an input field with this text, **Choose a file to import**, a **Browse** button, text (**No file selected**) an **Abort on First Error:** checkbox and an **Import File** button.

3. Check the **Abort on First Error** allows the user to specify if the selected import operation should abort on the first error (when checked-in) or continue.
4. Click **Browse** to open the **Choose File** popup window.
5. Navigate to the location of the Rule Template file you want to import, and select the file.
6. With the Rule Template filename displayed in the **File name** field, click **Open**.

   The filename appears in the **Choose a file to import** field.

7. Click **Import File**.

   The process is performed to import by mapping the conditions and actions.

   1. **Conditions** are correlated by the condition name (the values for the conditions are imported in the conditions with the same name). See *Table 39: Conditions correlated by the condition name*.
   2. **Actions** are correlated by their type (values of the actions are imported into the same actions) and order. See *Table 40: Actions are correlated by their type and order*.

   If the **Import File** button is clicked and any of the following conditions exist, the file is not imported and an error message appears:

   - The selected file does not exist.
   - The selected file is larger than 20 MB.
   - The selected file has wrong .xml structure or missing data.

- The Mediation version of the file is not compatible with the system into which the file is being imported.
- The selected file contains more than the allowed maximum number of rules per rule set (250).
- The selected rule exists with the same conditions.
- A mandatory condition / action of the imported rule are empty.
- Any Operator field in a Condition contains an invalid operator.
- Any Right value field in a Condition or Action parameter is invalid.

Glossary

A

ATP1	Mediation trigger point located immediately after the Diameter Routing Function decodes an ingress Request message received from the Diameter Transport Function.
ATP10	Mediation trigger point located immediately prior to Request message encoding that occurs before forwarding the message to the Diameter Transport Function.
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.

C

CEA	Capability-Exchange-Answer The Diameter response that the prepaid rating engine sends to the Mobile Originated application during capability exchanges.
CER	Capabilities-Exchange-Request A Diameter message that the Mobile Originated application sends to a prepaid rating engine to perform a capability exchange. The

C

	CER (indicated by the Command-Code set to 257 and the Command Flags' 'R' bit set) is sent to exchange local capabilities.The prepaid rating engine responds with a Capability-Exchange-Answer (CEA) message.

D

DAL	Diameter Application Layer
DAS	Diameter Application Server
DCL	Diameter Connection Layer The software layer of the stack which implements Diameter transport connections.
Diameter	Diameter can also be used as a signaling protocol for mobility management which is typically associated with an IMS or wireless type of environment. Diameter is the successor to the RADIUS protocol. The MPE device supports a range of Diameter interfaces, including Rx, Gx, Gy, and Ty. Protocol that provides an Authentication, Authorization, and Accounting (AAA) framework for applications such as network access or IP mobility. Diameter works in both local and roaming AAA situations. Diameter can also be used as a signaling protocol for mobility management which is typically associated with an IMS or wireless type of environment.
DPA	Disconnect-Peer-Answer

D

	A message used by a Diameter node to answer the Disconnect-Peer-Request (DPR).
DPR	Disconnect-Peer-Request A message used by a Diameter node to inform its peer of its intent to disconnect the transport layer. Upon receipt of a DPR, the Disconnect-Peer-Answer (DPA) is returned.
DWA	Device-Watchdog-Answer A Diameter message used with the Device-Watchdog-Request (DWR) message to proactively detect connection failures. If no traffic is detected on a connection between the Mobile Originated application and the prepaid rating engine within the configured timeout period, a DWR message is sent to the prepaid rating engine. If the prepaid rating engine fails to respond with a DWA within the required time, the connection is closed with the prepaid rating engine and initiates failover procedures. All new and pending requests are then sent to the secondary server.
DWR	Device-Watchdog-Request A Diameter message used with the Device-Watchdog-Answer (DWA) message to proactively detect connection failures. If no traffic is detected on a connection between the Mobile Originated application and the Diameter server within the configured timeout period, a DWR message is sent to the Diameter Server. If the Diameter server fails to respond within the required

D

	time, the connection is closed with the Diameter server and initiates failover procedures. All new and pending requests are then sent to the secondary Diameter server.

G

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

I

IWF	InterWorking Function

M

MCCS	Message Copy Configuration Set

N

NOAM	Network Operations, Administration, and Maintenance

R

RTP1	Mediation trigger point located immediately after the Diameter Routing Function finds a valid PTR associated with the ingress Answer message.
RTP10	Mediation trigger point located immediately prior to queuing an Answer message to the Diameter Transport Function.
Rule	An association between a Filter and an Action Set.

S

S

SOAM	System Operations, Administration, and Maintenance

T

TSA	Target Set Address An externally routable IP address that the IPFE presents to application clients. The IPFE distributes traffic sent to a target set address across a set of application servers.