# Oracle® Communications Policy Management

Policy Front End Wireless User's Guide

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Oracle® Communications Policy Management Policy Front End Wireless User's Guide, Release 9.7.3

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# Chapter 1

# About This Guide

**Topics:**



This guide describes how to use the Policy Front End in the Policy Management system.

## How This Guide is Organized

The information in this guide is presented in the following order:

- *About This Guide* contains general information about this guide, the organization of this guide, and how to get technical assistance.
- *Introduction* contains an overview of the guide, the Distributed Routing and Management Application (DRMA) protocol, and the Graphical User Interface (GUI).
- *Configuring a CMP System and MRA, MPE Devices* describes how to configure the CMP to manage the MRA, how to associate an MPE to the MRA, and how to configure an MRA.
- *Monitoring the MRA* describes how to monitor cluster and blade information, DRMA information, and event logs.

## Intended Audience

This guide is intended for the following trained and qualified telecommunications and network installation personnel, such as system operators or system administrators, who are responsible for operating Policy Management devices such as:

- Multimedia Policy Engines (MPE)
- Multi-Protocol Routing Engine (MRA)
- Configuration Management Platform

## 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:<br>(This icon and text indicate the possibility of *personal injury*.) |
|  | Warning:<br>(This icon and text indicate the possibility of *equipment damage*.) |

| Icon | Description |
|---|---|
|  | Caution:<br>(This icon and text indicate the possibility of *service interruption*.) |
|  | Topple:<br>(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 Technology Network (OTN) site. See *Locate Product Documentation on the Oracle Technology Network Site* for more information.

## Locate Product Documentation on the Oracle Technology Network Site

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

1. Access the Oracle Technology Network site at *http://docs.oracle.com*.
2. Click **Industries**.
3. Under the Oracle Communications subheading, click the **Oracle Communications documentation** link.
   The Oracle Communications Documentation page appears with Tekelec shown near the top.
4. Click the **Oracle Communications Documentation for Tekelec Products** link.
5. Navigate to your Product and then the Release Number, and click the **View** link (the Download link will retrieve the entire documentation set).
   A list of the entire documentation set for the selected product and release appears.
6. To download a file to your location, right-click the **PDF** link, select **Save target as**, 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

# Introduction

**Topics:**



This chapter describes the Oracle Policy Front End product (referred to in this document as the Multi-Protocol Routing Agent [MRA]), which is used to scale the Policy Management infrastructure by distributing the PCRF load across multiple MPE devices in the network.

## Policy Front End Overview

The Policy Front End product (referred to in this document as the Multi-Protocol Routing Agent [MRA]) is a product deployed in a Policy Management network that maintains bindings that link subscribers to Multimedia Policy Engine (MPE) devices. An MPE is a Policy Charging and Rules Function (PCRF) device. An MRA ensures that all of a subscriber's Diameter sessions established over the Gx, Gxx, Gx Lite, Rx and Sd reference points reach the same MPE device when multiple and separately addressable MPE clusters are deployed in a Diameter realm.

An MRA device implements the proxy (PA1 variant) DRA functionality defined in the 3GP TS 29.203 [1] and 3GPP TS 29.213 [2] specifications, whereby all Diameter Policy and Charging Control (PCC) application messages are proxied through the MRA device.

When an MRA device receives a request for a subscriber for which it has a binding to an MPE device, it routes that request to an MPE device. If an MRA device does not have a binding, it queries other MRA devices in the Policy Management network, using the proprietary Distributed Routing and Management Application (DRMA) protocol, for a binding. If another MRA device has the binding, the MRA device routes the request to it. If no other MRA device has a binding, the MRA device that received the request creates one.

An MRA device can route requests across multiple MRA clusters within the Policy Management network. Multiple MRA clusters can be deployed in the same domain, (or realm), interconnected as Diameter peers. Each MRA cluster is responsible for a set, (or pool), of MPE clusters as a domain of responsibility. Each MRA cluster is a peer with the MPE clusters in its domain of responsibility. The following diagram shows a typical MRA configuration.

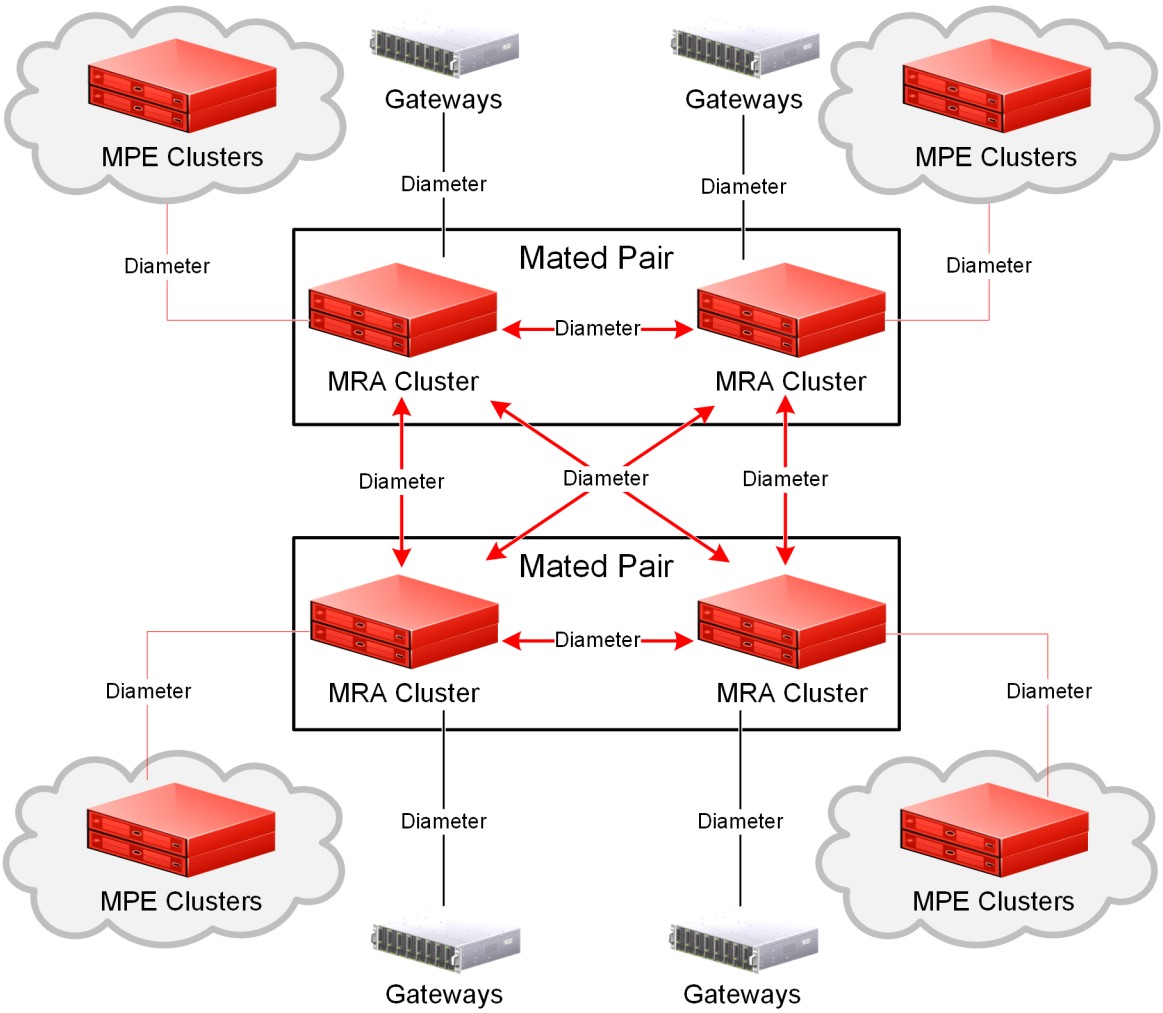



**Figure 1: Typical Front End ( MRA) Network**

## Distributed Routing and Management Application (DRMA) Protocol

The DRMA protocol is an Oracle proprietary Diameter based protocol that allows multiple MRA clusters in the network to communicate and share DRA binding information to ensure all the Diameter sessions for a subscriber are served by the same MPE device. An MRA device may query another MRA device for binding information by sending a DRA-Binding-Request (DBR) command and receiving a DRA-Binding-Answer (DBA) in response.

## Backup MRAs, Associated MRAs, and Mated Pairs

A backup MRA cluster is one with which an MRA cluster shares the same pool of MPE devices. All of the MPE devices in the pool of a given MRA cluster will have backup connections to the backup MRA cluster. An MRA cluster and its backup are considered a mated pair.

An associated MRA cluster is one that is not the backup MRA cluster, but with which there is a connection and to which external binding "lookups" are done.

An MRA cluster can simultaneously be a backup to one MRA cluster and an associate of another. However, an MRA cluster cannot use the same MRA cluster as both a backup and an associate. *Figure 2: Backup and Associated MRA Clusters and Mated Pairs* shows a valid configuration of four MRA clusters, in two mated pairs, and how each cluster views its relationships with the other three. The four MRA clusters form a mesh network.

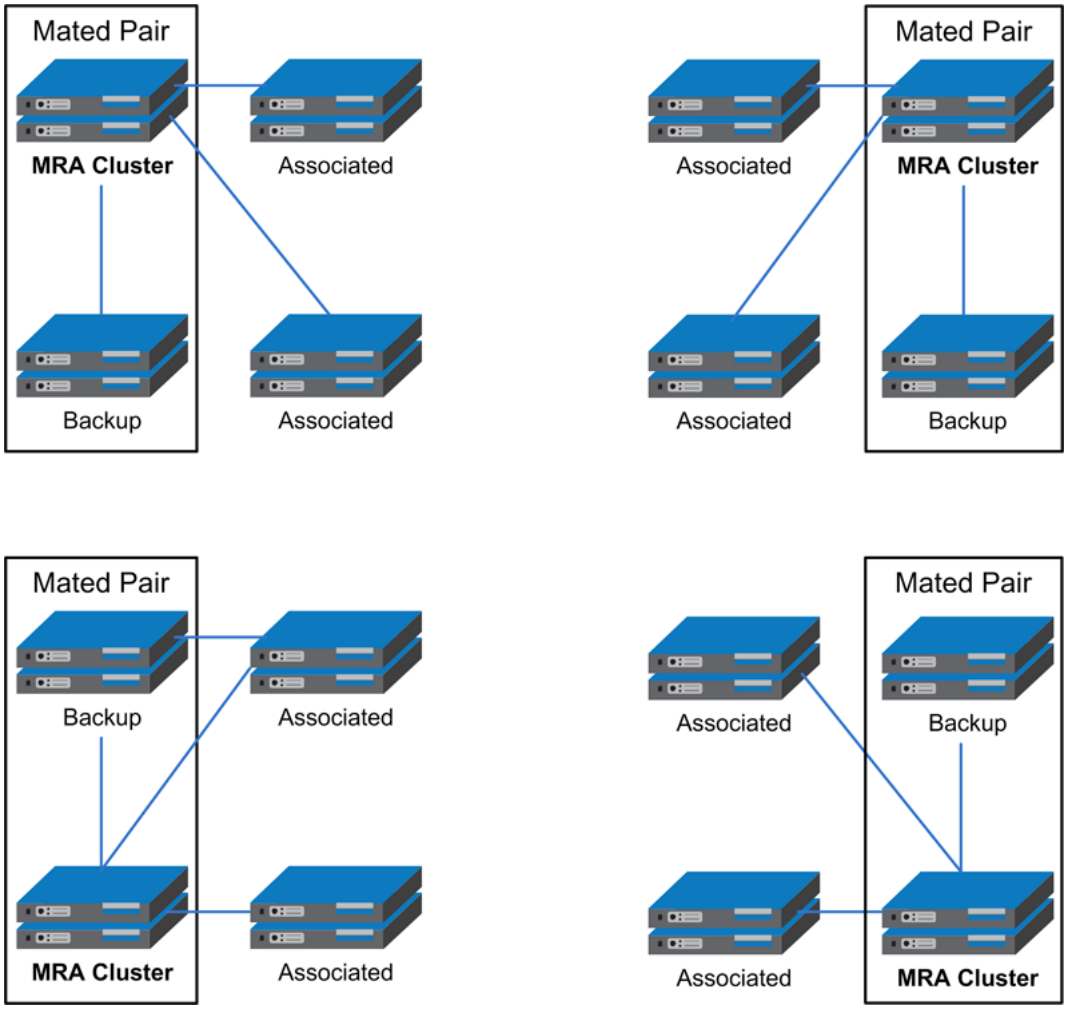



**Figure 2: Backup and Associated MRA Clusters and Mated Pairs**

# GUI Overview

You interact with the CMP system through an intuitive and highly portable graphical user interface (GUI) supporting industry-standard web technologies (, HTTP, HTTPS, IPv4, IPv6, and XML). *Figure 3: Structure of the CMP Wireless GUI* shows the layout of the CMP GUI.

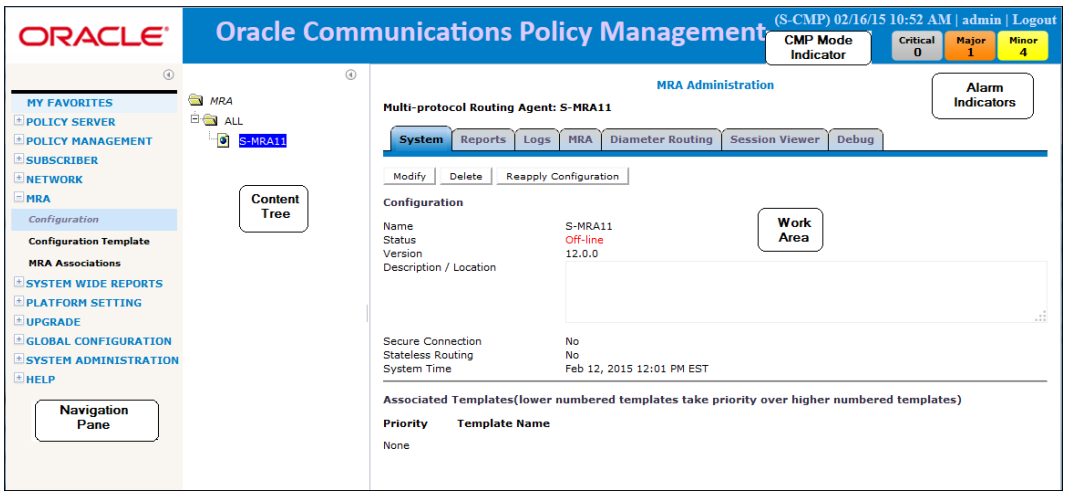



**Figure 3: Structure of the CMP Wireless GUI**

**Navigation Pane** Provides access to the various available options configured within the CMP system.

You can bookmark options in the navigation pane by right-clicking the option and selecting **Add to Favorite**. Access the bookmarks clicking the **My Favorites** folder at the top of the navigation pane. Within the **My Favorites** folder, you can arrange or delete options by right-clicking the option and selecting **Move Up**, **Move Down**, or **Delete from Favorite**.

You can collapse the navigation pane to make more room by clicking the button in the top right corner of the pane ( ). Click the button again to expand the pane.

**Content Tree** Contains an expandable/collapsible listing of all the defined items for a given selection. For content trees that contain a group labeled **ALL**, you can create customized groups that display in the tree.

The content tree section is not visible with all navigation selections.

You can collapse the content tree to make more room by clicking the button in the top right corner of the pane ( ). Click the button again to expand the tree. You can also resize the content tree relative to the work area.

**Work Area** Contains information that relates to choices in both the navigation pane and the content tree. This is the area where you perform all work.

**Alarm Indicators** Provides visual indicators that show the number of active alarms.

| | |
|---|---|
| **CMP Mode Indicator** | Indicates the current CMP mode. **NW-CMP** for Network mode or **S-CMP** for System mode. If there is not a mode indicated, the mode is **CMP**. |

# Chapter 3

# Configuring a CMP System and MRA, MPE Devices

**Topics:**



An MRA is a standalone entity that uses the Oracle Communications Policy Management Configuration Management Platform (CMP) system and an Multimedia Policy Engine (MPE) device.

**Note:** This document assumes that all CMP systems as well as MRA, and MPE devices are operational. Also, the procedures used in this guide are MRA specific; for additional CMP system and MPE device configuration information, refer to the *CMP Wireless User's Guide* and *Policy Wizard Reference Guide*.

# Configuring the CMP to Manage the MRA

The CMP is used to manage all MRA functions. Before this can occur, the CMP must be configured to:

- Access and manage the MRA
- Add the MRA to the CMP

## Creating an MRA Group

To create an MRA group:

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. From the content tree, select the **ALL** group.
   The **MRA Administration** page opens in the work area.
3. Click **Create Group**.
   The **Create Group** page opens.
4. Enter the name of the new CMP group.
   The name can be up to 250 characters long and must not contain quotation marks (") or commas (,).
5. When you finish, click **Save**.

The MRA group is created.

## Deleting an MRA Group

Deleting an MRA group also deletes any associated sub-groups. However, any MRA cluster profiles associated with the deleted groups or sub-groups remain in the ALL group. You cannot delete the ALL group.

To delete an MRA group or sub-group:

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is**ALL**.
2. Select the MRA group or subgroup from the content tree.
   The contents of the selected MRA group are displayed.
3. Click **Delete**.
   A confirmation message displays.
4. Click **OK** to delete the selected group.

The MRA group is deleted.

### Deleting an MRA Cluster Profile from an MRA Group

Removing an MRA cluster profile from an MRA group does not delete the MRA cluster profile from the ALL group, so it can be used again if needed. Removing an MRA cluster profile from the ALL group removes it from all other groups.

To delete an MRA cluster profile from an MRA group (other than ALL):

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. From the content tree, select the MRA group.
   The **MRA Administration** page opens in the work area, displaying the contents of the selected MRA group.
3. Remove the MRA cluster profile using one of the following methods:
   - On the **MRA Administration** page, click the **Delete** icon, located to the right of the MRA cluster profile you want to remove.
   - From the content tree, select the MRA cluster profile; the **MRA Administration** page opens. On the **System** tab, click **Remove**.

   The MRA cluster profile is removed from the group.

## Configuring the CMP System to Manage an MRA Cluster

The Policy Front End (also known as the MRA) device is a standalone entity that supports MPE devices. The CMP system is used to manage all MRA functions. Before this can occur, the CMP operating mode must support managing MRA clusters.

To reconfigure the CMP operating mode, complete the following:


**Caution:** CMP operating modes should only be set in consultation with My Oracle Support (MOS). Setting modes inappropriately can result in the loss of network element connectivity, policy function, OM statistical data, and cluster redundancy.

1. From the **Help** navigation pane, select **About**.
   The **About** page opens, displaying the CMP software version number.
2. Click the **Mode** button.

   Consult with My Oracle Support for information on this button.

   The **Mode Settings** page opens.
3. At the bottom of the page, select **Manage MRAs**.
4. Click **OK**.
   The browser page closes and you are automatically logged out.
5. Refresh the browser page.
   The **Welcome admin** page is displayed.

You are now ready to define an MRA cluster profile, specify network settings for the MRA cluster, and associate MPE devices with the MRA cluster.

## Configuring Protocol Options for an MRA Device

To configure protocol options on an MRA device:

1. From the **MRA** section of the navigation pane, select **Configuration**.
2. From the content tree, select the MRA device.
   The **MRA Administration** page opens.
3. On the **MRA Administration Administration** page, select the **MRA** tab.
   The current configuration options are displayed.
4. Click **Modify** and define options as necessary.

   *Table 2: MRA Protocol Configuration Options* defines available options that pertain specifically to MRA devices. (The options may vary depending on the configuration mode of the system.)
5. When you finish, click **Save** (or **Cancel** to discard your changes).

**Table 2: MRA Protocol Configuration Options**

| Attribute | Description |
|---|---|
| **Subscriber Indexing** | **Note:** The indexing parameters to use depend on what user IDs are needed for correlating various messages to ensure they all end up on the same MPE device for the same user. If you are unsure which indexing method(s) to configure, contact My Oracle Support (*https://support.oracle.com*). |
| Index by IPv4 | Select if the MRA devices in the association should index by IPv4 address. |
| Index by IP-Domain-Id | Select if the MRA devices in the association should index by IP domain ID. The combination of framed IPv4 address and IP domain ID ensures a globally unique binding, even if the same IPv4 address is locally assigned in multiple networks. |
| Index by IPv6 | Select if the MRA devices in the association should index by IPv6 address. |
| Index by Username | Select if the MRA devices in the association should index by account ID. |
| Index by NAI | Select if the MRA devices in the association should index by network access ID. |
| Index by E.164 (MSISDN) | Select if the MRA devices in the association should index by E.164 phone number. |
| Index by IMSI | Select if the MRA devices in the association should index by IMSI number. |
| Index by Session ID | Select if the MRA devices in the association should index by session ID. |
| **Overrides by APN** | Select to perform subscriber indexing for a specific IP address and a specific APN name.<br>1. In the **Overrides by APN** section, click **Add**. |

| Attribute | Description |
|---|---|
| | 2. Enter the APN name and click **Save** to enable **Index by IPv4**, **Index by IP-Domain-Id**,**Index by IPv6**, **Index by Username**, **Index by NAI**, **Index by E.164 (MSISDN)**, **Index by IMSI**, or **Index by Session ID**.<br>You can create APN overrides by cloning or editing existing APN overrides. You can also delete an APN override. |
| Primary Indexing | Select from the pull-down list to set to the type of index that is expected for messages that create bindings, for example Gx CCR-I.<br>**Note:** The type of index selected for primary indexing must also be selected either as an "Index by IMSI" or "Index by E.164" depending on the configuration.<br>⚠Primary Index cannot be changed on a system that has already created bindings without suffering data loss. |
| Protocol Timer Profile | |
| **Diameter** | |
| Diameter Realm | Specifies the MRA device's domain of responsibility (for example, **`galactel.com`**). |
| Diameter Identity | Specifies the Diameter identity of the MRA device (for example, **`pgw1024.galactel.com`**). |
| **S9** | |
| Primary DEA | If one or more Diameter Edge Agents is defined, you can select the primary agent from the pulldown list. For information on defining a DEA, see *Configuring Diameter Peers*. |
| Secondary DEA | If multiple Diameter Edge Agents are defined, you can select the secondary agent from the pulldown list. If you select both primary and secondary DEAs, the MRA device establishes a connection to both DEAs. If the primary connection is down, the MRA device sends messages over the secondary connection; once the primary connection is back up, communication reverts back to it. |
| **RADIUS Configuration** | |
| RADIUS Enabled | When selected, the MRA device processes RADIUS messages; when deselected, RADIUS messages are ignored. The default is deselected. |
| Secret | Enter the default passphrase (a text string). This shared secret value is used when no shared secret is defined for a specific RADIUS network element. If you enter no passphrase, and either of the fields in the associated network elements are unset as well, then the MRA device ignores RADIUS requests and responses. The default is **radius**. |

# Modifying MRA System Settings, Grouping or deleting MRA devices

Once an MRA has been created you can change the system settings, group the MRA devices, or delete an MRA device from the CMP.

## Defining an MRA Cluster Profile

You must define a profile for each MRA cluster you are managing. To define an MRA cluster profile:

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. From the content tree, select the ALL group.
   The **MRA Administration** page opens in the work area.
3. Click **Create Multi-protocol Routing Agent**.
   The **New MRA** page opens.
4. Enter information as appropriate for the MRA cluster:
   a) **Associated Cluster** (required) — Select the MRA cluster from the pulldown list.
   b) **Name** (required) — Enter a name for the MRA cluster.
      The name can be up to 250 characters long. The name can contain any alphanumeric characters except quotation marks (") and commas (,).
   c) **Description/Location** (optional) — Free-form text.
      Enter up to 250 characters.
   d) **Secure Connection** — Select to enable a secure HTTP connection (HTTPs) instead of a normal connection (HTTP).
      The default is a non-secure (HTTP) connection.
   e) **Stateless Routing** — Select to enable stateless routing. In stateless routing, the MRA cluster only routes traffic; it does not process traffic.
      The default is stateful routing.
5. When you finish, click **Save**.

The MRA cluster profile is defined. If you are setting up multiple MRA clusters, you must define multiple cluster profiles. Repeat the above steps to define additional profiles.

## Modifying an MRA Cluster Profile

To modify MRA cluster profile settings:

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. From the content tree, select the MRA cluster profile.
   The **MRA Administration** page opens in the work area.
3. Select the **System** tab of the **MRA Administration** page
4. Click **Modify**.
   The **Modify System Settings** page opens.

5. Modify MRA system settings.
6. When you finish, click **Save**.

The MRA cluster profile settings are modified.

## Reversing Cluster Preference

You can change the preference, or predilection, of the servers in a cluster to be active or spare. This setting is only available when the system has been configured for georedundancy.

To reverse cluster preference:

1. From the **Platform Setting** section of the navigation pane, select **Topology Settings**.
   The **Cluster Configuration** page opens.
2. Select the cluster from the content tree.
   The **Topology Configuration** page opens, displaying information about the selected cluster.
3. Click **Modify Cluster Settings**.
   The fields become editable.
4. In the **Cluster Settings** section of the page, toggle the **Site Preference** between **Normal** and **Reverse**.
5. Click **Save**.

The cluster preferences are reversed.

## Forcing a Server into Standby Status

You can change the status of a server in a cluster to Forced Standby. A server placed into Forced Standby status is prevented from assuming the role Active. You would do this, for example, to the active server prior to performing maintenance on it.

When you place a server into forced standby status, the following happens:

- If the server is active, the server is demoted.
- The server will not assume the active role, regardless of its status or the roles of the other servers in the cluster.
- The server continues as part of its cluster, and reports its status as "Forced-Standby."
- The server coordinates with the other servers in the cluster to take the role Standby or Spare.


**Caution:** If you force all servers in a cluster into Standby status, you can trigger a site outage.

To force a server into standby status:

1. From the **Platform Setting** section of the navigation pane, select **Topology Settings**.
   The **Topology Configuration** page opens, displaying a cluster settings table listing information about the clusters defined in the topology.
2. In the cluster settings table, in the row listing the cluster containing the server you want to force into standby status, click **View**.
   The **Topology Configuration** page displays information about the cluster.
3. Select the server. Click **Modify Server-A** or **Modify Server-B**, as appropriate.
4. Select **Forced Standby**.

5. Click **Save** (or **Cancel** to abandon your request).
   The page closes.

The server is placed in standby status.

## Setting Up a Non-CMP Cluster

A non-CMP cluster can be one of the following server types:

- MPE
- MRA

Before defining a non-CMP cluster, ensure the following:

- The server software is installed on all servers in the cluster
- The servers have been configured with network time protocol (NTP), domain name server (DNS), IP Routing, and OAM IP addresses
- The server IP connection is active
- The application is running on at least one server

If you are creating a cluster in a georedundant system, see *Setting Up a Georedundant Cluster*.

To define a cluster:

1. From the **Platform Setting** section of the navigation pane, select **Topology Settings**.
   The **Cluster Configuration** page opens.
2. Click **Add MPE/MRA Cluster**.
   The **Topology Configuration** page opens. Each section of the **Topology Configuration** page can be collapsed or expanded.
3. Define the general settings for the cluster in the General Settings section of the page.
   a) **Name** (required) — Name of the cluster. Enter up to 250 characters, excluding quotation marks (") and commas (,).
   b) **Appl Type** — Select the type of server:
      - **MPE** (default)
      - **MRA**
   c) **HW Type** — Select the type of hardware:
      - **C-Class** (default)
      - **C-Class(Segregated Traffic)** (for a configuration where Signaling and other networks are separated onto physically separate equipment)
      - **NETRA** (for a Netra server)
      - **RMS** (for a rack-mounted server)
      - **VM** (for a virtual machine)
   d) **OAM VIP** (optional) — The OAM VIP is the address the CMP cluster uses to communicate with the MPE or MRA cluster. Enter up to two OAM VIP addresses (one IPv4 and one IPv6) and their masks. Enter the IPv4 address and mask of the OAM VIP.

      Enter the address in the standard dot format and the subnet mask in CIDR notation from 0–32 (IPv4), or standard 8-part colon-separated hexadecimal string format and the subnet mask in CIDR notation from 0–128 (IPv6).

e) **Signaling VIPs** (required) — The signaling VIP is the IP address a PCEF device uses to communicate with a cluster. A cluster supports redundant communication channels, named SIG-A, SIG-B and SIG-C, for carriers that use redundant signaling channels. Click **Add New VIP** to add a VIP to the system.

**Note:** SIG-C is only available for MRA clusters. See *Configuring SigC in Devices Exposed to PCEF* for more information on configuring for SIG-C.See the *Policy Front End Wireless User's Guide* for more information on configuring for SIG-C.

At least one signaling VIP is required.

You can enter up to four IPv4 or IPv6 addresses and masks of the signaling VIP addresses.

For each new VIP, enter the address and mask in the New Signaling VIP dialog. Select **SIG-A**, **SIG-B** or **SIG-C** to indicate whether the cluster will use an external signaling network.

For an IPv4 address, use the standard dot format, and enter the subnet mask in CIDR notation from 0–32. For an IPv6 address, use the standard 8-part colon-separated hexadecimal string format, and enter the subnet mask in CIDR notation from 0–128.

4. Define the general network configuration for the C-Class, C-Class segregated, or Netra servers in the Network Configuration section of the page. This section is not available for RMS.
   a) Enter the **OAM**, **SIG-A**, **SIG-B** and **SIG-C** VLAN IDs, in the range 1–4095. The defaults are 3 for the OAM network and server IP, 5 for the SIG-A network, and 6 for the SIG-B network.

      **Note:** SIG-C is only available for MRA clusters.

5. Define the settings for **Server-A** in the Server-A section of the page.
   a) **IP** (required) — The IP address of the server. Up to two IP addresses can be entered (one IPv4 and one IPv6). Use the standard dot-formatted IP address string for an IPv4 address, and the standard 8-part colon-separated hexadecimal string format for an IPv6 address.
   b) **IP Preference** — Specify the preferred IP version, either **IPv4** or **IPV6**. If IPv6 is selected, the server will prefer to use the IPv6 address for communication. If neither an IPv6 OAM IP nor a static IP address is defined, the IPv6 radio button cannot be selected here. Similarly, If neither an IPv4 OAM IP nor a static IP address is defined, the IPv4 radio button isn't accessible.
   c) **HostName** — The name of the server. This must exactly match the host name provisioned for this server (the output of the Linux command `uname -n`).

      **Note:** If the server has a configured server IP address, you can click **Load** to retrieve the remote server hostname. If retrieval fails, you must enter the hostname.

   d) **Forced Standby** — Select to put the server into forced standby. (By default, Server A will be the initial active server of the cluster.)
6. (Optional) Click **Add Server-B** and enter the information for the standby server of the cluster. See step *Step 5* for information about the fields.
   Server-B is defined for the cluster.
7. When you finish, click **Save**.
   The following message displays: `The VLAN IDs on the page must match the VLAN IDs configured on the server. A mismatch will cause HA to fail. Please confirm that the VLAN IDs are correct before saving.`
8. Click **OK**.
9. If you are setting up multiple clusters, repeat the steps.

The cluster is defined.

*Figure 4: Sample MRA Cluster Topology Configuration* shows the configuration for a georedundant (two-site) MRA cluster, using SIG-B for a replication network and OAM for the backup heartbeat network, with eight WAN replication streams.

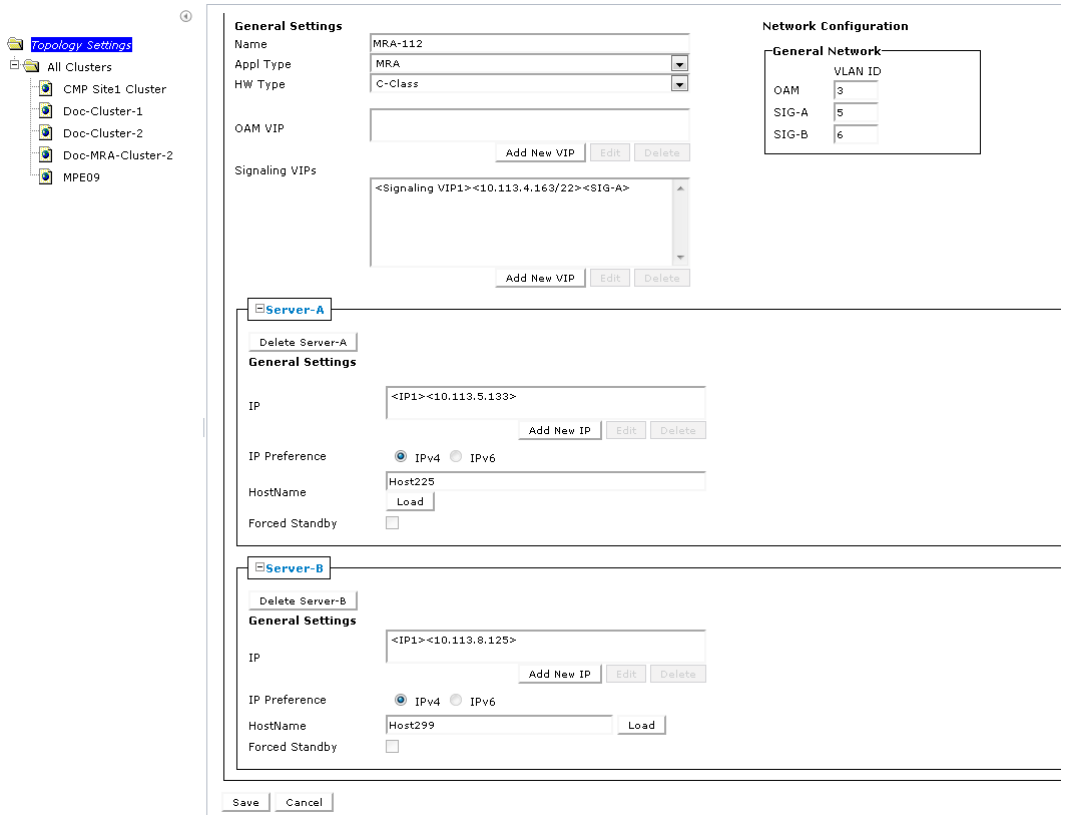



**Figure 4: Sample MRA Cluster Topology Configuration**

## Setting Up a Georedundant Cluster

This procedure contains the steps for setting up a non-CMP cluster:

- MPE
- MRA

Before defining a cluster, ensure the following:

- The server software is installed on all servers in the cluster
- The servers have been configured with network time protocol (NTP), domain name server (DNS), IP Routing, and OAM IP addresses
- The server IP connection is active
- The server application is running on at least one server

If your system is not set up for georedundancy, see *Setting Up a Non-CMP Cluster*.

To define a cluster in a georedundant system:

1. From the **Platform Setting** section of the navigation pane, select **Topology Settings**. The **Cluster Configuration** page opens.
2. From the content tree, select the **All Clusters** folder.

The defined clusters are listed.

3. Click **Add MPE/MRA Cluster**.
   The **Topology Configuration** page opens. Each section of the **Topology Configuration** page can be collapsed or expanded.
4. Define the general settings for the cluster in the **Cluster Settings** section of the page:
   a) **Name** (required) — Name of the cluster. Enter up to 250 characters, excluding quotation marks (") and commas (,).
   b) **Appl Type** — Select the application type:
      - **MPE** (default)
      - **MRA**
   c) **Site Preference** — Select **Normal** (default) or **Reverse**.
   d) **DSCP Marking** — Select the type of Differentiated Services Code Point (DSCP) marking for replication traffic. The valid code points are **AF11**, **AF12**, **AF13**, **AF21**, **AF22**, **AF23**, **AF31**, **AF32**, **AF33**, **AF41**, **AF42**, **AF43** (assured forwarding), **CS1**, **CS2**, **CS3**, **CS4**, **CS5**, **CS6**, **CS7** (class selector), **EF** (expedited forwarding), or **PHB(None)** (the default, for no marking). For information on DSCP marking, see *Setting Up a Non-CMP Cluster*.
   e) **Replication Stream Count** — Select the number of redundant TCP/IP socket connections (streams) to carry replication traffic between sites. Up to 8 streams can be configured. The default value is **1** stream.
   f) **Replication & Heartbeat** — Select a network to carry inter-site replication and heartbeat traffic. This field only appears if the system supports georedundancy:
      - **None** (the default)
      - **OAM**
      - **SIG-A**
      - **SIG-B**
      - **REP**

      A warning icon (  ) indicates that you cannot select a network until you define a static IP address on all servers of both sites.
   g) **Backup Heartbeat** — Select a network to carry inter-site backup heartbeat traffic. This field only appears if the system supports georedundancy:
      - **None** (the default)
      - **OAM**
      - **SIG-A**
      - **SIG-B**
      - **REP**

      A warning icon (  ) indicates that you cannot select a network until you define a static IP address on all servers of both sites.
5. Define the primary site settings in the **Primary Site Settings** section of the page:
   a) **Site Name** — Select **Unspecified** (default) or the name of a previously defined site. If you select **Unspecified**, you create a non-georedundant site, and cannot add a secondary site. You can assign multiple clusters to the same site.

      **Note:** To import the hardware type and VLAN settings from the from the selected site, select **Use Site Configuration**. When this is selected the **HW Type** and VALN IDs become read only.

To edit the field, clear the **Use Site Configuration** checkbox. If **Unspecified** is selected for the site name, the **Use Site Configuration** option becomes unavailable.

b) **HW Type** — Select the hardware type:

- **C-Class** (default)
- **C-Class(Segregated Traffic)** (for a configuration where Signaling and other networks are separated onto physically separate equipment)
- **NETRA** (for a Netra server)
- **RMS** (for a rack-mounted server)
- **VM** (for a virtual machine)

c) **OAM VIP** (optional) — The OAM VIP is the address the CMP cluster uses to communicate with the cluster. Enter the IPv4 address and mask of the OAM virtual IP (VIP) address.

For an IPv4 address, useEnter the address in the standard dot format, and enter the subnet mask in CIDR notation from 0–32. For an IPv6 address, use the standard 8-part colon-separated hexadecimal string format, and enter the subnet mask in CIDR notation from 0–128.

d) **Signaling VIPs** — The signaling VIP is the IP address a PCEF device uses to communicate with the cluster. A non-CMP cluster supports redundant communication channels, named SIG-A and SIG-B, for carriers who use redundant signaling channels.

At least one signaling VIP is required.

Click **Add New VIP** to add a VIP to the system. You can enter up to four IPv4 or IPv6 addresses and masks of the signaling VIP addresses.

For each new VIP, enter the address and mask in the New Signaling VIP dialog. Select **SIG-A** or **SIG-B** to indicate whether the cluster will use an external signaling network.

For an IPv4 address, use the standard dot format, and enter the subnet mask in CIDR notation from 0–32. For an IPv6 address, use the standard 8-part colon-separated hexadecimal string format, and enter the subnet mask in CIDR notation from 0–128.

e) **General Network VLAN ID** — This field appears if you selected **NETRA**, **C-Class**, or **C-Class(Segregated Traffic)**. Enter the **OAM**, **SIG-A**, and **SIG-B** VLAN IDs, in the range 1–4095. The defaults are 3 for the OAM network and server IP, 5 for the SIG-A network, and 6 for the SIG-B network.

f) **User Defined Network** — This field appears if you selected **C-Class** or **C-Class(Segregated Traffic)**. Enter the REP network VLAN ID, in the range 1–4095.

**6.** Define Server-A in the **Server-A** section of the page:

a) **IP** (required) — The IPv4 address of the server. For an IPv4 address, enter it inEnter the standard IP dot-formatted IPv4 address string. For an IPv6 address, enter it in the standard 8-part colon-separated hexadecimal string format.

b) **IP Preference** — Specify the preferred IP version, either **IPv4** or **IPV6**. If IPv6 is selected, the server will prefer to use the IPv6 address for communication. If neither an IPv6 OAM IP nor a static IP address is defined, the IPv6 radio button cannot be selected here. Similarly, If neither an IPv4 OAM IP nor a static IP address is defined, the IPv4 radio button isn't accessible.

c) **HostName** — The name of the server. This must exactly match the host name provisioned for this server (the output of the Linux command `uname -n`).

**Note:** If the has a configured server IP, you can click **Load** to retrieve the remote server hostname. If the retrieve fails, you must enter the hostname.

d) **Forced Standby** — Select to put Server A into forced standby. (By default, Server A will be the initial active server of the cluster.)

e) **Static IP** — If an alternate replication path and secondary HA heartbeat path is used, then a server address must be entered in this field. Click **Add New**. In the New Path dialog, enter an IP address and mask, and select the network.

- **SIG-A**
- **SIG-B**
- **REP**
- **BKUP** (if the hardware type is **C-Class(Segregated Traffic)** or **NETRA**)

7. (Optional) Define Server-B in the **Server-B** section of the page. Click **Add Server-B** and enter the standby server information for the cluster:

a) **IP** (required) — The IPv4 address of the server. For an IPv4 address, enter it inEnter the standard IP dot-formatted IPv4 address string. For an IPv6 address, enter it in the standard 8-part colon-separated hexadecimal string format.

b) **IP Preference** — Specify the preferred IP version, either **IPv4** or **IPV6**. If IPv6 is selected, the server will prefer to use the IPv6 address for communication. If neither an IPv6 OAM IP nor a static IP address is defined, the IPv6 radio button cannot be selected here. Similarly, If neither an IPv4 OAM IP nor a static IP address is defined, the IPv4 radio button isn't accessible.

c) **HostName** — The name of the server. This must exactly match the host name provisioned for this server (the output of the Linux command `uname -n`).

**Note:** If the server has a configured server IP address, you can click **Load** to retrieve the remote server hostname. If retrieval fails, you must enter the hostname.

d) **Forced Standby** — Select to put Server A into forced standby. (By default, Server A will be the initial active server of the cluster.)

e) **Static IP** — If an alternate replication path and secondary HA heartbeat path is used, then a server address must be entered in this field. Click **Add New**. In the New Path dialog, enter an IP address and mask, and select the network:

- **SIG-A**
- **SIG-B**
- **REP**
- **BKUP** (if the hardware type is **NETRA**)

8. Define the secondary site information in the **Secondary Site Settings** section of the page:

a) **Site Name** — Select **Unspecified** (default) or the name of a previously defined site. This site name must be different from the primary site name. If you select **Unspecified**, you create a non-georedundant site, and cannot add a secondary site. You can assign multiple clusters to the same site.

**Note:** To import the hardware type and VLAN settings from the from the selected site, select **Use Site Configuration**. When this is selected the **HW Type** and VALN IDs become read only. To edit the field, clear the **Use Site Configuration** checkbox. If **Unspecified** is selected for the site name, the **Use Site Configuration** option becomes unavailable.

b) **HW Type** — Select the hardware type:

- **C-Class** (default)

- **C-Class(Segregated Traffic)** (for a configuration where Signaling and other networks are separated onto physically separate equipment)
- **NETRA** (for a Netra server)
- **RMS** (for a rack-mounted server)
- **VM** (for a virtual machine)

c) **OAM VIP** (optional) — Enter the IPv4 address and mask of the OAM virtual IP (VIP) address. The OAM VIP is the address the CMP cluster uses to communicate with the cluster.

For an IPv4 address, useEnter the address in the standard dot format, and enter the subnet mask in CIDR notation from 0–32. For an IPv6 address, use the standard 8-part colon-separated hexadecimal string format, and enter the subnet mask in CIDR notation from 0–128.

d) **Signaling VIPs** — The signaling VIP is the IP address a PCEF device uses to communicate with a cluster. Clusters support redundant communication channels, named SIG-A and SIG-B, for carriers that use redundant signaling channels.

At least one signaling VIP is required.

Click **Add New VIP** to add a VIP to the system. You can enter up to four IPv4 or IPv6 addresses and masks of the signaling VIP addresses.

For each new VIP, enter the address and mask in the New Signaling VIP dialog. Select **SIG-A** or **SIG-B** to indicate whether the cluster will use an external signaling network.

For an IPv4 address, use the standard dot format, and enter the subnet mask in CIDR notation from 0–32. For an IPv6 address, use the standard 8-part colon-separated hexadecimal string format, and enter the subnet mask in CIDR notation from 0–128.

e) **General Network VLAN ID** — This field appears if you selected **C-Class**, **C-Class(Segregated Traffic)**, or **NETRA**. Enter the **OAM**, **SIG-A**, and **SIG-B** VLAN IDs, in the range 1–4095. The defaults are 3 for the OAM network and server IP, 5 for the SIG-A network, and 6 for the SIG-B network.

f) **User Defined Network** — This field appears if you selected **C-Class** or **C-Class(Segregated Traffic)**. Enter the REP network VLAN ID, in the range 1–4095.

**9.** Define Server-C in the **Server-C** section of the page. If you define a secondary site, you must define a spare server. Click **Add Server-C** and define the information for the spare server:

a) **IP** (optional) — The IPv4 address of the server. For an IPv4 address, enter it inEnter the standard IP dot-formatted IPv4 address string. For an IPv6 address, enter it in the standard 8-part colon-separated hexadecimal string format.

b) **IP Preference** — Specify the preferred IP version, either **IPv4** or **IPV6**. If IPv6 is selected, the server will prefer to use the IPv6 address for communication. If neither an IPv6 OAM IP nor a static IP address defined, the IPv6 radio button cannot be selected here. Similarly, If neither an IPv4 OAM IP nor a static IP address is defined, the IPv4 radio button isn't accessible.

c) **HostName** — The name of the server. This must exactly match the host name provisioned for this server (the output of the Linux command `uname -n`).

**Note:** If the server has a configured server IP address, you can click **Load** to retrieve the remote server hostname. If retrieval fails, you must enter the hostname.

d) **Forced Standby** — Select **Forced Standby** to ensure that the server is in standby mode.

e) **Static IP** — If an alternate replication path and secondary HA heartbeat path is used, then a server address must be entered in this field. Click **Add New**. In the New Path dialog, enter an IP address and mask, and select the network:

- **SIG-A**
- **SIG-B**
- **REP**

10. When you finish, click **Save** (or **Cancel** to discard your changes).
    You are prompted, "The VLAN IDs on the page must match the VLAN IDs configured on the server. A mismatch will cause HA to fail. Please confirm that the VLAN IDs are correct before saving." Click **OK** (or **Cancel** to stop the save operation).
11. If you are setting up multiple clusters, repeat the above steps as often as necessary.

The cluster is defined.

*Figure 5: Sample MPE Cluster Topology Configuration* shows the configuration for a georedundant (two-site) MPE cluster, using SIG-B for a replication network and OAM for the backup heartbeat network, with eight WAN replication streams.

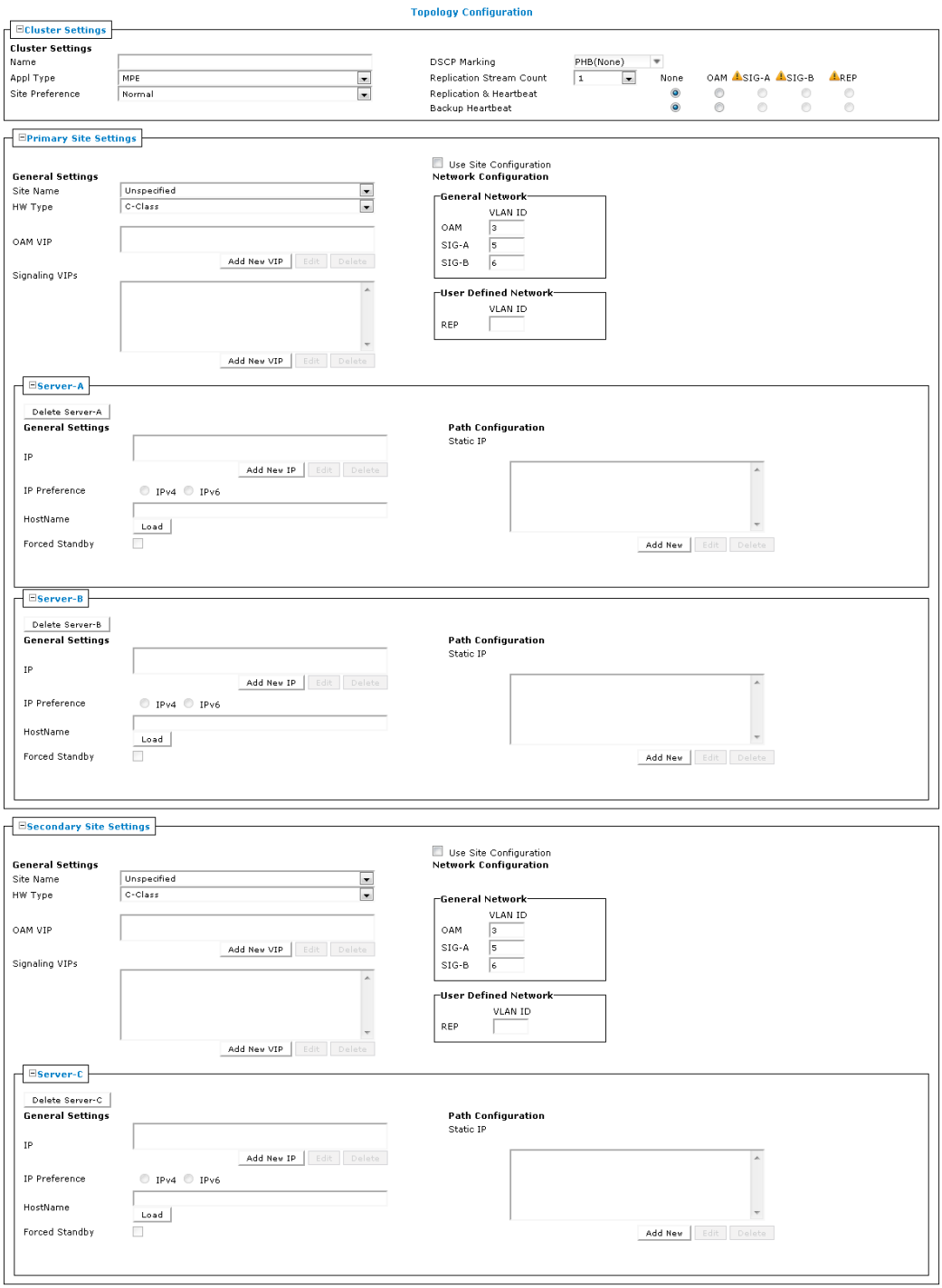


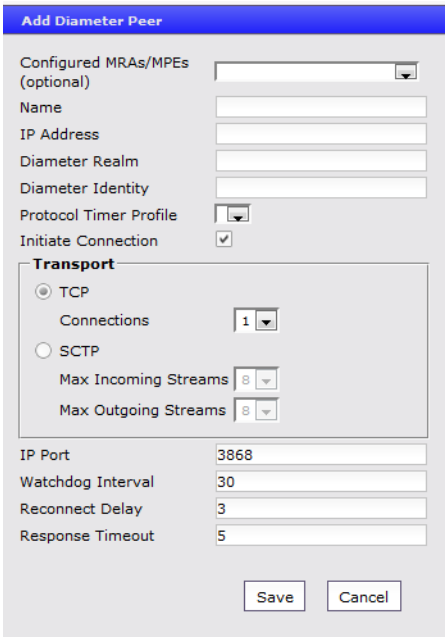

**Figure 5: Sample MPE Cluster Topology Configuration**

## Configuring Diameter Peers

Policy Management devices support Diameter Rx, Gq, Ty, Gxx, Gx, Gy, S9, and Sd applications. For example, traffic control is supported using the Diameter Gx application. When a subscriber attaches to the network (for example, using a phone) via a GGSN (Gateway GPRS Support Node), the GSSN can establish a session with an MPE device using a Diameter Gx CCR (Credit Control Request) message. The MPE device responds to the request with a Gx CCA (Credit Control Answer) message.

To configure Diameter peers:

1. From the **Policy Server** section of the navigation pane, select **Configuration**.
   The content tree displays a list of policy server groups.
2. From the content tree, select the MPE device.
   The **Policy Server Administration** page opens in the work area.
3. Select the **Diameter Routing** tab.
   The Diameter Routing configuration settings are displayed.
4. Click **Modify Peers**.
   The **Modify the Diameter Peer Table** page opens.
5. Add a peer to the table.
   a) Click **Add**. The **Add Diameter Peer** window opens.




   b) Enter the following:

   - **Configured MRAs/MPEs (optional)** — If you are defining an existing Policy Management cluster as a Diameter peer, select it from this list; the other fields are populated.
   - **Name** (required) — Name of the peer device (which must be unique within the CMP database).
   - **IP Address** (required) — IP address in IPv4 or IPv6 format of the peer device.

If not specified, the MPE device uses a DNS lookup to resolve the value in the Diameter Identity field into an IP address and try to connect.

- **Diameter Realm** (required) — The peer's domain of responsibility (for example, **`galactel.com`**).
- **Diameter Identity** (required) — Fully qualified domain name (FQDN) of the peer device (for example, **`mpe33.galactel.com`**).
- **Protocol Timer Profie** — Select from the pulldown menu.
- **Initiate Connection** — Check mark to initiate an S9 connection for this Diameter peer. The default transport method is TCP, but can be changed to SCTP in the following **Transport** field. Turned on (check marked) by default.
- **Transport** — Select either **TCP** or **SCTP** (shown as Transport Info in the Diameter peer table). For TCP select **Connections** (range 1-8, default 1). For SCTP select **Max Incoming Streams** and **Max Outgoing Streams**(1-8 connections, default is 8) which will be shown as Connection Info in the Diameter peer table.
- **IP Port** — Enter the IP Port number.
- **Watchdog Interval** — Enter the watchdog interval in seconds. The default is 30 seconds.
- **Reconnect Delay** — Enter the response time in seconds. The default is 3 seconds.
- **Response Timeout** — Enter the response timeout interval is seconds. The default is 5 seconds.

c) When you finish, click **Save**.

6. Add, edit or delete additional Diameter Peers.

- Cloning an entry in the table

  1. Select an entry in the table.
  2. Click **Clone**. The **Clone** window opens with the information for the entry.
  3. Make changes as required.
  4. When you finish, click **Save**. The entry is added to the table

- Editing an entry in the table

  1. Select the entry in the table.
  2. Click **Edit**. The **Edit Response** window opens, displaying the information for the entry.
  3. Make changes as required.
  4. When you finish, click **Save**. The entry is updated in the table.

- Deleting a value from the table

  1. Select the entry in the table.
  2. Click **Delete**. A confirmation message displays.
  3. Click **Delete** to remove the entry. The entry is removed from the table.

7. When you finish, click **Save**.

You have defined a Diameter peer.

# Role and Scope Configuration

When configured in MRA mode, the CMP system defines default user accounts with roles and scopes that allow for control of MRA devices. If you want to define additional users to control MRA devices, you need to add appropriate roles and scopes.

## Configuring an MRA Role

MRA configuration also provides the functionality for privilege control through Role Administration. The **Role Administration** page includes a section named **MRA Privileges** that contains a privilege setting option named **Configuration**. To access this option:

1. In the **System Administration** section of the navigation pane, click **User Management** and then click **Roles**.
   The **Role Administration** page opens.
2. Click **Create Role**.

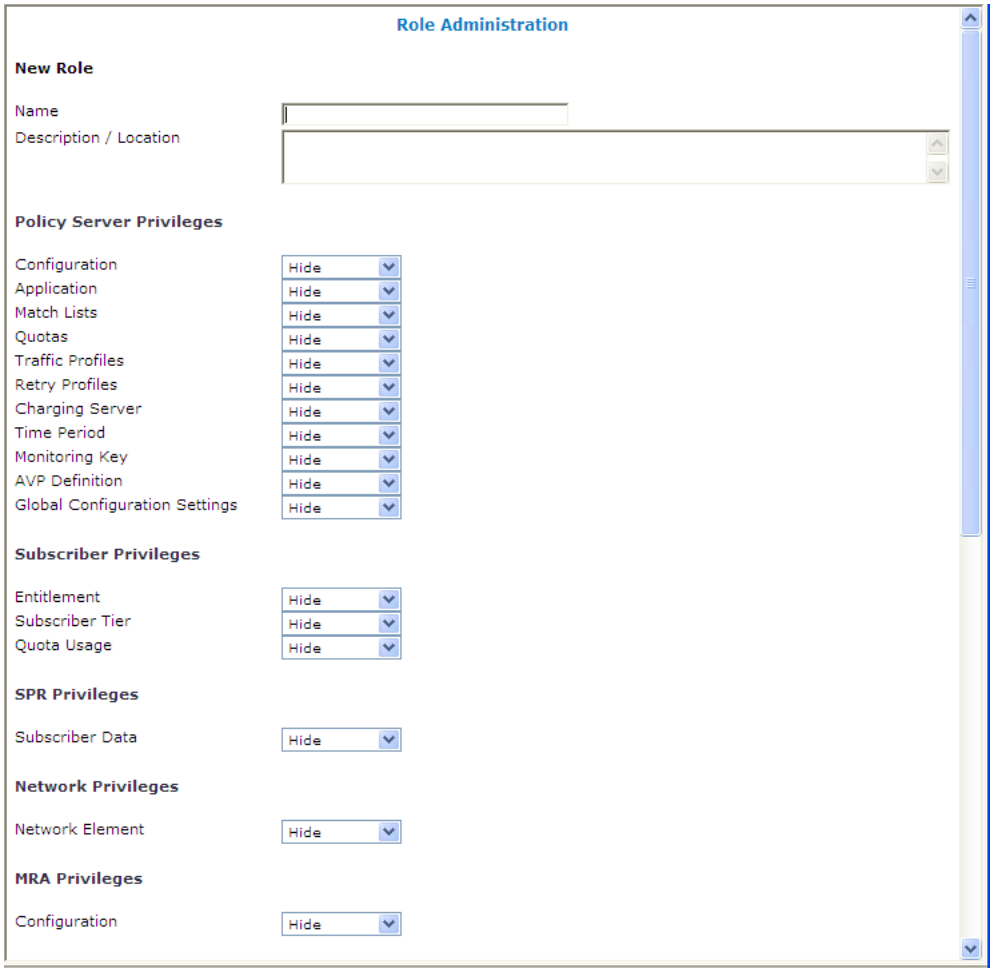



**Figure 6: New Role Page**

3. Enter the following information:
   a) **Name** — The name for the new role.
   b) **Description/Location** (optional) — Free-form text.
   c) **MRA Privileges** — There are three types of privileges for MRA configuration: Hide, Read-Only and Read-Write.

   - **Hide** — No operation can be done on MRA configuration.
   - **Read-Only** — Only read operations can be done on MRA configuration (that is, settings can be viewed but not changed).
   - **Read-Write** — Both read and write operations can be done on MRA configuration (that is, settings can be viewed and changed).

4. When you finish, click **Save** (or **Cancel** to discard your changes).
   Privileges are assigned to the role.

## Configuring the Scope for an MRA

MRA configuration provides scope functionality which allows the administrator to configure scopes for MRA groups, which provides the context for a role. The default scope of Global contains all items defined within the CMP. Once a scope is defined, the administrator can apply it to a user. A user can only manage the MRA devices in the user defined scope. To configure a scope, complete the following:

1. In the **System Administration** section of the navigation pane, click **User Management** and then click **Scopes**.
   The Scope Administration page opens.
2. Click **Create Scope**.

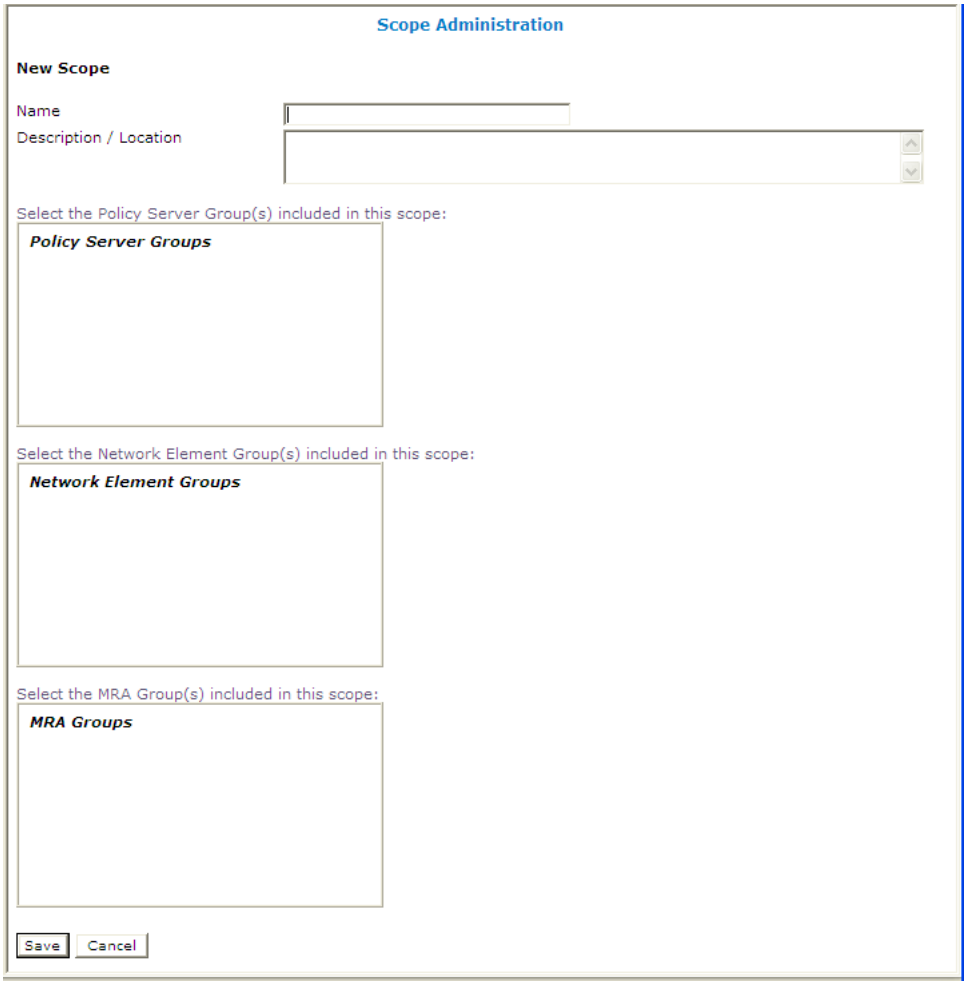



**Figure 7: Create Scope Page**

3. Enter the following information:
   a) **Name** — The name for the new scope.
   b) **Description/Location** (optional) — Free-form text.
   c) Select the MRA group(s) this scope can control.
4. When you finish, click **Save** (or **Cancel** to discard your changes).
   The scope is defined.

## MRA Advanced Configuration Settings

The advanced configuration settings provide access to attributes that are not normally configured, including session cleanup settings, stateful MRA settings, and defining configuration keys.

## Configuring MRA Session Clean Up Settings

Normally, a binding for a subscriber is maintained on only one MRA device. However, due to server or communication disruptions, it is possible for multiple MRA devices to create duplicate bindings. When a query returns duplicate bindings, the oldest is used.

The MRA device periodically runs a cleanup task to check for and remove stale and suspect bindings and sessions, which are defined as follows:

- A session is stale if its timestamp is greater than the Session Validity Time value for the MRA device.
- A binding is stale if its timestamp is greater than the Binding Validity Time value for the MRA device.
- A binding is suspect if it was created while one or more MRA devices were not reachable.

To customize stale session cleanup:

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. From the content tree, select an MRA device.
   The **MRA Administration** page opens.
3. On the **MRA Administration** page, select the **MRA** tab.
   The current MRA configuration settings are displayed.
4. Click **Advanced**.
   Session Clean Up settings are displayed and can be edited.

**Table 3: Session Clean Up Settings**

| Attribute | Description |
|---|---|
| **Check for Stale Sessions in Binding** | Select to check for stale sessions in bindings during the cleanup cycle. If not selected, then the system only checks to see if the entire binding is stale. The default is selected (check for stale sessions). |
| **Check for Stale Bindings** | Select to check for stale bindings during the cleanup cycle. If not selected, then the system will not check if the binding is stale. If **Check For Stale Sessions in Binding** is selected, then the system still iterates through the enclosed session information to detect and clean up stale sessions. The default is deselected (do not check for stale bindings). |
| **Check for Suspect Bindings** | Select to check for suspect bindings during the cleanup cycle. If not selected, the system checks if the entire binding is stale. If **Check for Stale Sessions In Binding** is selected, stale sessions enclosed in the suspect binding are cleaned up as well. The default is selected (check for suspect bindings). |
| **Session Cleanup Start Time** | Defines the time of day when the cleanup task occurs. Specify either **Start Time** or **Interval** by clicking the associated radio button and entering or selecting a value. You can specify a time in 24-hour format from the drop-down menu. No default value is defined. |

| | |
|---|---|
| **Binding Cleanup Interval (hour)** | Defines the interval, in hours, at which the cleanup task runs. Specify either **Start Time** or **Interval** by clicking the associated radio button and entering or selecting a value from 0 to 24 hours. A value of 0 disables cleanup. The default is 24 hours.<br>**Note:** Do not modify this setting without consulting Oracle Customer Service. |
| **Max Duration For Binding Iteration (hour)** | Defines the maximum duration, in hours, to iterate through the bindings. The default is 2 hours. The valid range is 1 to 2 hours.<br>**Note:** Do not modify this setting without consulting Oracle Customer Service. |
| **Binding Validity Time (hours)** | Defines the number of hours after which the binding is declared stale. The default is 240 hours. The valid range is 1 to 240 hours. |
| **Max Binding Cleanup Rate (bindings/sec)** | Defines the rate, in bindings per second, at which the cleanup task attempts to clean stale bindings. The default is 50 sessions/sec. The valid range is 1 to 50 sessions/sec.<br>**Note:** Do not modify this setting without consulting Oracle Customer Service. |
| **Max Binding Iteration Rate (bindings/sec)** | Defines the maximum rate, in bindings per second, at which the cleanup task iterates through the bindings database. The default is 1000 bindings/sec. The valid range is 1 to 1000 bindings/sec.<br>**Note:** Do not modify this setting without consulting Oracle Customer Service. |
| **Session Validity Time (hours)** | **Note:** Do not modify this setting without consulting Oracle Customer Service. |
| **Max Session Validity Time (hours)** | **Note:** Do not modify this setting without consulting Oracle Customer Service. |
| **Scheduler Granularity (sec)** | Defines the adaptor scheduler's granularity in seconds. The default is 1 second. The valid range is 1-5 seconds. |
| **Scheduler Thread Count** | Defines the number of threads used by the cleanup scheduler to schedule jobs. The default is 2 threads. the valid range is 1 to 4 threads. |
| **Cleanup Session Validity Time (hours)** | Defines the number of hours after which a session in a binding is declared stale. the default is 120 hours. The valid range is 1 to 120 hours. |

5. Click **Save** (or **Cancel** to discard changes).
   The settings are applied to the MRA.

## Configuring SigC in Devices Exposed to PCEF

SigC in VLAN 3 in MRA is designed for internal signaling communication between MPE and MRA. SigC configuration is used when an MRA's hardware is selected as either C-Class, or C-Class (Segregated Traffic), NETRA, or VMWare.

**Note:** To configure a device for SigC, the MRA topology must be configured for either C-Class, or C-Class(Segregated Traffic), NETRA, or VMWare. See *Setting Up a Non-CMP Cluster*

Complete these steps to set the configuration key for SigC.

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. From the content tree, select an MRA device.
   The **MRA Administration** page opens.
3. On the **MRA Administration** page, select the **MRA** tab.
   The current MRA configuration settings are displayed.
4. Click **Advanced**.
5. Click **Add** in the **Other Advanced Configuration Settings** section.

   **Note:** You can also **Clone, Edit, Delete** existing configuration key records, as well as scroll up and down the list.

6. In the **Add Configuration Key Value** screen enter the following information:
   - Enter **DIAMETERDRA.SIGDeviceFilter**in the Configuration Key field.
   - Enter either **SIGA** or **SIGB** in the Value field
   - Enter **Comments** (or leave blank) for this configuration in the Change Log field.
7. Click **Save** to apply the settings to the system.

## About Stateful MRAs

Stateful MRAs let you view the session and track its destination prior to sending multiple sessions to the same MPE device. An MRA is placed into migration mode in order to render a stateful MRA.

See *About Stateless Routing* for more information.

## Redirecting Traffic to Upgrade or Remove an MRA

When the software for an MRA needs to be upgraded or an MRA needs to be removed from an MRA cluster, the traffic or potential traffic must be redirected to the other MRA within the cluster, and the current sessions released. To do this, traffic on clustered MRAs is redirected on to another MRA, allowing the traffic-free MRA to be replaced in the cluster or to have its software upgraded. During this process, the MRA that is to be replaced or updated is placed in a redirect state of ALWAYS, where it does not take on new subscribers but redirects them to the other MRA. Once all traffic has been removed or redirected, existing traffic is released from the MRA and it is shut down. Once the MRA is replaced or upgraded, the same process can be used on the other MRA, and then returned to the cluster.

**Note:** For detailed directions on performing a migration using the redirect states, please contact Oracle.

## Changing Redirect States

To change the redirect state of an MRA device:

1. In the **MRA** section of the navigation bar, click **Configuration**.
2. Select an MRA. The **MRA Administration** page displays information about the selected MRA.
3. On the **MRA** tab, click **Advanced**.
4. In the **Other Advanced Configuration Settings** section, click the **Add** icon in the table. The **Add Configuration Key Value** window opens (*Figure 8: Add Configuration Key Value Window*).

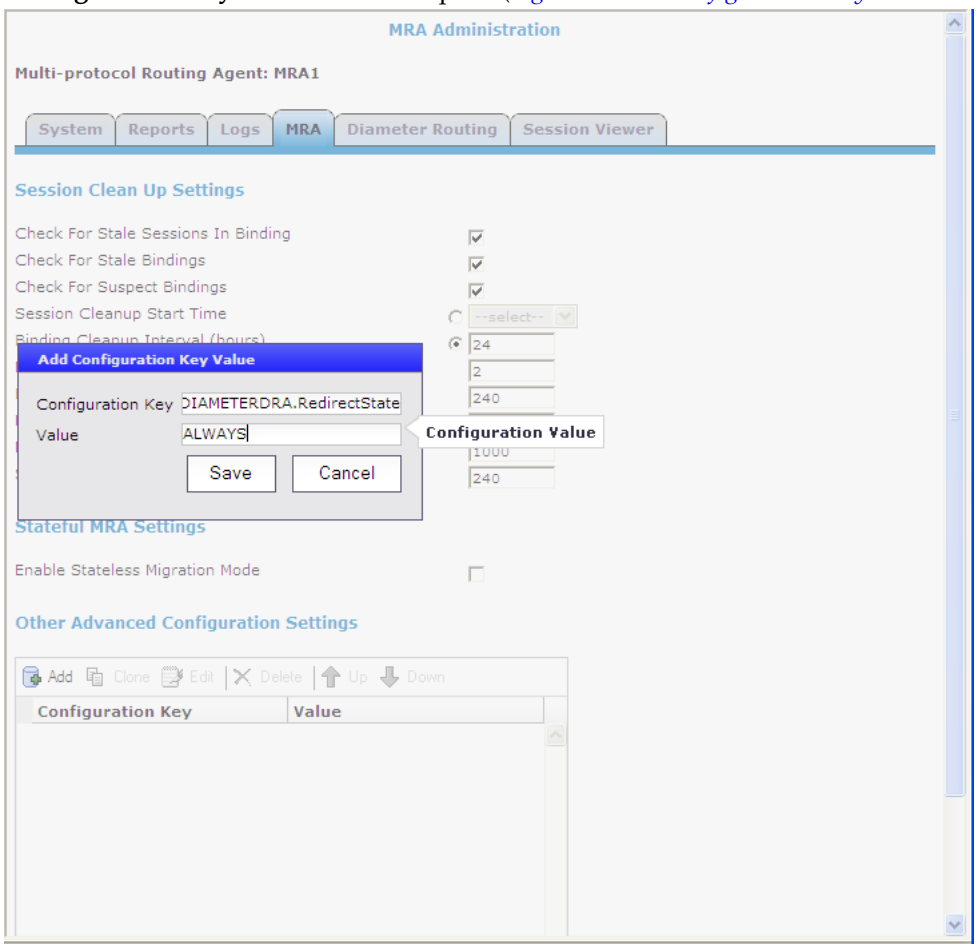



**Figure 8: Add Configuration Key Value Window**

The redirect configurable variable is DIAMETERDRA.RedirectState, which indicates the redirect state of the MRA. Changing this variable to NORMAL will stop the release process. Valid values are:

- **NORMAL** (the default) — The MRA redirects CCR-I messages only when the DRMA link between the clustered MRAs is down and the subscriber does not have an existing binding on the MRA that first receives the CCR-I.
- **ALWAYS** — The MRA always redirects CCR-I messages to the MRA it is clustered with for subscribers that do not have existing bindings, whether the DRMA link is active or not. An MRA in this state is not able to create new bindings.

- **NEVER** — The MRA never redirects messages to the MRA it is clustered to, whether the DRMA link is active or not.

**Note:** In all redirect states, the MRA devices continue to handle DRMA traffic and process traffic normally for subscribers with existing bindings.

### Releasing Active Sessions

Release configuration settings allow the MRA to release active subscribers and remove their bindings. These settings allow a task to be started that iterates through the bindings in the database and sends RARs for each session contained in each binding. These RARs indicate a session release cause, triggering the PGW/HSGW to terminate the corresponding sessions. Upon receiving a message to terminate the session, the MRA removes the session from the binding, and once the binding no longer has any sessions associated with it, it is removed. Any new sessions are redirected to the active MRA.

The release configurable variables are:

- DIAMETERDRA.Release.Enabled: Indicates whether the binding release task is started. Valid values are **TRUE** or **FALSE**; the default is **FALSE**. Setting this to **FALSE** stops the release process.
- DIAMETERDRA.Release.MaxRARsRate: The rate (in RARs/sec) at which the release task queues RAR messages to be sent; they will be evenly spread across the entire second. Valid values are a positive integer; default is **250**. Setting this to a negative integer stops the release process.
- DIAMETERDRA.Release.UnconditionallyRemoveSessions: Indicates if the release task removes the session information from the binding as soon as it is processed by the release task, or if it waits until it receives a CCR-T before updating the binding. Valid values are **TRUE** or **FALSE**; the default is **FALSE**.
- DIAMETERDRA.Release.ReleaseTaskDone: Internal flag used by the release task to indicate if it has completed. Values are **TRUE** or **FALSE**; the default is FALSE.
- DIAMETERDRA.Release.OriginHost: This value indicates the origin host to use when sending RARs initiated by the release task. Valid values are **MPE** or **MRA**; the default is **MPE**.

### Determining a Mapping MRA (M-MRA)

The DRADRMA.MultiSiteOptimization configuration determines the algorithm used to distribute binding indexes across MRAs in a system. The default value is Algov1 (Algorithm version1). To disable this functionality, the configuration needs to be set to Legacy.

## Managing Configuration and Virtual Templates

Configuration and Virtual templates allow for a more efficient means of normalizing common configurations between multiple MPE/MRA instances. Any given MPE/MRA can be associated with no template, one or many templates. In addition, users can add, remove, clone and reorder templates.

Virtual templates are similar to symbolic links in Linux. Virtual templates are particularly efficient when users want to replace a template that has been associated to multiple MPE or MRA with another template.

## Creating a Template

Since an MPE or an MRA can exist independently of one another, there are two locations in the Policy Management interface where, both virtual and configuration, templates can be created. Either in the **MRA** or the **Policy Server** section of the navigation pane. After the template is created, the template has the functionality that is specific to their instance (MPE or MRA).

**Note:** This procedure applies to both MPE or MRA devices.

**Note:** You must create a Configuration Template before a Virtual Template because a Virtual Template references and is dependent on a Configuration Template.

To create a configuration template:

1. From the **MRA** or **Policy Server** section of the navigation pane, select **Configuration Template**. The content tree displays a list of **All Templates** including Virtual and Configuration.
2. From the content tree, select **Configuration Template**. The **Configuration Template Administration** page opens.
3. Click **Create Template**. The **New Configuration Template** page opens.
4. Enter the **Name** of the template.

   **Note:** This is an alphanumeric field that is limited to 255 characters. Single quotes, double quotes, space, comma, backslash characters are not valid.

5. (Optional) Select a template from the **Copy From** list
6. (Optional) Enter a **Description / Location** (limited to 255 characters).
7. When you finish, click **Save**.

The settings are saved for the template and applied to all associated MPE or MRA devices.

## Modifying a Template

Since an MPE or MRA device can exist independently of one another, there are two locations in the Policy Management interface where , both virtual and configuration, templates can be managed. Either in the **Policy Server** or the **MRA** section of the navigation pane. After the template is created, the template has the functionality specific to their instance (MPE or MRA devices). After templates are created and associated, the templates can be viewed and managed from the **System** tab of the MPE or MRA device.

**Note:** This procedure applies to both MPE or MRA devices.

To modify a configuration template:

1. From the **MRA** or **Policy Server** section of the navigation pane, select **Configuration Template**. The content tree displays a list of all templates including Virtual and Configuration.
2. From the content tree, select the configuration template for modification. The **Configuration Template Administration** page opens with the template.
3. Click **Modify**. From the **MRA** and **Diameter Routing** tabs, you can configure the following:
   - From the **MRA** section you have the following tabs and options:
     - **Template** tab

    - **Name**
    - **Description**
  - **MRA** tab - **Modify** button
    - **Associations** or (*Associating Network Elements with an MRA Device*)
    - **MPE Pools** (*Configuring Diameter Realm Based Peer Routes*)
    - **Subscriber Indexing** (*Configuring Protocol Options for an MRA Device*)
    - **Diameter** settings (*Associating Network Elements with an MRA Device*)
  - **MRA** tab - **Advanced** button
    - **Expert Settings**
    - **Service Overrides**
    - **Load Shedding Configuration**
  - **Diameter Routing** tab
    - **Diameter Peers** (*Loading MPE/MRA Configuration Data when Adding Diameter Peer*)
    - **Diameter Routes** (*Configuring Diameter Realm Based Peer Routes*)
- From the **Policy Server** section you have the following tabs and options:
  - **Template** tab
    - **Name**
    - **Description**
  - **Logs** tab
    - **Trace Log Level**
    - **Modify Policy Log Settings**
    - **Policy Syslog Forwarding Configuration**
    - **SMS Log Configuration**
    - **SMTP Log Configuration**
    - **HTTP Log Configuration**
  - **Policy Server** tab - **Modify** button
    - **Associations**
    - **Subscriber Indexing**
    - **Configuration**
    - **Diameter** settings (*Associating Network Elements with an MRA Device*)
    - **User Profile Lookup Retry on Session Updates**
    - **Diameter AF Default Profiles**
    - **Default Charging Servers**
  - **Policy Server** tab - **Advanced** button
    - **Expert Settings**
    - **Service Overrides**
    - **Load Shedding Configuration**
  - **Diameter Routing** tab

- **Diameter Peers** (*Loading MPE/MRA Configuration Data when Adding Diameter Peer*)
- **Diameter Routes** (*Configuring Diameter Realm Based Peer Routes*)

- **Policies** tab
  - **Deployed Policies**
- **Data Sources** tab
  - **Data Sources**
  - **General Settings**
  - **Sh Settings**

4. When you finish, click **Save**.

The settings are saved for the template, and applied to all associated MRA or MPE devices.

## Reordering Templates

Since an MPE or an MRA can exist independently of one another, there are two locations in the Policy Management interface where templates can be created. Either in the **Policy Server** or the **MRA** section of the navigation pane. Templates have the functionality specific to their instance (MPE or MRA). After a template is created and associated, the template can be viewed in the **System** tab of the **Configuration** for the MPE or MRA device.

**Note:** This procedure applies to both MPE or MRA devices.

Reordering templates in a list allows a user to prioritize templates according to configuration values applied to a given MRA or MPE instance. For example, different configurations will provide different prioritizations depending on the order (the lower the number the higher the prioritization) as it appears in the **Associated Templates** section of the **Modify System Settings** screen.

1. From the **MRA** or **Policy Server** section of the navigation pane, select **Configuration Template**. The content tree displays a list of all templates including Virtual and Configuration.
2. From the content tree, select the configuration template for modification. The **Configuration Template Administration** page opens with the template.
3. Click **Modify**.
4. Edit the numbers in the priority field.
5. Click **Update Order**. The associated templates are reodered.

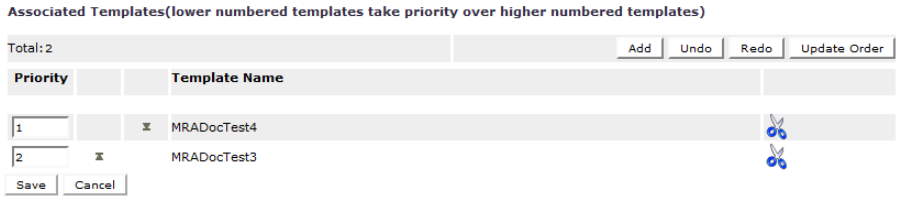



**Figure 9: Original Template List**

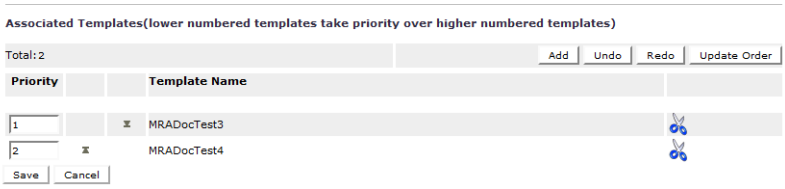



**Figure 10: Reordered Template List**

## Creating Virtual Templates

Since an MPE or MRA can exist independently of one another, there are two locations in the Policy Management interface where, both virtual and configuration, templates can be created. Templates can be created and managed either in the **Policy Server** or **MRA** section of the Navigation pane. Because Virtual templates are based on Configuration Templates, modifying a Configuration Template associated with a Virtual Template automatically modifies the Virtual Template. After the templates are created, the templates have the functionality specific to their instance (MPE or MRA ).

**Note:** This procedure applies to both MPE or MRA devices.

Complete these steps to create a configuration template.

1. From the **MRA** or **Policy Server** section of the Navigation pane, select **Configuration Templates**. The content tree displays a list of all templates including Virtual and Configuration.

   **Note:** You must create a Configuration Template before a Virtual Template because a Virtual Template references and is dependent on a Configuration Template.

2. From the content tree, select **Virtual Templates**.
   The **Virtual Template Administration** page opens.
3. Click **Create Virtual Template**.
   The **New Virtual Template** page opens.
4. Enter the **Name** of the template.

   **Note:** This is an alphanumeric field that is limited to 255 characters. Single quotes, double quotes, space, comma, backslash characters are not valid.

5. Select a template from the **Associated Configuration Template** pull-down menu.
6. (Optional) Type in a **Description**.
7. When you finish, click **Save**.

The settings are saved for the template, and applied to all associated MRA or MPE devices.

## Overlaps

Overlaps occur when both a template and an MRA or MPE are assigned an identical value for the same attribute or field. For example, the index of a user name is true in template A, and the index of a user name is also true in an MRA or MPE. The result is that when the template and MRA or MPE are associated, the index of the user name becomes an overlapped field. When an overlap occurs, a prompt opens stating, `The server configuration has overlaps with the associated template(s).` The user can take one of two actions:

- Remove the overlaps and use the settings from the template.

- Keep the overlaps and use the settings from the server.

## Configuring Topology Hiding for the Gx Application

When topology hiding is enabled, Gx CCA and RAR messages forwarded by the MRA to the network are modified to include the MRA Origin-Host instead of the MPE Origin-Host. Route-Record in RARs are not removed.

If a Gx CCR-U/T message does not contain a Destination-Host, or contains a Destination-Host set to the MRA identity, a binding lookup is performed based on the available and indexed keys to find the corresponding MPE device. The message is then forwarded to the MPE device with no Destination-Host. If the message contains a Destination-Host set to an identity other than the MRA, the message is routed based on the Destination-Host only.

When the Origin-Host is replaced on a forwarded message, the original Origin-Host is logged at the end of a message when logging the message details.

To configure topology hiding:

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. From the content tree, select an MRA device.
   The **MRA Administration** page opens.
3. On the **MRA Administration** page, select the **MRA** tab.
   The current MRA configuration settings are displayed.
4. On the **MRA** tab, click **Modify**.
   The **Modify MRA** page opens.
5. In the **Subscriber Indexing** section, ensure that the **Index by Session ID** option is enabled if there are no other indexed subscriber keys available in "update/terminate" messages.
6. Click **Save** (or **Cancel** to discard changes).
7. On the **MRA** tab, click **Advanced**.
8. In the **Other Advanced Configuration Settings** section, click the **Add** icon in the table. The **Add Configuration Key Value** window opens (see *Figure 8: Add Configuration Key Value Window*).
   Add the following configuration keys to the **Add Configuration Key Value** window:

   **Table 4: Topology Hiding Configuration Keys**

| Configuration Key | Value |
|---|---|
| DIAMETERDRA.TopologyHiding.Apps | **Gx** |
| DIAMETERDRA.TopologyHiding.Enabled | **true** |

9. Click **Save** (or **Cancel** to discard changes).
   The topology hiding settings are applied to the MRA.

# Chapter 4

# Managing Network Elements, Backups and Diameter Settings

**Topics:**



The **MRA** tab on the **MRA Configuration** page displays a list of network elements associated with the MRA device, the associated MPE pool, configuration settings for the MRA device, Diameter-related configuration information, and if load shedding is configured.

**Note:** This document assumes that all CMP systems as well as MRA, and MPE devices are operational. Also, the procedures used in this guide are MRA specific; for additional CMP system and MPE device configuration information, refer to the *CMP Wireless User's Guide* and *Policy Wizard Reference Guide*.

## Adding Associated MRAs

Each MRA cluster can have a backup MRA and multiple associated MRA clusters. In addition, if your system is configured for georedundancy, you have the option to configure an georedundant MRA with a secondary site (Default Secondary IP Address).

If the system is set for georedundancy, a primary site contains the preferred site or connection, and a secondary site contains a non-preferred (optional) spare server. The spare server, though located elsewhere, is still part of the cluster, and prepared to take over if an active server and its secondary backup fails. You must associate a primary and secondary site with a cluster.

To configure an associated MRA device, complete the following:

1. From the **Navigation Panel** select **MRA Associations**.
   The **MRA Association Administration** page opens.
2. From the top of the MRA Associations tree, select **MRA Associations**.
3. Click **Create MRA Association**
   The **Configuration** screen opens.
4. Type in the **Name** of the MRA Association.
5. (Optional) Type in a **Description** of the MRA Association.
6. Select the **Type** of binding the Association will use (Algov1 or Legacy).
   - Algov1 - (Default) Uses `Algorithm Verson 1` to distribute binding indexes across MRAs in a system.
   - Legacy - Used after an MRA has been migrated and issues are encountered. Using this option deletes all mappings from the database and starts a "rollback" process. "revert" MRAs back
7. From the **Members** section, click **Add**.
   The Add MRA Association Member pop-up appears.
8. From the **Add MRA Association Member** window, perform the following steps:
   a) Select an **MRA** from the list of existing MRAs.
   After the MRA has been selected, the **Default Primary IP Address** of that MRA appears in the field.
   b) (Optional) If the Association is to be georedundant, select a **Default Secondary IP Address**. This is the IP Address other MRAs in the Association will use when establishing Diameter Connections with this MRA.

      **Note:** A different IP Address will be used if there are any matching overrides configured.

   c) (Optional) Select a **Backup MRA** from the list.

      **Note:** The backup feature has a "two-way" capacity, for example, if MRA1 is selected to be the backup for MRA2, MRA2 will also function as a backup for MRA1 if something happens to MRA1.

   d) (Optional) Select a **Protocol Timer Profile** from the list. For more information, see *Managing Subscriber Profile Repositories*.
   e) Select either **TCP or SCTP** for transport protocol.

If other MRAs in the Association should connect to this MRA using SCTP instead of TCP, select **Connect SCTP** and then select **Max Incoming Streams** and **Max Outgoing Streams** (the default is "8" streams for both incoming and outgoing streams).

f) Click **Save** to save your configuration.

9. (Optional) If there is to be an **Association Override**, click **Add** in the **Association Override** section. Then repeat **substeps 7a-7e** and click **Save**.
10. For **Subscriber Indexing**, select any or all of the following: (For more information, see *Configuring Protocol Options for an MRA Device*.)

    - **Index by Username**
    - **Index by NAI**
    - **Index by E.164 (MSISDN)**
    - **Index by IMSI**
    - **Index by Session ID**
    - **Primary Indexing** (IMSI or e.164/MSISDN)

      **Note:** Used for having all MRAs use the same subscriber indexing value after an upgrade.

11. (Optional) If there are to be **Overrides by APN** click **Add** in the section. Fill in or select the following parameters as needed.
    a) Type in the name of the **APN** (255 character limit, no spaces or special characters).
    b) **Index by IPv4,**
    c) **Index by IPv6**
    d) **Index by Username**
    e) **Index by NAI**.
    f) **Index by E.164 (MSISDN)**
    g) **Index by IMSI**
    h) Click **Save** to save the APN configuration.
12. When you finish, click **Save** (or **Cancel** to abandon your changes).

The MRA clusters are configured as associated MRA devices.

## Configuring Protocol Options on an Associated MRA Device

Follow these steps to configure protocol options on an Associated MRA device:

1. From the **MRA** section of the navigation pane, select **MRA Associations**.
   The content tree displays the list of Associated MRAs. The initial group is **ALL**.
2. From the content tree, select the MRA Association.
   The **MRA Association Administration** page opens.
3. On the **MRA Association Administration** page, click the **Modify**.
   The current configuration options are displayed.
4. From the **Subscriber Indexing** section define options as necessary.

   MRA Protocol Configuration Options defines available options that pertain specifically to MRA devices. (The options may vary depending on the configuration mode of the system.)
5. When you finish, click **Save** (or **Cancel** to discard your changes).

**Table 5: MRA Protocol Configuration Options**

| Attribute | Description |
|---|---|
| **Subscriber Indexing** | **Note:** The indexing parameters to use depend on what user ids are needed for correlating various messages to ensure they all end up on the same MPE for the same user. If you are unsure which indexing method(s) to configure, contact My Oracle Support. (*https://support.oracle.com*) |
| Index by Username | Select if the MRAs in the association should index by account ID. |
| Index by NAI | Select if the MRAs in the association should index by network access ID. |
| Index by E.164 (MSISDN) | Select if the MRAs in the association should index by E.164 phone number. |
| Index by IMSI | Select if the MRAs in the association should index by IMSI number). |
| Index by Session ID | Select if the MRAs in the association should index by session ID. |
| Primary Indexing | Select from the pull-down list to set to the type of index that is expected for messages that create bindings, for example Gx CRR-I.<br>**Note:** The type of index selected for primary indexing must also be selected either as an "Index by IMSI" or "Index by E.164" depending on the configuration.<br>⚠Primary Index cannot be changed on a system that has already created bindings without suffering data loss. |
| Index by IP Address | Select if the MRAs in the association should index by IP address. You can select **Index by IPv4**, **Index by IPv6**, or both formats. |
| Overrides by APN | Select to perform subscriber indexing for a specific IP address and a specific APN name. In the **Overrides by APN** section, click **Add**. Enter the APN name and click **Save** to enable **Index by IPv4**, **Index by IPv6**, or both. You can create new APN overrides by cloning or editing existing APN overrides. You can also delete an APN override. |

## Modifying Backup and Associated MRA devices

Once you have defined backup and associated MRA devices, they are listed in an Associated MRA table. The table indicates whether an MRA is a backup, the primary IP address, and, in a georedundant configuration, the secondary IP address. Using this table you can add, modify, or delete MRA devices from the list.

To modify backup and associated MRA devices:

1. From the **Navigation Panel** select **MRA Associations**.Select **MRA Associations**from the within the screen, click **Modify**.

The **MRA Association Administration** screen opens.

2. From the top of the MRA Associations tree, select **MRA Association** that will be modified. The functions available from the table are as follows:
3. Click **Modify**.

   - **To add an MRA to the table** — Click **Add**; the **Select MRA** window opens. Select an MRA device. If this is a backup MRA, select **Is Backup**. Enter the **Primary IP Address**, and for a georedundant configuration, the **Secondary IP Address**.
   - **To clone an MRA in the table** — Select an MRA and click **Clone**; the **Clone MRA** window opens with the information for the MRA device. Make changes as required.
   - **To edit an MRA in the table** — Select the MRA and click **Edit**; the **Edit MRA** window opens with the information for the MRA device. Make changes as required.
   - **To delete an MRA from the table** — Select the MRA and click **Delete**; you are prompted, `Are you sure you want to delete the selected MRA?` Click **Delete** to remove the MRA (or **Cancel** to cancel your request).

   When you finish, click **Save** (or **Cancel** to abandon your changes).

## MRA Association Status Definitions

The **Status** column of an MRA shows current status on any sync or migration tasks that have run or are running. A status can be one of the following:

- **OK** - This status means the MRA is not currently running any migration or sync tasks. If all MRAs are in this state, a new MRA can safely be added to the Association.
- **Syncing (xx%)** - This status means the MRA is currently running the sync task. If any MRAs are in this state, a new MRA cannot be safely added to the Association. If a new MRA is added, data integrity can't be guaranteed across the association. The percentage completion through the task will be displayed in parentheses.
- **Migrating (xx%)** - This status means the MRA is currently running the legacy migration task. If any MRAs are in this state, a new MRA cannot be safely added to the Association. The percentage completion through the task will be displayed in parentheses.
- **Migration Failed** - This status means the last migration task which ran on the MRA did not complete successfully. This likely means there were some connection failures between MRAs during the task and the task should be manually rerun using the Operations menu.
- **Sync Failed** - This means the last sync task which ran on the MRA did not complete successfully. This likely means there were some connection failures between MRAs during the task and the task should be manually rerun using the Operations menu.
- **Migrated** - This status means the last migration task which ran on the MRA completed successfully. The MRA is still running in a special migration mode, however. Use the operation "Complete Migration" to turn off migration mode on the MRA and start using the n-site MRA optimizations. Complete Migration can also be used when in a Migration Failed state if the number of failures is low and running another full migration is not needed.

## MRA Association Operations

There are various operations that can be performed on MRA Associations.

These operations include:

- **Manual Sync** - To be able to manually start a sync task on all MRAs in the Association.

- **Cancel Sync** - To cancel a sync which is currently in progress.
- **Manual Migration** - To be able to manually start a migration task on all MRAs in the Association.
- **Cancel Migration** - To cancel a migration which is currently in progress.
- **Accept Migration** - To accept the migration (after all MRAs have finished running the migration task).

  **Note:** This operation will disable the migration mode on the MRAs so that they will fully transition into using the N-site feature. All MRAs in the Association must either be in **Migrated** or **Failed Migration** status.

- **Reset Counters** - Reset all counters for all MRAs in the association.
- **Reapply Configuration** - Reapply configuration for all MRAs in the association.

**Note:** If at least one MRA in the Association has a software version less than the version where this feature is introduced, the CMP will display a warning that clusters are in a mixed version, and the Operations drop down will be disabled. This is to prevent running operations on servers which don't have the required software to support those operations.

**Conditions Limiting Operation Options**

- If the association type is set to **Legacy**, only Reset Counters and Reapply Configuration operations are available.
- If all of the MRAs in the association show **Migrated** or **Failed Migration** status, only Accept Migration operation is available.
- If at least one MRAs in the association shows**Migrating** status, only the Cancel operation is available.
- If at least one MRAs in the association shows**Syncing** status, only the Cancel Sync operation is available.
- If any of the MRAs in the association show **Syncing** or **Failed Sync** status, then only the Manual Migration operation is available.
- If any of the MRAs in the association show **Migrating**, **Migrated** or **Failed** status the Manual Sync operation will not be available.

## Associating Network Elements with an MRA Device

Adding network elements to an MRA device is similar to how network elements are added to an MPE device: a list of supported network elements, which are pre-entered into the system (see *Defining a Network Element* to add network elements), is available for selection.

To add a network element to an MRA, complete the following:

1. From within the **MRA** tab, click **Modify**.
   The **MRA Administration Modify** page opens.
2. In the Associations section of the **MRA Administration Modify** page, click **Manage**.
   The Select Network Elements window displays showing a list of network elements.

   For example:

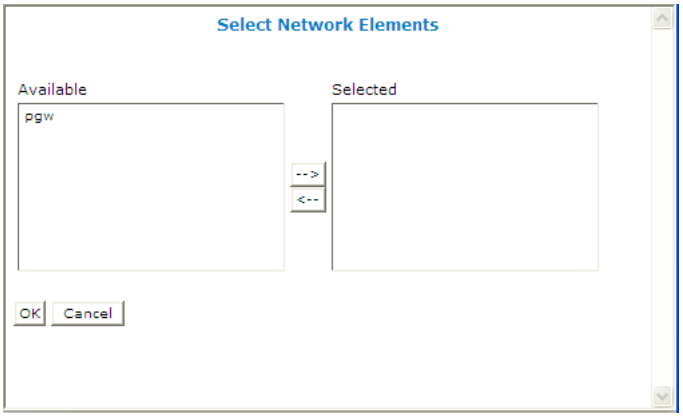



**Figure 11: Select Network Elements**

3. Select a network element in the **Available** list, click the right arrow to move the network element to the **Selected** list.
4. (Optional) Add additional network elements to the **Selected** list.
5. Click **OK**.

The network element is added to the MRA.

## Defining a Network Element

You must define a network element for each device associated with any of the MPE devices within the network. To define a network element:

1. From the **Network** section of the navigation pane, select **Network Elements**.
   The content tree displays a list of network element groups; the initial group is **ALL**.
2. From the content tree, select the network element group in which you want to define the network element.
   (See *Creating a Network Element Group* for information on creating network element groups.)
   The **Network Element Administration** page opens in the work area.
3. On the **Network Element Administration** page, click **Create Network Element**.
   The **New Network Element** page opens.
4. Enter information for the network element:
   a) **Name** (required) — The name you assign to the network element.
      Enter up to 250 alphanumeric characters. The name can include underscores (_), hyphens (-), colons (:), and periods (.).
   b) **Host Name/IP Address** (required) — Registered domain name, or IP address in IPv4 or IPv6 format, assigned to the network element.
   c) **Backup Host Name** — Alternate address that is used if communication between the MPE device and the network element's primary address fails.
   d) **Description/Location** — Free-form text.
      Enter up to 250 characters.
   e) **Type** (required) — Select the type of network element.
      The supported types are:

**Note:** This list varies depending on the configuration of the CMP system.

- **PDSN** — Packet Data Serving Node (with the sub-types **Generic PDSN** or **Starent**)
- **HomeAgent** — Customer equipment Home Agent (with the sub-types **Generic HomeAgent** or **Starent**)
- **GGSN** (default) — Gateway GPRS Support Node
- **Radius-BNG** — RADIUS broadband network gateway
- **HSGW** — HRPD Serving Gateway
- **PGW** — Packet Data Network Gateway
- **SGW** — Serving Gateway
- **DPI** — Deep Packet Inspection device
- **DSR** — Diameter Signaling Router device
- **NAS** — Network Access Server device

f) **Protocol Timer Profile**—select a protocol timer profile. For information on creating protocol timers, see *Managing Protocol Timer Profiles*.

g) **Capability** — This field is valid for some network element types. When present, it contains the following options:

- **TDF-Solicit** (DPI) — the DPI accepts Sd session establishment requests from the MPE device.
- **Time-Tariff** (PGW, DPI) — these network element types support Time-Tariff functionality.
- **SCE-Gx** (DPI)
- **Usage-Report-26** (GGSN, PGW, SGW, DPI) — these network element types are compatible with usage_report event trigger value 26.

h) **Capacity** — The bandwidth allocated to this network element.Not applicable.

i) **Links to other Network Elements** — Specifies the links to other network elements.

5. Select one or more policy servers (MPE devices) to associate with this network element.
6. Select one or more MRA devices to associate with this network element.
7. To add a network element to a network element group, select the group (see *Adding a Network Element to a Network Element Group*).
8. When you finish, click **Save**.

You have created the definition for a network element.

## Associating a DSR Network Element with an MRA

Use this procedure to associate a DSR with an MRA device. If the MRA device gets an MPE-initiated message and the MRA device has a DSR configured, the MRA device will forward the message to the Primary DSR. If the connection to the primary DSR is not available, the MRA device forwards the message to another DSR (if configured). Note that the primary DSR Network Element (NE) should be configured in the Associated NEs list first.

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. From the content tree, select an MRA device.
   The **MRA Administration** page opens.
3. On the **MRA Administration** page, select the **MRA** tab.
   The current MRA configuration settings are displayed.

4. From within the **MRA** tab, click **Modify**.
   The **Modify MRA** page opens.
5. Select a **Primary DSR** to associate with this MRA from the pulldown menu.
6. Enter a string value into **Segment ID**, if needed. If the MRA receives a message with a Destination-Host equal to the Segment ID, the MRA removes the Destination-Host AVP from the message.
7. Click **Save** (or **Cancel** to abandon your changes).

The specified DSR information is associated with this MRA device.

## Creating a Network Element Group

To create a network element group:

1. From the **Network** section of the navigation pane, select **Network Elements**.
   The content tree displays a list of network element groups; the initial group is **ALL**.
2. From the content tree, select the **ALL** group.
   The **Network Element Administration** page opens in the work area.
3. Click **Create Group**.
   The **Create Group** page opens.
4. Enter the name of the new network element group.

   The name can be up to 250 characters long and must not contain quotation marks (") or commas (,).
5. Enter a text description of the network group.
6. When you finish, click **Save**.

You have created a network element group.

## Adding a Network Element to a Network Element Group

Once a network element group is created, you can add individual network elements to it. To add a network element to a network element group:

1. From the **Network** section of the navigation pane, select **Network Elements**.
   The content tree displays a list of network element groups; the initial group is **ALL**.
2. From the content tree, select the network element group.
   The **Network Element Administration** page opens in the work area, displaying the contents of the selected network element group.
3. On the **Network Element Administration** page, click **Add Network Element**.

   The **Add Network Elements** page opens. The page supports both small and large networks, as follows:

   - If there are 25 or fewer network elements defined, the page displays the network elements not already part of the group. (*Figure 12: Add Network Element Page* shows an example.)
   - If there are more than 25 network elements defined, the page does not display any of them. Instead, use the **Search Pattern** field to filter the list. Enter an asterisk (*) to generate a global search, or a search pattern to locate only those network elements whose name matches the pattern (for example, `star*`, `*pGw`, or `*-*`). When you have defined a search string, click **Filter**; the page displays the filtered list.

4. Select the network element you want to add; use the Ctrl or Shift keys to select multiple network elements.

   You can also add previously defined groups of network elements by selecting those groups.

5. When you finish, click **Save**.

The network element is added to the selected group, and a message indicates the change; for example, `2 Network Elements were added to this group`.

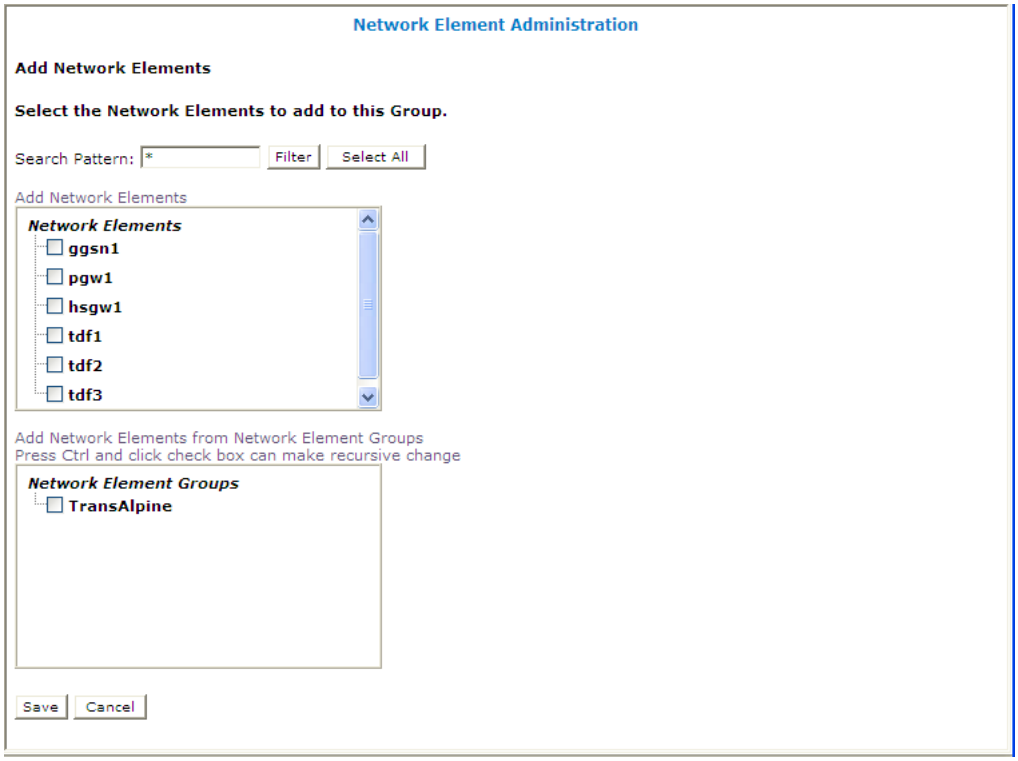



**Figure 12: Add Network Element Page**

### Managing Protocol Timer Profiles

*Managing Protocol Timer Profiles* describes how to define and manage protocol timer profiles within the CMP system.

A protocol timer profile configures the Diameter response timeout values for specific applications and the different message types within an application.

## About MPE/MRA Pools and Diameter Peer Tables

**Note:** Each MRA cluster can support a pool of 10 MPE clusters.

The MPE can have dual roles within the MRA. It can be associated with a MRA as an element in the MPE pool of the MRA so that it participates in the load balancing operation of the MRA and it can serve as a Diameter peer for Diameter routing.

The MPE can function in the following roles:

- The MPE is associated with an MRA and participates in the load balancing action of the MRA.
- The MPE is added as a simple Diameter peer for Diameter routing and it does not participate in the load balancing of the MRA.
- The MPE can serve both roles but not simultaneously.

If there are explicit Diameter routes, the routes take precedence over the load balancing action of the MRA. To allow maximum flexibility, you can associate an MPE with an MRA to cover roles 1 and 3. When you associate an MPE with the MRA, the MPE automatically becomes a Diameter routing peer available in the Diameter routing table. In addition, you can add a new MPE as a simple Diameter peer to cover role 2. In this case, the MPE only serves as a simple Diameter peer and does not participate in the load balancing operation at all.

**Note:** An MPE cannot be present in both the MPE pool and Diameter routing table at the same time. If you try to do this, an error message is returned indicating that an MPE entry already exists in either the MPE pool or the Diameter peer routing table. If an MPE is in the peer table and you want to add it to the MPE pool, you need to delete it from the peer table first and then add it to the MPE pool. Also, if you try to remove an MPE from the MPE pool and the MPE is also in the Diameter peer routing table, a warning message is displayed informing you that the selected MPE cannot be removed until it is first deleted from the Diameter peer routing table.

## Configuring Diameter Realm Based Peer Routes

By default, Diameter messages are processed locally. In a network with multiple Policy Management devices, messages can be routed, by realm, application, or user ID, for processing by peers or other realms.

To configure the Diameter route table:

1. From the **Policy Server** section of the navigation pane, select **Configuration**.
   The content tree displays a list of policy server groups.
2. From the content tree, select the policy server.
   The **Policy Server Administration** page opens in the work area.
3. Select the **Diameter Routing** tab.
   The Diameter Routing configuration settings are displayed.
4. Click **Modify Routes**.
   The **Modify the Diameter Route Table** page opens.
5. Add a route to the table
   a) Click **Add**.
      the **Add Diameter Route** window opens.
   b) Configure the route using the following fields.
      - **Diameter Realm** — For example, `galactel.com`.
      - **Application ID** — Select **Rx** (the default), **Gq**, **Ty**, **Gx**, **Gy**, **Gxx**, **Sh**, **Sy**, or **All**.

        **Note:** You can include only one application per route rule. For multiple applications, create multiple rules.

      - **User ID type** — Select **ANY** (the default), **E.164(MSISDN)**, **IMSI**, **IP**, **NAI**, **PRIVATE**, **SIP_URI**, or **USERNAME**.

- **Value** — Enter the user ID to be routed (for example, an NAI or E.164 number). Separate user IDs using a comma (,); use a period followed by an asterisk (.*) as a wildcard character. To add the user ID to the list, click **Add**; to remove one or more user IDs from the list, select them and click **Delete**.
- **Evaluate as Regular Expression** — The check box allows the matching of route criteria using regular expression syntax, opposed to the previously supported matching wildcards. routes.
- **Action** — Select **PROXY** (stateful route, the default), **RELAY** (stateless route), or **LOCAL** (process on this device).
- **Server ID** — Select a destination peer from the list.

  **Note:** You can define a server with a Diameter identity.

c) When you finish, click **Save**.

6. (Optional) Add, delete, modify, or order entries.

- Cloning an entry in the table

  1. Select an entry in the table.
  2. Click **Clone**. The **Clone** window opens with the information for the entry.
  3. Make changes as required.
  4. When you finish, click **Save**. The entry is added to the table

- Editing an entry in the table

  1. Select the entry in the table.
  2. Click **Edit**. The **Edit Response** window opens, displaying the information for the entry.
  3. Make changes as required.
  4. When you finish, click **Save**. The entry is updated in the table.

- Deleting a value from the table

  1. Select the entry in the table.
  2. Click **Delete**. A confirmation message displays.
  3. Click **Delete** to remove the entry. The entry is removed from the table.

- Ordering the list.

  If you define multiple entries, they are searched in the order displayed in this list. To change the order:

  1. Select an entry.
  2. Click **Up** or **Down**. The search order is changed.

7. Define the default route:
   a) Click **Edit** in the **Default Route** section.
   b) Select the default action: **PROXY**, **RELAY**, or **LOCAL**.
   c) Select the peer server ID.
   d) When you finish, click **Save**.
8. To delete the default route, click **Delete**.
9. When you finish, click **Save**.

The Diameter routes are configured.

## Associating a Diameter MPE Peer with an MRA

When adding an MPE device to the MPE Pool, the IP Address must be from the application network and not from the management network.

**Note:** When specifying an associated MPE device, it is not necessary that the MPE device is under the same CMP. The CMP does not verify if it is an MPE device and if it is online or not.

To associate an MPE device with an MRA and add it to the MPE pool, complete the following steps:

1. Select **MRA > Configuration**.
2. Select the **MRA** that is to associated with an MPE device.
3. Select the **MRA** tab, click **Modify**.
4. In the **MPE Pool** section, click **Add** to open the **Add Diameter MPE Peer** window..

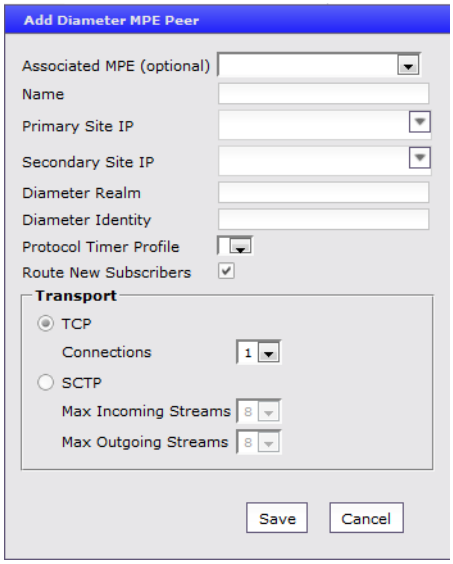



**Figure 13: Add Diameter MPE Peer Window**

5. Enter the following information:
   a) **Associated MPE** — Select an MPE device.

      **Note:** An MPE device is selected from the list of MPEs managed by the CMP. If the MPE is not managed by this CMP, this should be left blank.

   b) **Name** — Name of the MPE device.
   c) **Primary Site IP** — Enter the IP address of the primary site.
   d) **Secondary Site IP** (for georedundant configurations only) — Enter the IP address of the secondary site.
   e) **Diameter Realm** — Enter the domain of responsibility for the peer (for example, **`galactelEU.com`**).
   f) **Diameter Identity** — Enter a fully qualified domain name (FQDN) or the peer device (for example, **`MRA10-24.galactel.com`**).
   g) **Route New Subscribers** — Select if the MPE no new sessions will be routed requests for new subscribers (that is, no existing binding). If it is unselected, the MPE no new sessions will be routed to this MPE.

h) In the **Transport** section, select:

- Select **TCP** and the number of **Connections** to be used (default is 1).
- Select **SCTP** and the number of **Connections** (incoming and outgoing streams) to be used (default is 8 for each).

6. When you finish, click **Save** (or **Cancel** to abandon your changes).
   The **Add Diameter MPE Peer** window closes.
7. (Optional) In the **Diameter** section enter the following information:
   a) **Diameter Realm**.
   b) **Diameter Identity**.
8. In the **S9** section select the following information:
   a) **Primary DEA**.
   b) **Secondary DEA**.
9. Click **Save**.

The MPE device is added to the MPE pool. If you are setting up multiple MRA clusters, repeat the above steps for each MRA in each cluster.

### Cloning, Modifying, or Deleting an MPE

To clone, modify, or delete an MPE from the MPE pool of an MRA, complete the following steps:

1. From the **MRA** tab, click **Modify**.
2. In the **MPE Pool** section of the page, select the MPE.
3. Click **Clone**, **Edit**, or **Delete**.
   a) If deleting, click **Delete**.
   b) If cloning or modifying, enter the required information and click **Save**.

## About Stateless Routing

Stateless routing allows the MRA to route diameter messages to MPE devices or other devices, without the need to maintain state. Typically, the MRA selects an MPE device for a user, and continues to use the same MPE for the user by maintaining session state. Using stateless routing, static routes are configured ahead of time, so the state does not need to be maintained.

Using stateless routing, the MRA establishes a diameter connection with every peer that is defined in the Diameter Peer Table, where a peer consists of a name, IP address, diameter realm, diameter identity, and port. A route consists of a diameter realm, application ID, user ID, action, and server ID. The Action can be either proxy or relay.

Stateless routing uses routing based on FramedIPAddress and FramedIPv6Prefix, with wildcard pattern matching. The IP address must be configured in either dotted decimal notation for IPv4 or expanded notation for IPv6 excluding the prefix length.

The MRA processes routes in the order of their configured priority, which is based on the order in which they were configured in the route. If the destination of a route is unreachable, the route with the next highest priority is used. If no available routes are found, the MRA returns a

DIAMETER_UNABLE_TO_DELIVER error message. If a destination is currently up when the route is chosen but the forwarded request times out, the MRA returns a DIAMETER_UNABLE_TO_DELIVER error message and does not try the next route.

## Enabling Stateless Routing

To hide configuration relevant to a stateful MRA device in the CMP display, perform the following procedure.

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is**ALL**.
2. Select the MRA from the content tree.
   The **MRA Administration** page displays the configuration for the MRA.
3. Select the **System** tab.
   The **Modify System Settings** page opens.
4. Select **Stateless Routing** (*Figure 14: Enabling Stateless Routing* shows an example).

The stateful MRA configuration is hidden.

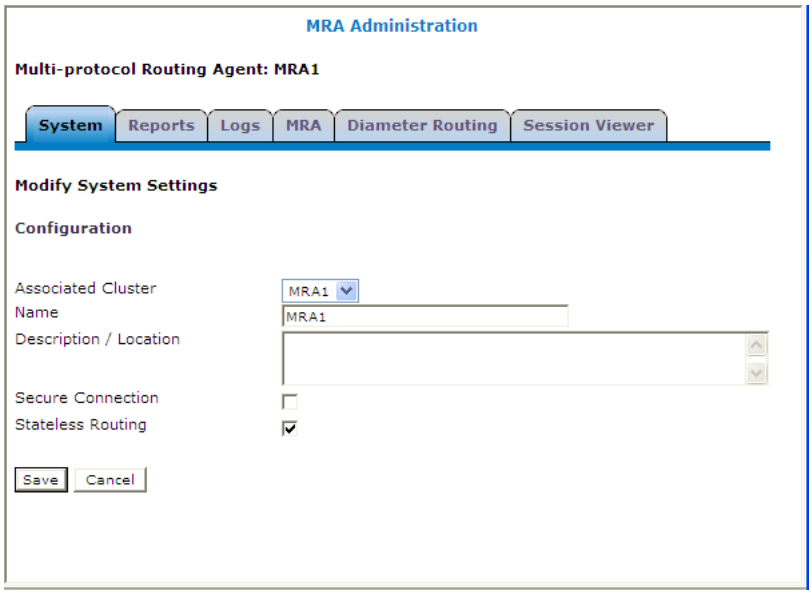



**Figure 14: Enabling Stateless Routing**

## Modifying the Stateless Migration Mode in an Existing MRA

When modifying an existing MRA, you can enable or disable the **Enable Stateless Migration Mode** which enables the MRA device to use static routes to transition to a stateless migration mode.

To enable and disable the migration mode setting:

1. From the **MRA** section of the navigation pane, select **Configuration**.
   The content tree displays a list of MRA groups; the initial group is **ALL**.
2. Select the MRA device from the content tree.
   The **MRA Administration** page opens, displaying information about the selected MRA device.

3. Select the **MRA** tab.
4. Click **Advanced**.
5. In the **Stateful MRA Settings** section of the page, select **Enable Stateless Migration Mode** (or leave the box unchecked if you do not want to enable the migration mode).
   The stateless migration mode is enabled.
6. Click **Save** (or **Cancel** to abandon your change).

The MRA device is put into migration mode.

### Loading MPE/MRA Configuration Data when Adding Diameter Peer

When adding a diameter peer one must be selected from the list contained within the Diameter Routing tab. Once selected, the peer configuration fields are auto populated.

## Configuring for RADIUS

For an MRA to utilize RADIUS, the system must be RADIUS enabled (see *CMP Wireless User's Guide*) and the MPE for the MRA must be configured for RADIUS (see *CMP Wireless User's Guide*).

Complete these steps to configure an existing MRA for RADIUS.

1. From the **MRA Tree**, select the **MRA** to be configured for RADIUS.
2. Select the **MRA Tab**.
3. Click **Modify**.
4. Scroll to the **RADIUS Configuration** section and enter the following:

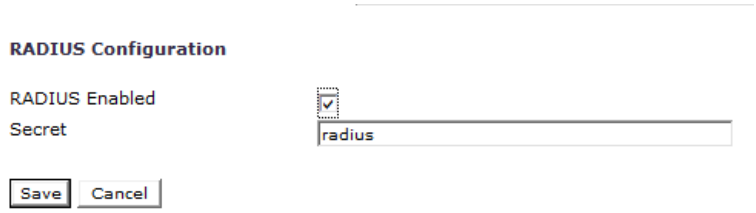



**Figure 15: RADIUS Configuration Section**

- Select **RADIUS Enabled**.
- **Secret** — Enter name of the **Default Passphrase**.

5. Click **Save** when you have completed the steps.

# Chapter 5

# Managing Subscriber Profile Repositories

**Topics:**



*Managing Subscriber Profile Repositories* describes how to define and manage an optional Subscriber Profile Repository (SPR) using the CMP system.

An SPR is a system for storing and managing subscriber-specific policy control data as defined in the 3GPP standard.

**Note:** For information on operating Oracle Communications Enhanced Subscriber Profile Repository devices, refer to the ESPRUDR documentation.

## About Subscriber Profile Repositories

A Subscriber Profile Repository (SPR) is a system for storing and managing subscriber-specific policy control data as defined under the 3GPP standard.

An SPR can be deployed in environments where the MPE device needs access to a separate repository for subscriber data. The SPR acts as a centralized repository for this data so that multiple MPE devices can access and share the data. This data may include profile data (pre-provisioned information that describes the capabilities of each subscriber), quota data (information that represents the subscriber's use of managed resources), or other subscriber-specific data.

The following SPR systems can be used in the CMP system:

- The Oracle Communications Subscriber Database Management (SDM) product includes interfaces for provisioning subscriber information, as well as managing, changing, and accessing this information. These interfaces include an application programming interface (API) for XML provisioning of subscriber profile data, as well as an interactive user interface through the CMP system using a proprietary RESTful API interface.

  The SDM is built upon an existing software base and technology. It not only manages static provisioned subscriber data, but also dynamic intra- and inter-session data from MPE devices—for example, when it is critical to store inter-session quota data centrally so that it can be retrieved upon the next subscriber attachment, wherever that attachment occurs within the network. Intra-session data such as mappings from IP addresses to MSISDNs becomes important as well, especially when managing enforcement points such as DPI devices and optimization gateways where MSISDN/IMSI data is not available. With this the SDM provides both a storage and notification platform for policy operations, as well as a platform for operator provisioning.

  For detailed information on the SDM, see the SDM documentation.

- The Oracle Communications User Data Repository (UDR) is a highly-scalable, consolidated database back end for subscriber and profile data. UDR utilizes multiple application front ends with the database. UDR supports the Oracle Communications Enhanced Subscriber Profile Repository (ESPR) application, a function used for the storage and management of subscriber policy control and pool data. XML-REST and XML-SOAP interfaces are used by ESPR for creating, retrieving, modifying, and deleting subscriber and pool data.

  For detailed information on the UDR, see the UDR documentation.

- A customer specified SPR.

  See the SPR documentation for more information.

To use an SPR with CMP, you must perform the following actions:

- *Configuring the CMP System to Manage SPR Subscriber Data*
- *Configuring the SPR Connection*

You can also modify an SPR connection. See *Modifying the SPR Connection* for details.

## Configuring the CMP System to Manage SPR Subscriber Data

The CMP system can manage SPR subscriber data. Before this can occur, the CMP operating mode must support managing SPR clusters.


**Caution:** CMP operating modes should only be set in consultation with My Oracle Support (MOS). Setting modes inappropriately can result in the loss of network element connectivity, policy function, OM statistical data, and cluster redundancy.

To reconfigure the CMP operating mode, complete the following:

1. From the **Help** section of the navigation pane, select **About**.
   The **About** page opens, displaying the CMP software version number.
2. Click the **Change Mode** button.
   Consult with My Oracle Support for information on this button.
   The **Mode Settings** page opens.
3. In the Mode section, select the mode **Diameter 3GPP**, **Diameter 3GPP2**, or **PCC Extensions**, as appropriate.
4. At the bottom of the page, select **Manage SPR Subscriber Data**.
5. Click **OK**.
   The browser page closes and you are automatically logged out.
6. Refresh the browser page.
   The **Welcome** log in page is displayed.

You are now ready to define an SPR cluster profile and manage SPR subscriber profile and pooled quota data.

## Configuring the SPR Connection

You must define the operation mode and connection details for the SPR before you can look up subscriber information from the CMP system.

To configure the CMP connection to an SPR database:

1. From the **SPR** section of the navigation pane, select **Configuration**.
   The **SPR Connection Configuration** page opens in the work area, displaying connection information.
2. On the **SPR Connection Configuration** page, click **Modify**.
   The **Configuration** page opens.
3. Enter information as appropriate for the SPR system:
   a) **SPR Operation Mode** (required) — Select from the list:
      - **SDM RESTful API** (default)
   b) **Remote Port** — Enter the port (a number from 1 to 65535) to listen on for SPR traffic.
      The default port is 8787.
   c) **Secure Connection** — Select to establish a secure connection.

d) **Enable Custom Fields for Data Entry**—Select to show the custom fields on the **Service**, **User Session Policy**, and **User Location** tabs.

e) **SDM Profile Fields**—Defines the custom fields for the SDM profile.

Enter the field name in the field and click **Add**. To remove a field from the list, select the field and click **Delete**.

f) **SDM Pool Fields**—Defines the custom fields for the SDM pool.

Enter the field name in the field and click **Add**. To remove a field from the list, select the field and click **Delete**.

4. When you finish, click **Save**.
The connection definition is added to the CMP database.

The SPR connection is configured.

## Modifying the SPR Connection

To modify the SPR connection:

1. From the **SPR** section of the navigation pane, select **Configuration**.
The **SPR Connection Configuration** page opens in the work area, displaying connection information.
2. Click **Modify**.
The **Configuration** page opens.
3. Modify the configuration information.
See *Configuring the SPR Connection* for information on the fields on this page.
4. When you finish, click **Save**.

The SPR connection configuration is modified.

## Finding a Subscriber Profile

Once you have defined SPR devices, you can search them for a subscriber profile.

To find a subscriber profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
The **Subscriber Profile Administration** page opens.
2. Select the **Data Source Primary Diameter Identity**.
This is the list of defined SPR devices. You can select any SPR device configured for the Policy Management network. Devices are identified by both their primary identity and MPE device name.
3. Select the **Key Type**:
   - **E.164 (MSISDN)** (default) — search by Mobile Station International Subscriber Directory Number. This is a number of up to 15 digits.
   - **IMSI** — search by International Mobile Subscriber Identity. This is a number of up to 15 digits.
   - **NAI** — search by Network Access Identifier.
   - **Pool ID** — search by quota pool identifier.

4. **Key String** — enter a search string in the format appropriate for the selected key type.
   The string must match exactly; partial or wildcard searching is not supported.
5. Click **Search**.
   The **Subscriber Profile** page opens, displaying information about the subscriber.

   **Note:** If no matching subscriber profile is found, the page displays the message `No matching user is found`.

6. When you finish, click **Back to Search Page**.
   The **Subscriber Profile Administration** page opens.

## Creating a Subscriber Profile

If an SPR database is configured to use the RESTful API interface, you can manually create a subscriber profile.

To create a subscriber profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Click **Create Subscriber Profile**.
   The **New Subscriber Profile** page opens in the work area.
3. Enter the following information:
   a) Select the **Data Source Primary Diameter Identity**.
   You can select any SPR device configured for the Policy Management network.
   b) In the **Key Fields** section, enter one format:

   - **NAI** — Network Access Identifier. You must enter a valid user name, optionally followed by a valid realm name. A valid user name consists of the characters &*+0-9?a-z_A-Z{}!#$%'^/=`|~-, optionally separated by a period (.). A valid realm name consists of the characters 0-9a-zA-Z- separated by one or more period (.), but the minus sign (-) cannot be first, last, or adjacent to a period.
   - **E.164 (MSISDN)** — Mobile Station International Subscriber Directory Number. Enter up to 15 Unicode digits, optionally preceded by a plus sign (+).
   - **IMSI** — International Mobile Subscriber Identity. Enter up to 15 Unicode digits.

   c) Optionally, in the **Subscriber Information** section, enter the following:

   - **Account ID** — Free-form string that can identify the account for the subscriber. You can enter up to 255 characters.
   - **Billing Day** — The day of the month on which the subscriber's associated quota is reset. If you enter 0 or leave this field blank, then the default global value configured for this MPE device is used instead.
   - **Tier** — The subscriber's tier. Enter a tier name defined in the CMP database; or, if you click **Manage**, a window opens from which you can select a tier name. In order to add a tier, you must enter the tier name prior to clicking **Manage**. See *Managing Subscribers Managing Subscriber In the CMP Wireless User's Guide* for information on managing tiers.
   - **Entitlements** — The subscriber's entitlement(s). Enter the entitlement name(s); or, if you click **Manage**, a window opens from which you can enter or select entitlement names defined

in the CMP database. See *Managing Subscribers Managing Subscriber In the CMP Wireless User's Guide* for information on managing entitlements.

**Note:** Entitlements are defined external to the CMP system.

- **Custom** — Free-form strings representing custom subscriber fields. You can enter up to 255 characters per field. By default, five fields are available, but if the subscriber profile has more than five custom fields defined, the page displays them. Click **Add** to create additional fields as needed.

4. When you finish, click **Save**.

The subscriber profile is defined.

### Managing Subscribers

*Managing Subscribers* describes how to create and manage subscriber tiers and quota usage within the CMP system.

**Note:** The actual options you see depend on whether or not your CMP system is configured to operate with a (SPR). For information about the Oracle Communications Subscriber Database Management product, see the SDM documentation. For information about the Oracle Communications User Data Repository product, see the UDR documentation.

## Modifying a Subscriber Profile

To modify a subscriber profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to modify.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Click **Modify**.
   The **Subscriber Profile Administration** page opens.
4. Modify subscriber profile information as required.
   For a description of the fields contained on this page, see *Creating a Subscriber Profile*.
5. When you finish, click **Save**.

The subscriber profile is modified.

## Deleting a Subscriber Profile

Using the RESTful API operation mode, you can delete a subscriber profile. See *Configuring the SPR Connection* for information on setting the operation mode.

To delete a subscriber profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to delete.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Click **Delete**.
   A confirmation message displays.
4. Click **OK** to delete the subscriber profile.

The subscriber profile is deleted.

## Viewing Subscriber Entity States

Subscriber entity states are a set of name-value pairs associated with a subscriber.

To view the entity states associated with a subscriber:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to view.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Click the **State** tab.
   Entity state information is displayed.
4. When you finish, click **Back to Search Page**.

You have viewed the subscriber entity states.

## Creating a Subscriber Entity State Property

To create a subscriber entity state property:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to modify.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Select the **State** tab.
   Entity state information is displayed.
4. Click **Create**.
   The **Create Property** page opens.
5. Enter the following information:
   a) **Name** — The name assigned to the property.
      The name cannot be blank and must be unique within this list of properties.
   b) **Value** — The property value.
      The value cannot be blank.

6. Click **Save**.
   The profile information page opens, and displays the message `Properties created successfully`.
7. To create additional properties, repeat steps 4 through 6.
   If you exceed 100 states, you are prompted whether you want to add more. Click **Yes** to continue, or **No** to stop.
8. When you finish, click **Back to Search Page**.
   The page displays the message `Properties created successfully`.

The subscriber entity state property is defined.

## Modifying a Subscriber Entity State Property

You can modify the value (but not the name) of a subscriber profile entity state property. To modify a subscriber entity state property:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to modify.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Select the **State** tab.
   Entity state information is displayed.
4. In the list of entity state properties, click the property you want to modify.
   The **Modify Property** page opens.
5. Modify the property value as required.
   The value cannot be blank.
6. When you finish, click **Save**.

The subscriber entity state property value is modified.

## Deleting a Subscriber Entity State Property

To delete a subscriber entity state property:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to modify.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Select the **State** tab.
   Entity state information is displayed.
4. In the list of entity state properties, use the check boxes to select the property or properties you want to delete.
   To select all properties, click **All**. To deselect all properties, click **None**.

5. Click **Delete**.
   A confirmation message displays.
6. Click **OK**.
   The property or properties are removed from the list.

The subscriber entity state properties are deleted.

## Viewing Subscriber Quota Information

To view the quotas associated with a subscriber:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select the subscriber profile.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on locating a subscriber profile.)
3. Select the **Quota** tab.
   The **Subscriber Profile Quota Usage** page is displayed. The table provides the following information:
   - **Name** — Quota name defined in the CMP system.
   - **Time Usage** — Usage counter, in seconds, to track time-based resource consumption.
   - **Time Limit** — Time limit, in seconds, defined in the named quota.
   - **Total Volume Usage** — Usage counter, in bytes, to track volume-based resource consumption.
   - **Total Volume Limit** — Volume limit, in bytes, defined in the named quota.
   - **Upstream Volume Usage** — Usage counter, in bytes, to track upstream bandwidth volume-based resource consumption. Also known as Input Volume.
   - **Upstream Volume Limit** — Upstream volume limit, in bytes, defined in the named quota.
   - **Downstream Volume Usage** — Usage counter, in bytes, to track downstream bandwidth volume-based resource consumption. Also known as Output Volume.
   - **Downstream Volume Limit** — Downstream volume limit, in bytes, defined in the named quota.
   - **Service Specific Event** — Usage counter to track service-specific resource consumption.
   - **Service Specific Event Limit** — Resource consumption limit defined in the named quota.
   - **Next Reset Time** — The time after which the usage counters need to be reset.
   - **CID** — A unique identifier, assigned by the CMP system. Top-ups and rollovers have the CID of their associated plan.
   - **Type** — Defines whether the data is for a quota (plan), pass, rollover, top-up, or default rollover.
   - **Quota State** — An internal identifier, which defines whether the option selected in the **Type** field is active or expired.
   - **RefInstanceId** — The CID of the plan.
4. When you finish, click **Back to Search Page**.

You have viewed the subscriber quota information.

## Adding a Subscriber Quota Category

To add a subscriber quota category:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to view.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Select the **Quota** tab.
   The Quota Usage information appears in the work area.
4. Click **Create**.
   The **Quota Usage** page opens. If you exceed 10 quotas, you are prompted whether to add more. Click **Yes** to continue, or **No** to stop.
5. Enter the following information:
   a) **CID** — A unique identifier assigned by the CMP system. Rollovers and top-ups have the CID of their associated plan.

      **Note:** This information is assigned by the system, and you should not change it.

   b) **Name** (required) — Select the name of a quota. You cannot add the same quota twice for a subscriber. See the *Policy Wizard Reference* for information on creating quotas.
   c) **Type** — Select the type of quota defined in the CMP system. You can select **quota** (plan), **pass**, **rollover**, **top-up**, or **default rollover**.
   d) **Time (seconds)** — Enter a value, in seconds, to track time consumption.
   The valid range is $-2^{63}$ to $2^{63} - 1$ (a 64-bit value).
   e) **Total Volume (bytes)** — Enter a value, in bytes, to track bandwidth volume consumption.
   The valid range is $-2^{63}$ to $2^{63} - 1$ (a 64-bit value).
   f) **Upstream Volume (bytes)** — Enter a value, in bytes, to track upstream bandwidth volume consumption.
   The valid range is $-2^{63}$ to $2^{63} - 1$ (a 64-bit value).
   g) **Downstream Volume (bytes)** — Enter a value, in bytes, to track downstream bandwidth volume consumption.
   The valid range is $-2^{63}$ to $2^{63} - 1$ (a 64-bit value).
   h) **Service Specific Event** — Enter a value representing service-specific resource consumption.
   The valid range is $-2^{63}$ to $2^{63} - 1$ (a 64-bit value).
   i) **Next Reset Time** (required) — Enter a date and time after which the quotas need to be reset, in the format *yyyy-mm-dd*T*hh*:*mm*:*ss*[*Z*] (for example, **`2011-11-01T00:00:01-5:00`**).
   Alternatively, click (calendar) and select a date, enter a time, and optionally select a UTC offset (time zone). When you finish, click **OK**.
   j) **Quota State** — This field is an internal identifier and should not be defined by the user.
   k) **RefInstanceID** — The CID of the associated plan. This field only applies to a top-up.

      **Note:** This field is an internal identifier, and you should not change it.

6. When you finish, click **Save**.

The subscriber quota is defined.

## Modifying a Subscriber Quota Category

To modify a subscriber quota category:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to view.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Select the **Quota** tab.
   The **Subscriber Profile Quota Usage** page is displayed.
4. Click the name of the quota you want to modify.
   The **Quota Usage** page opens, displaying information about the quota.
5. Modify subscriber quota information as required.
   For a description of the fields contained on this page, see *Adding a Subscriber Quota Category*.
6. When you finish, click **Save**.

The subscriber quota category is modified.

## Deleting a Subscriber Quota Category

To delete a subscriber quota category:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Find the subscriber profile you want to modify.
   Profile information is displayed. (See *Finding a Subscriber Profile* for information on finding a subscriber profile.)
3. Select the **Quota** tab.
   Entity quota information is displayed.
4. In the list of quotas, use the check boxes to select the quota or quotas you want to delete.
   To select all quotas, click **All**. To deselect all quotas, click **None**.
5. Click **Delete**.
   A confirmation message displays.
6. Click **OK**.
   The quota or quotas are removed from the list.

The subscriber quota categories are deleted.

## Adding a Member to a Pooled Quota Group

You can add a member and associate a subscriber when creating a pooled quota group. You can include up to 20 subscribers in a pooled quota group.

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select **Create Pooled Quota Group**.
   The **New Pooled Quota Group Profile** page opens.
3. In the **Data Source Primary Diameter Identity** section of the page, select one of the configured ProfileV3 or ProfileV4 data sources.
4. In the **Pool Quota Group Key Fields** section of the page, enter the **Pool ID**.

   The pool ID is an alphanumeric string of up to 255 characters that can contain hyphens (-) and underscores (_) but no spaces. **`0`** is invalid.
5. (Optional) In the **Pool Information** section of the page, enter the following:
   a) **Billing Day** — The billing day of the subscriber pool. This field is used only for monthly billing.
   b) **Tier** — Enter the name of a tier defined in the CMP database; or click **Manage** to select a tier.
   c) **Entitlements** — Click **Manage** and select one or more entitlement names defined in the CMP database.
   d) **Custom 1, Custom 2, Custom 3, Custom 4, Custom 5** — Enter name value fields. You can refer to them in policies.
   e) **Custom N** — If you click **Add**, you can add additional custom fields.
6. (Optional) In the **Membership Information** section of the page, to add a member or associate a subscriber to the pooled quota group.

   **Note:** When associating a subscriber, you must enter the subscriber key string.

   a) **Key Type** — The type of subscriber identifier type. You can select one of the following:
      - **E.164 (MSISDN)** — Mobile Station International Subscriber Directory Number.
      - **IMSI** — International Mobile Subscriber Identity.
      - **NAI** — Network Access Identifier.

   b) **Key String** — Enter the key string for the subscriber.
   c) Click **Add** to add the subscriber to the pooled quota group.
7. When you finish, click **Save**.

The member is added to the pooled quota group.

## Querying by Pool ID

You can query a new quota by specifying the Pool ID Key Type and Key String value.

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select **Pool ID** in the **Key Type** pulldown and enter a **Key String**. Click **Search**.
   The **Pool Group Quota Profile** page opens with the search results. The following tabs are displayed:
   - **Pool Profile**
   - **Pool Quota**
   - **Pool State**
3. You can select the **Modify**, **Delete**, or **Back to Search Page** options.

## Creating a Pool Quota Profile

A pool quota profile can be created for the purpose of tracking and displaying usage threshold events.

To create a pool quota profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select a **Data Source Primary Diameter Identity**, and the **Key Type** of **Pool ID.**
3. Enter a **Key String**, and click **Search**.
   The **Pool Profile** page opens.
4. Click **Pool Quota Profile**.
   The **Quota Usage** section displays.
5. Click **Create**.
6. Enter the following:
   a) **Name** — Select the name of the pool state.
   b) **Type** — Select the quota being assigned to the pool. You can select **quota** (plan), **pass**, **top-up**, **roll-over**, or **roll-over-def**.

      If you select **roll-over-def**, rollover units are consumed before top-up units unless the highest priority top-up expires in the next 24 hours.
   c) **Time** (seconds) — The amount of time attributed to the quota in seconds.
   d) **Total Volume** (bytes) — The amount of volume attributed to a length of time.
   e) **Upstream Volume** (bytes) — Traffic from the handset (or other device) to the network.
   f) **Downstream Volume** (bytes) — Traffic directed to the handset or other device.
   g) **Service Specific Event** — Tracks text information.
   h) **Next Reset Time** — The reset date and time of the subscriber or pool quota usage.

      **Note:** This is typically the billing day, although for a daily quota the usage is normally reset at midnight or shortly thereafter.
7. When you finish, click **Save**.

The pool quota profile is created.

## Modifying a Pool Quota Profile

A pool quota profile can be modified if you want to make changes to the subscriber information or membership information.

To modify a pool quota profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select a **Data Source Primary Diameter Identity**, and the **Key Type** of **Pool ID.**
3. Enter a **Key String**, and click **Search**.
   The **Pool Profile** page opens with **Pool Profile** as the default.

4. Click **Pool Quota Profile**.
   The **Pool Quota Profile** view displays.
5. Select the profile that you want to modify.
6. Modify any of the fields.

   **Note:** The **Name** field cannot be changed.

7. When you finish, click **Save**.

The pool quota profile is modified.

## Deleting a Pool Quota Profile

A pool quota profile can be deleted.

To delete a pool quota profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select a **Data Source Primary Diameter Identity**, and the **Key Type** of **Pool ID.**
   The Data Source Primary Diameter Identity and Key Type are selected.
3. Enter a **Key String** and click **Search**.
   The **Pool Profile** page opens.
4. Click **Pool Quota Profile**.
   The Quota Usage section displays.
5. Select the name of the properties you want to delete, then click **Delete**.
   A confirmation message displays.
6. Click **OK**.
   The selected properties are deleted.

## Modifying a Pool Profile

A pool profile can be modified if you want to make changes to the subscriber information or membership information.

To modify a pool profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select a **Data Source Primary Diameter Identity**, and the **Key Type** of **Pool ID.**
   The Data Source Primary Diameter Identity and Key Type are selected.
3. Enter a **Key String**, and click **Search**.
   The **Pool Profile** page opens with Pool Profile as the default.
4. Click **Modify**.
   The **Subscriber Profile Configuration** page opens.
5. Modify any of the field information.

6. When you finish, click **Save**.

The pool profile is modified.

## Deleting a Pool Profile

A pool profile can be deleted.

To delete a pool profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select a **Data Source Primary Diameter Identity**, and the **Key Type** of **Pool ID.**
   The Data Source Primary Diameter Identity and Key Type are selected.
3. Enter a **Key String**, and click **Search**.
   The **Pool Profile** page opens with **Pool Profile** as the default.
4. Click **Delete**.
   A confirmation message displays.
5. Click **OK**.

The pool profile is deleted.

## Creating a Pool State

A pool state can be created when an Sh ProfileV3 or ProfileV4 data source is selected. For more information, see *Configuring Protocol Options on the Policy Server*.

To create a pool state:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select a **Data Source Primary Diameter Identity**, and the **Key Type** of **Pool ID**.
   The Data Source Primary Diameter Identity and Key Type are selected.
3. Enter a **Key String**, and click **Search**.
   The **Pool Profile** page opens.
4. Click **Pool State**.
5. Click **Create**.
   The Create Property section displays.
6. Enter the following:
   - **Name** — The name of the pool state.
   - **Value** — The value can be any string; for example, **`Profile V3`**, **`V4`**.
7. When you finish, click **Save** (or **Cancel** to discard your changes).

The pool state is created. The **Pool Entity State Properties** section displays the Pool Quota Group Key Fields and the searched Pool ID.

## Configuring Protocol Options on the Policy Server

To configure protocol options on an MPE device:

1. From the **Policy Server** section of the navigation pane, select **Configuration**.
   The content tree displays a list of policy server groups; the initial group is **ALL**.
2. From the content tree, select the desired MPE device.
   The **Policy Server Administration** page opens.
3. Select the **Policy Server** tab.
   The current configuration options are displayed.
4. Click **Modify** and define options as necessary.

   Selecting or choosing **undefined** signifies that the value come from a configuration profile. If there is not a configuration profile, then the default is used. The following tables define the available options. (The options you see vary depending on the mode configuration of your system.)

   - *Table 6: Associations Configuration Options*
   - *Table 7: Subscriber Indexing Configuration Options*
   - *Table 8: General Configuration Options*
   - *Table 9: RADIUS-S Configuration Options*
   - *Table 10: Diameter Configuration Options*
   - *Table 11: S9 Configuration Options*
   - *Table 12: User Profile Lookup Retry and Session Updates Configuration Options*
   - *Table 13: Diameter AF Default Profiles Configuration Options*
   - *Table 14: Default Charging Servers Configuration Options*
   - *Table 16: SMS Relay Configuration Options*
   - *Table 17: SMPP Configuration Options*
   - *Table 18: Primary SMSC Host Configuration Options*
   - *Table 19: Secondary SMSC Host Configuration Options*
   - *Table 20: SMTP Configuration Options*
   - *Table 21: RADIUS Configuration Options*
   - *Table 22: Analytics Configuration Options*

5. When you finish, click **Save**.

You have defined the protocol options for this MPE device.

**Table 6: Associations Configuration Options**

| Attribute | Description |
|---|---|
| Applications | The application profiles associated with this MPE device. To modify this list, click **Manage**. For more information on application profiles, see the *Policy Wizard Reference*. |
| Network Elements | The network elements associated with this MPE device. To modify this list, click **Manage**. For more information on network elements, see *CMP Wireless User's Guide*. |

| Attribute | Description |
|---|---|
| Network Element Groups | The network element groups associated with this MPE device. To modify this list, select or deselect groups. For more information on network element groups, see *CMP Wireless User's Guide*. |

**Table 7: Subscriber Indexing Configuration Options**

| Attribute | Description |
|---|---|
| Index by IPv4 | Select if the associated Subscriber Profile Repository is indexed by IPv4 address. |
| Index by IP-Domain-ID | Select if the associated Subscriber Profile Repository is indexed by IP domain ID. The combination of framed IPv4 address and IP domain ID ensures a globally unique binding, even if the same IPv4 address is locally assigned in multiple networks. |
| Index by IPv6 | Select if the associated Subscriber Profile Repository is indexed by IPv6 address. |
| Index by Username | Select if the associated Subscriber Profile Repository is indexed by account ID. |
| Index by NAI | Select if the associated Subscriber Profile Repository is indexed by network access ID. |
| Index by E.164 (MSISDN) | Select if the associated Subscriber Profile Repository is indexed by E.164 phone number. |
| Index by IMSI | Select if the associated Subscriber Profile Repository is indexed by International Mobile Subscriber Identity (IMSI) number. |
| Overrides by APN | Select to configure an alternate subscriber indexing by IP address, Username, NAI, E.164 (MSISDN) and IMSI for a specific access point name (APN). In the **Overrides by APN** section, click **Add**. Enter the APN and click **Save** to enable Index by IPv4, Index by IPv6, or both. You can create new APN overrides by cloning or editing existing APN overrides. You can also delete an APN override. |

**Table 8: General Configuration Options**

| Attribute | Description |
|---|---|
| Time of Day Triggering | Select **Enable** or **Disable** (default) from the pulldown menu. If you select **Enable**, this MPE device supports time-of-day triggering when evaluating policy rules. For more information on time-of-day triggering, see the *Policy Wizard Reference*. |
| Billing Day | If enabled, you can configure a global monthly billing day for subscribers who do not have a specific day configured in their profiles in a backend database. |
| Billing Day of Month | If **Billing Day** is enabled, enter the day of the month on which subscriber usage counters are reset. This date is the default billing date for all |

| Attribute | Description |
|---|---|
| | subscribers handled by this MPE device; billing dates can be changed on a per-subscriber basis.<br><br>**Note:** After the billing day is changed, if a subscriber already has usage recorded for the month, usage will be reset on the current billing day; otherwise, the new billing day takes effect immediately. This will be temporary until the billing cycle is over. |
| Billing Time Zone | Select the time zone used for billing cycle calculations. If this feature is configured, the user equipment time zone, even if reported, is irrelevant for billing cycle calculations. |
| Observe Daylight Saving Changes | If selected, the MPE device observes Daylight Saving Time for the configured Billing Time Zone. |
| Default Local Time Mode | Select the time used within a user's session from the pulldown menu: **System Local Time** to use the local time of the MPE device (default) or **User Local Time** to use the user's local time.<br><br>**Note:** If the time zone was never provided for the user equipment, system local time is applied. |
| Enable Pro Rate | If disabled, the full monthly quota for the subscribers is granted for the billing cycle following a quota reset. If enabled, the monthly quota for subscribers is prorated, on a per-quota basis (for up to 30 quotas), for the billing cycle following a quota reset, based on the value of the **Billing Date Effective** field in the subscriber's profile. This is a global setting affecting all subscribers. (If the field value is null, usage will not be prorated.) |
| Billing Date Effective Name | Enter the name of the custom field in subscriber profiles to use for the SPR variable **NewBillingDateEffective**. The default is null. This is a global setting affecting all subscribers.<br><br>• To specify a local time in the SPR, the field must be in the format:<br>`yyyy-mm-ddThh:mm:ss`<br>• To specify a time zone (UTC offset), the field must be in the format:<br>`yyyy-mm-ddThh:mm:ssZ`<br>For example: **`2011-10-30T00:00:00-5:00`** |
| Track Usage for Unknown Users | If enabled, the MPE device tracks usage and state per subscriber ID, even if the subscriber is not registered in the SPR. If tracking was enabled and is now disabled, usage and state is no longer tracked for unknown users, but existing usage and state data is retained. |

| Attribute | Description |
|---|---|
| Subscribe For Unknown Users | If Validate User is *off* (at the MPE device), then the unknown users are allowed to create sessions. In this case, if Subscribe for Unknown Users is enabled, then the MPE device will subscribe for those users.<br><br>**Note:** This setting is only for the MPE device and does not have any effect on the SPR. There are settings in the SPR that must be set to allow auto-enrolling. |
| Use Single Lookup | If enabled, the MPE device reads multiple Sh user data blocks (subscriber, quota usage, and entity state) with a single read request. If you enable this feature, you must also configure the Sh data source with the option **Notif-Eff**. If disabled, separate lookups are used. |
| Use Combined Writes | The MPE device will combine the updates (PUR messages) resulting from a single user request into a single PUR update to the SPR. The PUR will contain both the quota usage and state updates for the user. This reduces the number of transactions between the MPE and SPR. |
| Cache Quota Usage | If enabled, the MPE device caches the quota usage objects locally for as long as the user session exists. If disabled, objects are cached for a default of 60 seconds. |
| Cache Entity State | If enabled, the MPE device caches the entity state objects locally for as long as the user session exists. If disabled, objects are cached for a default of 60 seconds. |
| Subscribe Quota Usage | Subscribe to receive notifications from the SPR for any changes to the quota. |
| Subscribe Entity State | Subscribe to receive notifications from the SPR for any changes to the entity state. |

**Table 9: RADIUS-S Configuration Options**

| Attribute | Description |
|---|---|
| RADIUS Shared Secret | Authenticates RADIUS messages received from external gateways (that is, PDSN or HA). This field must be configured with a value or the RADIUS-S protocol will not work. Also, each gateway must be configured to use this value when sending messages to the MPE device, or the messages received from that gateway will be dropped. |
| Untiered Plan Name | When the MPE device is set to RADIUS-S mode, this attribute indicates that a matching plan name does not participate in any tiered service plan. On a successful lookup for a given subscriber, the plan name returned by LDAP is compared to the Untiered Plan Name configured for the MPE device via the **Policy Server** tab. If they match, no default QoS values are sent to the gateway for the subscriber. If the Untiered Plan Name is null, this only matches if the subscriber has an entry in LDAP with no value for the associated attribute. The default value is null. |
| Default Downstream Profile | Define the upstream and downstream bandwidth parameters that are used when establishing a default traffic profile using RADIUS-S. You can override |

| Attribute | Description |
|---|---|
| Default Upstream Profile | these parameters by configuring policy rules that apply different profiles. If a default profile is not configured, and the policy rules do not set the bandwidth parameters, a default traffic profile is sent to the Gateway to disable policing. |
| Index by Username | Select if the RADIUS database is indexed by subscriber account ID. |
| Index by NAI | Select if the RADIUS database is indexed by subscriber network address ID. |
| Index by Calling Station ID | Select if the RADIUS database is indexed by subscriber calling station ID. |
| Index by IP Address | Select if the RADIUS database is indexed by subscriber IP address. |

**Table 10: Diameter Configuration Options**

| Attribute | Description |
|---|---|
| Diameter Realm | The domain of responsibility (for example, **`galactel.com`**) for the MPE device. |
| Diameter Identity | The fully qualified domain name (FQDN) of the MPE device (for example, **`mpe3.galactel.com`** ). |
| Default Resource Id | The bearer used if a GGSN does not send any bearer information in a Credit-Control Request (CCR). Enter an alphanumeric string of up to 100 characters. The default is no resource ID (that is, no bearer). |
| Correlate PCEF sessions | If selected, the primary PCEF Gx session will share information with all secondary sessions that share an IP address within the same IP-CAN session. Up to 10 different Gx sessions can be correlated to one subscriber. By default, PCEF sessions are not correlated, and do not share information. |
| Validate user | If enabled, sessions for unknown users are rejected. |
| Diameter PCEF Default Profile | Select the default traffic profile from the list that will be applied during PCEF session establishment using the Gx or Ty protocols, or if no other SCE traffic profile is applied as a result of a policy being triggered. |
| Use Synchronous Sd | If selected, the MPE device establishes an Sd session before sending a Gx CCA message to a traffic detection function (TDF). |
| Identify Duplicate sessions based on APN | If enabled, the MPE device will detect duplicate sessions. This makes it possible to remove duplicate sessions if their number becomes excessive. |
| Subscriber ID to detect duplicate sessions | Available only if **Identify Duplicate sessions based on APN** is selected. Select the subscriber index type to use from the pulldown list:<br>• **Username**<br>• **NAI**<br>• **E.164 (MSISDN)**<br>• **IMSI** |
| Protocol Timer Profile | The timer profile to use. |

| Attribute | Description |
|---|---|
| Prevent Overlapping Rule Names | If selected, rule names that are dynamically generated on the primary and spare MPE devices in the same Gx session are unique. |
| Allow Multiple Rx Connections with the same Origin-host Id | When enabled, the MPE device accepts multiple Rx connections with the same Origin-Host Attribute Value Pair (AVP) and source IP address. |
| Timers | Rx-to-PCMM gate timers. Enter values in seconds for T1 (authorized, default 1 second), T2 (reserved, default 300 seconds), and T3 (committed, default 300 seconds). |

**Table 11: S9 Configuration Options**

| Attribute | Description |
|---|---|
| Initiate S9 Requests | If enabled, the MPE device can initiate S9 requests. In addition, you must specify **Initiate Connection** when you define the Diameter peer. For more information, see *Configuring Diameter Peers*.<br>**Note:** If an MRA device is deployed in the Policy Management network, the MPE device will not initiate S9 connections regardless of how you configure S9 options. |
| Accept S9 Requests | If enabled, the MPE device can accept S9 requests. If not enabled, when the MPE device receives an S9 request, an error code is generated at the device. |
| Primary DEA | If one or more Diameter Edge Agents is defined, you can select the primary agent from the pulldown list. For information on defining a DEA, see *Configuring Diameter Peers*. |
| Secondary DEA | If multiple Diameter Edge Agents are defined, you can select the secondary agent from the pulldown list. If you select both primary and secondary DEAs (and there is no MRA device deployed in the Policy Management network), the MPE device establishes a connection to both DEAs. If the primary connection is down, the MPE device sends messages over the secondary connection; once the primary connection is back up, communication reverts back to it. |

**Table 12: User Profile Lookup Retry and Session Updates Configuration Options**

| Attribute | Description |
|---|---|
| Enforcement | If enabled, allows user profile lookup retry on session updates for Gx and Gxx updates. |
| Application | If enabled, allows user profile lookup retry on session updates for Rx. |

**Table 13: Diameter AF Default Profiles Configuration Options**

| Attribute | Description |
|---|---|
| Default | Define the bandwidth parameters that are used when a request from an Application Function (AF) does not contain sufficient information for the |

| Attribute | Description |
|---|---|
| | MPE device to derive QoS parameters. These profiles are defined per media type: The **Default** profile is used when a profile for a media type is not defined.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |
| Audio | The profile for the audio.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |
| Video | The profile for the video.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |
| Data | The profile for data.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |
| Application | The profile for application.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |
| Control | The profile for control.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |
| Text | The profile for text.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |
| Message | The profile for messages.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |
| Other | The profile for all other media types.<br>**Note:** To select a profile, first create a Diameter profile in the general profile configuration. |

**Table 14: Default Charging Servers Configuration Options**

| Attribute | Description |
|---|---|
| Primary Online Server | FQDN of the primary online charging server (used, for example, for prepaid accounts). |
| Primary Offline Server | FQDN of the primary offline charging server (used, for example, for billed accounts). |

| Attribute | Description |
|---|---|
| Secondary Online Server | FQDN of the secondary (backup) online charging server. |
| Secondary Offline Server | FQDN of the secondary (backup) offline charging server. |

**Table 15: Default Charging Methods Configuration Options**

| Attribute | Description |
|---|---|
| Default Online Method | Controls the online charging method. The default is **N/A** which indicates that there is not an online charging method configured. |
| Default Offline Method | Controls the offline charging method. The default is **N/A** which indicates that there is not an online charging method configured. |

**Table 16: SMS Relay Configuration Options**

| Attribute | Description |
|---|---|
| SMS Enabled | Select to enable SMS messaging to subscribers. |
| Relay Host | Enter the FQDN or IP address of the relay server. |
| Relay Port | Enter the port number on which the relay server is listening for SMS messages. The default port is 8080. |
| Throttle Value | Enter the time interval, in milliseconds, at which SMS messages are sent from the MPE device. If set to 1000 ms, the MPE device sends one SMS message per second; if set to 500 ms, the MPE device sends two messages per second. The recommend throttle value is 0 ms which means that the device sends the SMS message as soon as it receives the message. |

**Table 17: SMPP Configuration Options**

| Attribute | Description |
|---|---|
| SMPP Enabled | Select to enable Short Message Peer to Peer (SMPP) messaging to subscribers. To send an SMS message to a subscriber, a Mobile Station International Subscriber Directory Number (MSISDN) must be present in the subscriber's profile. Messages can be up to 254 characters long. |
| Validate Message Length | Select to validate message length. |
| SMPP Long Message Support | If selected, SMS messages longer than 160 characters are split into segments and reassembled by the receiving device. Messages of up to 1000 characters are supported. |
| Delivery Method for Long Message | Select the message delivery method for long messages from the pulldown list:<br>• **Segmentation and Reassembly (SAR)** (default) |

| Attribute | Description |
|---|---|
| | • **Message Payload** |

**Table 18: Primary SMSC Host Configuration Options**

| Attribute | Description |
|---|---|
| SMSC Host | Enter the FQDN or IP address of the primary Short Messaging Service Center store-and-forward server, which accepts SMS messages from the relay server. |
| SMSC Port | Enter the port number on which the primary Short Messaging Service Center store-and-forward server is listening for SMS messages. The default port is 2775. |
| ESME System ID | Enter the system ID of the primary External Short Messaging Entity. Sending the ID and password values authenticates the relay server as a trusted source.<br>**Note:** This value must be configured on the primary SMPP server. |
| ESME Password | Enter the password of the primary External Short Messaging Entity. Sending the ID and password values authenticates the relay server as a trusted source.<br>**Note:** This value must be configured on the SMPP server. |
| Confirm ESME Password | Re-enter the primary ESME password for verification.<br>**Note:** This setting is only available from the **Modify** page. |

**Table 19: Secondary SMSC Host Configuration Options**

| Attribute | Description |
|---|---|
| SMSC Host | Enter the FQDN or IP address of the secondary Short Messaging Service Center store-and-forward server, which accepts SMS messages from the relay server. The secondary SMSC server is used if the primary server fails. |
| SMSC Port | Enter the port number on which the secondary Short Messaging Service Center store-and-forward server is listening for SMS messages. The default port is 2775. |
| ESME System ID | Enter the system ID of the secondary External Short Messaging Entity. Sending the ID and password values authenticates the relay server as a trusted source.<br>**Note:** This value must be configured on the secondary SMPP server. |
| ESME Password | Enter the password of the secondary External Short Messaging Entity. Sending the ID and password values authenticates the relay server as a trusted source.<br>**Note:** This value must be configured on the SMPP server. |
| Confirm ESME Password | Re-enter the secondary ESME password for verification. |

| Attribute | Description |
|---|---|
| ESME Source Address | Enter the source address for a SUBMIT_SM operation in SMPP Protocol V3.4. The default is none. |
| ESME Source Address TON | Select the source address Type of Number (TON) from the pulldown menu:<br>• **UNKNOWN** (default)<br>• **INTERNATIONAL**<br>• **NATIONAL**<br>• **NETWORK SPECIFIC**<br>• **SUBSCRIBER NUMBER**<br>• **ALPHANUMERIC**<br>• **ABBREVIATED** |
| ESME Source Address NPI | Select the source address Number Plan Indicator (NPI) from the pulldown menu:<br>• **UNKNOWN** (default)<br>• **ISDN (E163/E164)**<br>• **DATA (X.121)**<br>• **TELEX (F.69)**<br>• **LAND MOBILE (E.212)**<br>• **NATIONAL**<br>• **PRIVATE**<br>• **ERMES**<br>• **INTERNET (IP)**<br>• **WAP CLIENT ID** |
| Character Encoding Scheme | Select the character-set encoding for SMS messages from the pulldown menu:<br>• **SMSC Default Alphabet**<br>• **IA5 (CCITT T.50)/ASCII (ANSI X3.4)**<br>• **Latin 1 (ISO-8859-1)**<br>• **Cyrillic (ISO-8859-5)**<br>• **Latin/Hebrew (ISO-8859-8)**<br>• **UCS2 (ISO/IEC-10646)**<br>• **ISO-2022-JP (Music Codes)**<br>• **JIS (X 0208-1990)**<br>• **Extended Kanji JIS(X 212-1990)** |
| SMSC Default Encoding Scheme | Select the SMSC default encoding from the pulldown menu: **UTF-8** or **GSM7**. |
| Request Delivery Receipt | Select the global default behavior when evaluating the policy action **send SMS** from the pulldown menu:<br>• **No Delivery Receipt**<br>• **Delivery Receipt on success and failure**<br>• **Delivery Receipt on failure** |

**Table 20: SMTP Configuration Options**

| Attribute | Description |
|---|---|
| SMTP Enabled | Select to enable Simple Mail Transport Protocol (SMTP) messaging (email) to subscribers. SMTP notifications are triggered from policy action and sent through an SMS Relay (SMSR) function to an external mail transfer agent (MTA).<br>**Note:** There is no delivery receipt for the SMTP messages sent from the SMSR, only confirmation that it reached the configured MTA. |
| MTA Host | Enter the FQDN or IP address of the Mail Transfer Agent server, which accepts SMTP messages from the SMSR function. |
| MTA Port | Enter the port number on which the MTA server is listening for SMTP messages. The default port is 25. |
| MTA Username | Enter the system ID of the SMSR function. Sending the ID and password values authenticates the SMSR function as a trusted source.<br>**Note:** This value must be configured on the MTA. |
| MTA Password | Enter the password of the SMSR function. Sending the ID and password values authenticates the SMSR function as a trusted source.<br>**Note:** This value must be configured on the MTA. |
| Confirm MTA Password | Re-enter the password for verification.<br>**Note:** This is a new configuration setting for the SMTP connection. |
| Default From Address(es) | Enter the source address for an SMTP message. Enter up to five comma-separated static values, or up to five comma-separated references to custom fields in the subscriber profile. The default is none.<br>**Note:** The total number of To, CC, and BCC addresses is limited to five. |
| SMTP Connections | The number of SMTP connections. Enter a number from 1–10.<br>**Note:** SMTP connections can be increased to support a higher throughput. |
| Default Reply-To Address(es) | Enter the email address automatically inserted into the To field when a user replies to an email message. For most email messages, the From and Reply-To fields are the same, but this is not necessarily so. If no Default Reply-To is specified here, the From address is used. Optionally, enter a static email address to use for Reply-To. The default is none. |
| Default CC Address(es) | Enter the copy address for an SMTP message. Enter up to five comma-separated static values, or up to five comma-separated references to custom fields in the subscriber profile. The default is none.<br>**Note:** The total number of To, CC, and BCC addresses is limited to five. |

| Attribute | Description |
|---|---|
| Default BCC Address(es) | Enter the blind copy recipient address for an SMTP message. Enter up to five comma-separated static values, or up to five comma-separated references to custom fields in the subscriber profile. The default is none.<br>**Note:** The total number of To, CC, and BCC addresses is limited to five. |
| Default Signature | Enter the text that appears as a signature in an SMTP message. The default is none. |

**Table 21: RADIUS Configuration Options**

| Attribute | Description |
|---|---|
| RADIUS Enabled | When selected, the MPE device processes RADIUS messages; when deselected, RADIUS messages are ignored. The default is enabled. |
| RADIUS Ports (Listening) | Enter a comma-separated list of UDP port numbers that the MPE device listens on for RADIUS messages. The default is **1813,3799**. |
| Concatenate Multiply Occurring VSA's | When selected, if a string VSA appears multiple times in a RADIUS message, the values are concatenated to form one large value. When not selected, if a string VSA appears multiple times in a RADIUS message, the value of the last TLV or VSA is used, and the earlier values are ignored. The default is disabled (earlier values are ignored). |
| Validate User | When selected, if an SPR lookup fails for a subscriber, the MPE device rejects the request. When not selected, if an SPR lookup fails for a subscriber, the MPE device creates a dummy subscriber instance to store necessary information for later use. The default is disabled (requests are processed). |
| Default Passphrase | Enter the default passphrase (a text string). This shared secret value is used when no shared secret is defined for a specific RADIUS network element. The same shared secret is used for decrypting accounting requests and CoA responses and encoding accounting and CoA responses. If you enter no passphrase, and either of the fields in the associated network elements are unset as well, then the MPE device ignores RADIUS requests and responses. The default is **radius**. |
| Correlate to RADIUS | If selected, Diameter DPI sessions will share information with RADIUS sessions. By default, sessions are not correlated, and do not share information. |

**Table 22: Analytics Configuration Options**

| Attribute | Description |
|---|---|
| Policy Analytics Enabled | If the Oracle Communications Policy Management Analytics feature is enabled, select this option to generate an analytics data stream from the MPE device. For more information, see Analytics Data Stream in the *CMP Wireless User's Guide*. |

## Modifying a Pool State

A pool profile can be modified if you want to make changes to the subscriber information or membership information.

To modify a pool profile:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select a **Data Source Primary Diameter Identity**, and the **Key Type** of **Pool ID**.
   The Data Source Primary Diameter Identity and Key Type are selected.
3. Enter a **Key String**, and click **Search**.
   The **Pool Profile** page opens with **Pool Profile** as the default.
4. Click **Pool State**.
   The **Pool Entity State Properties** section displays.
5. Select the **Name** of the pool state that you want to modify.
   The **Modify Property** section displays.
6. The **Name** and **Value** fields are displayed. You can only modify the **Value** field.
7. Modify the **Value** field.
8. When you finish, click **Save**.

The pool state content is modified.

## Deleting a Pool State

A pool state can be deleted.

To delete a pool state:

1. From the **SPR** section of the navigation pane, select **Profile Data**.
   The **Subscriber Profile Administration** page opens.
2. Select a **Data Source Primary Diameter Identity**, and the **Key Type** of **Pool ID**.
   The Data Source Primary Diameter Identity and Key Type are selected.
3. Enter a **Key String**, and click **Search**.
   The **Pool Profile** page opens.
4. Click **Pool State**.
   The **Pool Entity State Properties** section is displayed.
5. Select one or more properties to delete, then click **Delete**.

The properties are deleted.

# Chapter 6

# Monitoring the MRA

**Topics:**



Monitoring MRA is similar to monitoring the MPE devices. The MRA uses the Reports page, the Logs page, and the Debug page to provide the MRA status information. Specifically:

- Cluster and blade information
- DRMA information
- Event logs

## Displaying Cluster and Blade Information

The report page is used to display the cluster and blade status, in addition to the Diameter protocol related statistics. The following figure shows cluster, blade information, and the Diameter statistics.

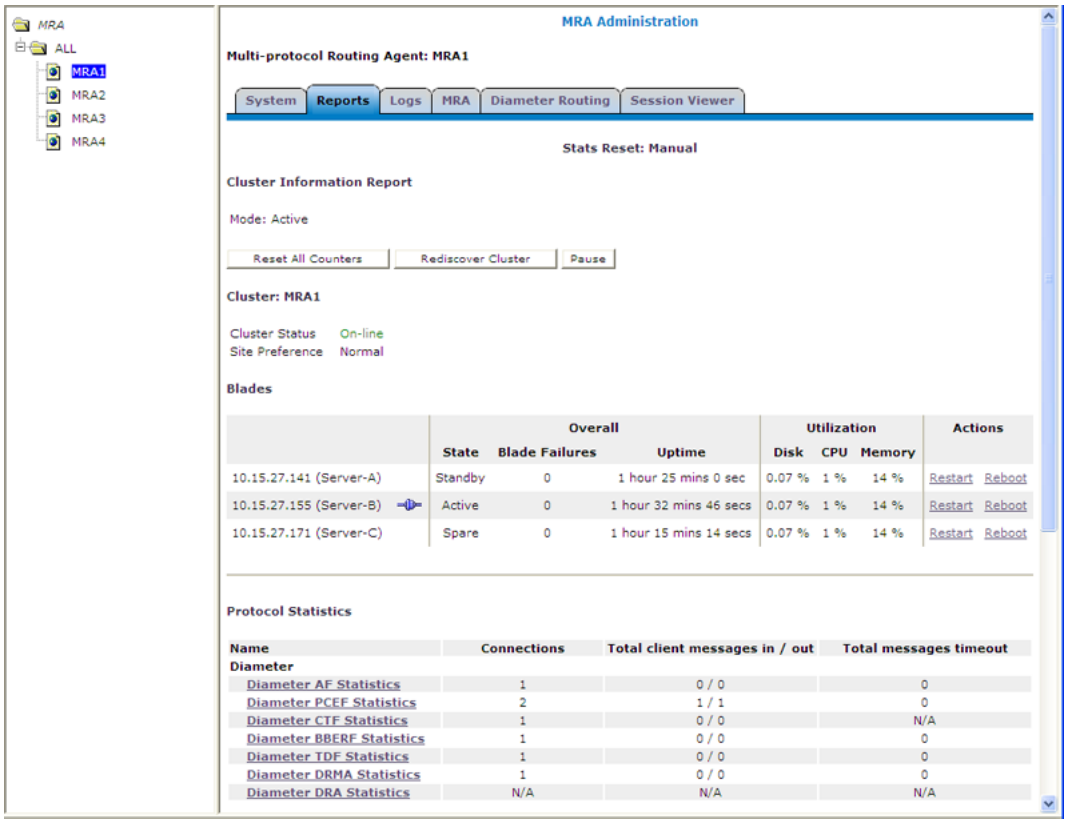



**Figure 16: Cluster, Blade, and Diameter Information**

The following is a list of Diameter statistics:

- Diameter AF (Application Function ) Statistics
- Diameter PCEF (Policy and Charging Enforcement Function) Statistics
- Diameter CTF (Charging Trigger Function) Statistics
- Diameter BBERF (Bearer Binding and Event Reporting) Statistics
- Diameter TDF (Traffic Detection Function) Statistics
- Diameter DRMA (Distributed Routing and Management Application) Statistics
- Diameter DRA (Distributed Routing Application) Statistics

For a detailed breakdown of a statistic, click the statistic. For descriptions of the statistics available for display, refer to *Mapping Reports Display to KPIs*.

### Viewing Trace Logs

The trace logs page displays MRA related messages. The page also has functionality to configure these logs and provides a log viewer to search and browse the log entries.

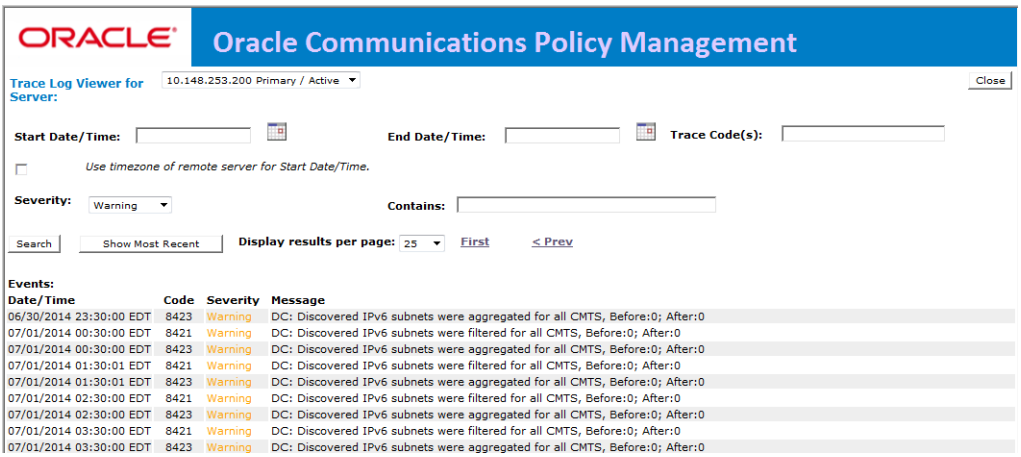



**Figure 17: MRA Trace Log**

## KPI Dashboard

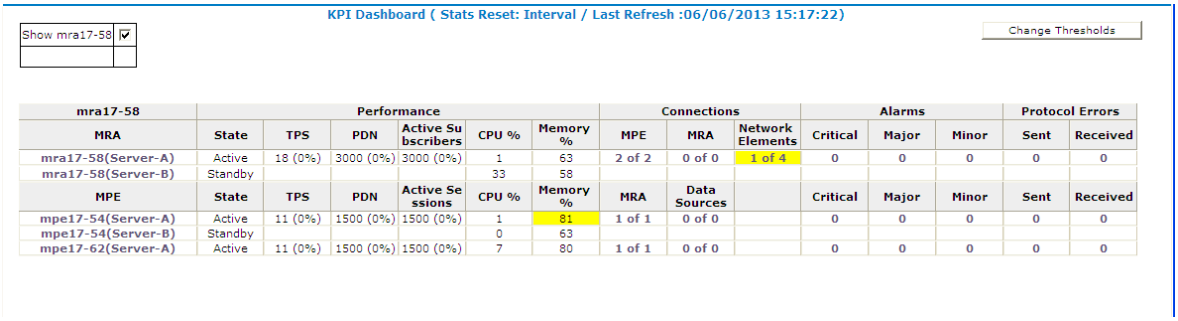
The KPI dashboard provides a multi-site, system-level, summary of performance and operational health indicators in the CMP web based GUI. The display includes indicators for:

- Offered load (transaction rate)
- System capacity (counters for active sessions)
- Inter-system connectivity
- Physical resource utilization (memory, CPU)
- System status

To display the KPI dashboard, from the main menu click KPI Dashboard. The dashboard opens in the work area.

The KPI dashboard displays the indicators for all the systems on a single page, with the KPIS for each MRA in a separate table. Each row within a table represents a single system (either an MRA blade or an MPE blade that is being managed by that MRA). The table cells are rendered using a color scheme to highlight areas of concern that is well adapted by the telecommunication industry. The table contents are periodically refreshed. The color changing thresholds are user configurable. The refresh rate is set to 10 seconds and is not configurable.

The following figure is an example illustrating the dashboard's contents.


KPI Dashboard ( Stats Reset: Interval / Last Refresh :06/06/2013 15:17:22)

Show mra17-58

Change Thresholds

| mra17-58 | Performance | | | | | | Connections | | | Alarms | | | Protocol Errors | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRA | State | TPS | PDN | Active Subscribers | CPU % | Memory % | MPE | MRA | Network Elements | Critical | Major | Minor | Sent | Received |
| mra17-58(Server-A) | Active | 18 (0%) | 3000 (0%) | 3000 (0%) | 1 | 63 | 2 of 2 | 0 of 0 | 1 of 4 | 0 | 0 | 0 | 0 | 0 |
| mra17-58(Server-B) | Standby | | | | 33 | 58 | | | | | | | | |
| MPE | State | TPS | PDN | Active Sessions | CPU % | Memory % | MRA | Data Sources | | Critical | Major | Minor | Sent | Received |
| mpe17-54(Server-A) | Active | 11 (0%) | 1500 (0%) | 1500 (0%) | 1 | 81 | 1 of 1 | 0 of 0 | | 0 | 0 | 0 | 0 | 0 |
| mpe17-54(Server-B) | Standby | | | | 0 | 63 | | | | | | | | |
| mpe17-62(Server-A) | Active | 11 (0%) | 1500 (0%) | 1500 (0%) | 7 | 80 | 1 of 1 | 0 of 0 | | 0 | 0 | 0 | 0 | 0 |

**Figure 18: KPI Dashboard**

The top left corner lists each MRA with a checkbox that allows you to enable/disable the table for that MRA. In the top right corner there is a **Change Thresholds** button that allows you to change threshold settings used to determine cell coloring (discussed below).

Each MRA or MPE system has two rows in the table. The first row displays data for the primary (active) blade in the cluster. The second row displays data for the secondary (backup) blade in the cluster. Several of the KPI columns are not populated for the secondary blade (since the blade is not active). The only columns that contain data are: Status, CPU%, and Memory%.

If a monitored system is unreachable, or if the data is unavailable for some reason, then the status is set to "Off-line" and the values in all the associated columns is cleared. In this situation, the entire row is displayed with the error color (red). If a monitored system does not support KPI retrieval then the status is set to "N/A" and the values in all the associated columns is cleared. No coloring is applied.

The columns that display "TPS" [1] (on the MPE - the number of Diameter Requests (per second) received from the Clients) and "PDN Connections" information is displayed in the form X (Y%) where X represents the actual numeric value and Y represents the % of rated system capacity that is consumed.

The columns that display connection counts is displayed in the form "X of Y" where X is the current number of connections and Y is the configured number of connections. When X and Y are not the same, the column uses the warning color to indicate a connectivity issue, unless X is 0, in which case the error color is displayed.

## Mapping Reports Display to KPIs

From the KPI Dashboard, you can click any MPE or MRA system shown to open the **Reports** page. From there, a variety of statistics and measurements can be viewed. In the following tables, these statistics are mapped to their names as they appear in OSSI XML output.

For more information on the OSSI XML interface, see the *OSSI XML Interface Definitions Reference Guide*.

[1] On the MPE - the number of Diameter Requests (per second) received from the Clients). On the MRA - The number of Diameter Requests per second received from either MRA and the number of Diameter Requests per second sent to the HSS.

**Table 23: Policy Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Peg Count | Y | N | Policy Count |
| Evaluated | Y | N | Evaluated Count |
| Executed | Y | N | Executed Count |
| Ignored | Y | N | Ignored Count |
| **Policy Details Stats:** | | | |
| Policy TDF session | Y | N | |
| Name | Y | N | Policy Name |
| Evaluated | Y | N | Eval Count |
| Executed | Y | N | Trigger Count |
| Ignored | Y | N | Ignore Count |
| Total Execution Time (ms) | Y | N | |
| Max Execution Time (ms) | Y | N | |
| Avg Execution Time (ms) | Y | N | |
| Processing Time Stats | Y | N | (Data for each installed rule) |

**Table 24: Quota Profile Statistics Details**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Peg Count | Y | N | Quota Count |
| Activated | Y | N | Quota Activated Count |
| Volume Threshold Reached | Y | N | Quota Volume Threshold Reached Count |
| Time Threshold Reached | Y | N | Quota Time Threshold Reached Count |
| Event Threshold Reached | Y | N | Quota Event Threshold Reached Count |

**Table 25: Diameter Application Function (AF) Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | Y | Conn Count |
| Currently OK peers | Y | Y | Peer Okay Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| Currently down/suspect/reopened peers | Y | Y | Peer Down Count\Peer Suspect Count\Peer Reopen Count |
| Total messages in/out | Y | Y | Msg In Count\Msg Out Count |
| AAR messages received/sent | Y | Y | AAR Recv Count\AAR Send Count |
| AAR Initial messages received/sent | Y | Y | AAR Initial Recv Count\AAR Initial Send Count |
| AAR Modification messages received/sent | Y | Y | AAR Modification Recv Count\AAR Modification Send Count |
| AAA success messages received/sent | Y | Y | AAA Recv Success Count\AAA Send Success Count |
| AAA failure messages received/sent | Y | Y | AAA Recv Failure Count\AAA Send Failure Count |
| AAR messages timeout | Y | Y | AAR Timeout Count |
| ASR messages received/sent | Y | Y | ASR Recv Count\ASR Sent Count |
| ASR messages timeout | Y | Y | ASR Timeout Count |
| ASA success messages received/sent | Y | Y | ASA Recv Success Count\ASA Send Success Count |
| ASA failure messages received/sent | Y | Y | ASA Recv Failure Count\ASA Send Failure Count |
| RAR messages received/sent | Y | Y | RAR Recv Count\RAR Send Count |
| RAR messages timeout | Y | Y | RAR Timeout Count |
| RAA success messages received/sent | Y | Y | RAA Recv Success Count\RAA Send Success Count |
| RAA failure messages received/sent | Y | Y | RAA Recv Failure Count\RAA Send Failure Count |
| STR messages received/sent | Y | Y | STR Recv Count\STR Send Count |
| STR messages timeout | Y | Y | STR Timeout Count |
| STA success messages received/sent | Y | Y | STA Recv Success Count\STA Send Success Count |
| STA failure messages received/sent | Y | Y | STA Recv Failure Count\STA Send Failure Count |
| Currently active sessions | Y | N | Active Session Count |
| Max active sessions | Y | N | Max Active Session Count |
| Cleanup ASA received | Y | Y | ASA Received Count |
| Cleanup ASR sent | Y | Y | ASR Sent Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| Current number of active sponsored sessions | Y | N | Current Sponsored Session Count |
| Max sponsored active sessions | Y | N | Max Sponsored Session Count |
| Current number of active sponsors | Y | N | Current Sponsor Count |
| Max number of sponsors | Y | N | Max Sponsor Count |
| Current number of active service providers | Y | N | Current Service Provider Count |
| Max number of service providers | Y | N | Max Service Provider Count |
| **Diameter AF Peer Stats (in Diameter AF Stats window)** | N | Y | |
| ID | Y | Y | |
| IP Address: Port | | | |
| Currently active connections | | | |
| Currently active sessions | | | |
| Connect Time | N | Y | Connect Time |
| Disconnect Time | N | Y | Disconnect Time |

**Table 26: Diameter Policy Charging Enforcement Function (PCEF) Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | N | Conn Count (SCTP or TCP) |
| Currently okay peers | Y | N | Peer Okay Count |
| Currently down/suspect/reopened peers | Y | N | Peer Down Count\Peer Suspect Count\Peer Reopen Count |
| Total messages in/out | Y | N | Msg In Count\Msg Out Count |
| CCR messages received/sent | Y | Y | CCR Recv Count\CCR Send Count |
| CCR messages timeout | Y | Y | CCR-Timeout Count |
| CCA success messages received/sent | Y | Y | CCA Recv Success Count\CCA Send Success Count |
| CCA failure messages received/sent | Y | Y | CCA Recv Failure Count\CCA Send Failure Count |
| CCR-I messages received/sent | Y | Y | CCR-I Recv Count\CCR-I Send Count |
| CCR-I messages timeout | Y | Y | CCR-I Timeout Count |
| CCA-I success messages received/sent | Y | Y | CCA-I Recv Success Count\CCA-I Send Success Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| CCA-I failure messages received/sent | Y | Y | CCA-I Recv Failure Count\CCA-I Send Failure Count |
| CCR-U messages received/sent | Y | Y | CCR-U Recv Count\CCR-U Send Count |
| CCR-U messages timeout | Y | Y | CCR-U Timeout Count |
| CCA-U success messages received/sent | Y | Y | CCA-U Recv Success Count\CCA-U Send Success Count |
| CCA-U failure messages received/sent | Y | Y | CCA-U Recv Failure Count\CCA-U Send Failure Count |
| CCR-T messages received/sent | Y | Y | CCR-T Recv Count\CCR-T Send Count |
| CCR-T messages timeout | Y | Y | CCR-T Timeout Count |
| CCA-T success messages received/sent | Y | Y | CCA-T Recv Success Count\CCA-T Send Success Count |
| CCA-T failure messages received/sent | Y | Y | CCA-T Recv Failure Count\CCA-T Send Failure Count |
| RAR messages received/sent | Y | Y | RAR Recv Count\RAR Send Count |
| RAR messages timeout | Y | Y | RAR Timeout Count |
| RAA success messages received/sent | Y | Y | RAA Recv Success Count\RAA Send Success Count |
| RAA failure messages received/sent | Y | Y | RAA Recv Failure Count\RAA Send Failure Count |
| Currently active sessions | Y | N | Active Session Count |
| Max active sessions | Y | N | Max Active Session Count |

**Table 27: Diameter Charging Function (CTF) Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | N | Y | Conn Count |
| Currently OK peers | N | Y | Peer Okay Count |
| Currently down/suspect/reopened peers | N | Y | Peer Down Count\Peer Suspect Count\Peer Reopen Count |
| Total messages in/out | N | Y | Msg In Count\Msg Out Count |
| CCR messages sent/received | N | Y | CCR Recv Count\CCR Send Count |
| CCA success messages recd/sent | N | Y | CCA Recv Success Count\CCA Send Success Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| CCA failure messages recd/sent | N | Y | CCA Recv Failure Count\CCA Send Failure Count |
| CCR-I messages sent/received | N | Y | CCR-I Recv Count\CCR-I Send Count |
| CCA-I success messages recd/sent | N | Y | CCA-I Recv Success Count\CCA-I Send Success Count |
| CCA-I failure messages recd/sent | N | Y | CCA-I Recv Failure Count\CCA-I Send Failure Count |
| CCR-U messages sent/received | N | Y | CCR-U Recv Count\CCR-U Send Count |
| CCA-U success messages recd/sent | N | Y | CCA-U Recv Success Count\CCA-U Send Success Count |
| CCA-U failure messages recd/sent | N | Y | CCA-U Recv Failure Count\CCA-U Send Failure Count |
| CCR-T messages sent/received | N | Y | CCR-T Recv Count\CCR-T Send Count |
| CCA-T success messages recd/sent | N | Y | CCA-T Recv Success Count\CCA-T Send Success Count |
| CCA-T failure messages recd/sent | N | Y | CCA-T Recv Failure Count\CCA-T Send Failure Count |
| RAR messages sent/received | N | Y | RAR Recv Count\RAR Send Count |
| RAA success messages recd/sent | N | Y | RAA Recv Success Count\RAA Send Success Count |
| RAA failure messages recd/sent | N | Y | RAA Recv Failure Count\RAA Send Failure Count |
| ASR messages sent/received | N | Y | ASR Recv Count\ASR Send Count |
| ASA success messages recd/sent | N | Y | ASA Recv Success Count\ASA Send Success Count |
| ASA failure messages recd/sent | N | Y | ASA Recv Failure Count\ASA Send Failure Count |
| Currently active sessions | N | Y | Active Session Count |
| Max active sessions | N | Y | Max Active Session Count |

**Table 28: Diameter Bearer Binding and Event Reporting Function (BBERF) Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | Y | Conn Count |
| Currently OK peers | Y | Y | Peer Okay Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| Currently down/suspect/reopened peers | Y | Y | Peer Down Count\Peer Suspect Count\Peer Reopen Count |
| Total messages in/out | Y | Y | Msg In Count\Msg Out Count |
| CCR messages received/sent | Y | Y | CCR Recv Count\CCR Send Count |
| CCR messages timeout | Y | Y | CCR-Timeout Count |
| CCA success messages received/sent | Y | Y | CCA Recv Success Count\CCA Send Success Count |
| CCA failure messages received/sent | Y | Y | CCA Recv Failure Count\CCA Send Failure Count |
| CCR-I messages received/sent | Y | Y | CCR-I Recv Count\CCR-I Send Count |
| CCR-I messages timeout | Y | Y | CCR-I Timeout Count |
| CCA-I success messages received/sent | Y | Y | CCA-I Recv Success Count\CCA-I Send Success Count |
| CCA-I failure messages received/sent | Y | Y | CCA-I Recv Failure Count\CCA-I Send Failure Count |
| CCR-U messages received/sent | Y | Y | CCR-U Recv Count\CCR-U Send Count |
| CCR-U messages timeout | Y | Y | CCR-U Timeout Count |
| CCA-U success messages received/sent | Y | Y | CCA-U Recv Success Count\CCA-U Send Success Count |
| CCA-U failure messages received/sent | Y | Y | CCA-U Recv Failure Count\CCA-U Send Failure Count |
| CCR-T messages received/sent | Y | Y | CCR-T Recv Count\CCR-T Send Count |
| CCR-T messages timeout | Y | Y | CCR-T Timeout Count |
| CCA-T success messages received/sent | Y | Y | CCA-T Recv Success Count\CCA-T Send Success Count |
| CCA-T failure messages received/sent | Y | Y | CCA-T Recv Failure Count\CCA-T Send Failure Count |
| RAR messages received/sent | Y | Y | RAR Recv Count\RAR Send Count |
| RAR messages timeout | Y | Y | RAR Timeout Count |
| RAA success messages received/sent | Y | Y | RAA Recv Success Count\RAA Send Success Count |
| RAA failure messages received/sent | Y | Y | RAA Recv Failure Count\RAA Send Failure Count |
| Currently active sessions | Y | N | Curr Session Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| Max active sessions | Y | N | Max Active Session Count |
| Diameter BBERF connections | Y | Y | |

**Table 29: Diameter TDF Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | Y | Conn Count |
| Currently OK peers | Y | Y | Peer Okay Count |
| Currently down/suspect/reopened peers | Y | Y | Peer Down Count\Peer Suspect Count\Peer Reopen Count |
| Total messages in/out | Y | Y | Msg In Count\Msg Out Count |
| CCR messages received/sent | Y | Y | CCR Recv Count\CCR Send Count |
| CCR messages timeout | Y | Y | CCR-Timeout Count |
| CCA success messages received/sent | Y | Y | CCA Recv Success Count\CCA Send Success Count |
| CCA failure messages received/sent | Y | Y | CCA Recv Failure Count\CCA Send Failure Count |
| CCR-U messages received/sent | Y | Y | CCR-U Recv Count\CCR-U Send Count |
| CCR-U messages timeout | Y | Y | CCR-U Timeout Count |
| CCA-U success messages received/sent | Y | Y | CCA-U Recv Success Count\CCA-U Send Success Count |
| CCA-U failure messages received/sent | Y | Y | CCA-U Recv Failure Count\CCA-U Send Failure Count |
| CCR-T messages received/sent | Y | Y | CCR-T Recv Count\CCR-T Send Count |
| CCR-T messages timeout | Y | Y | CCR-T Timeout Count |
| CCA-T success messages received/sent | Y | Y | CCA-T Recv Success Count\CCA-T Send Success Count |
| CCA-T failure messages received/sent | Y | Y | CCA-T Recv Failure Count\CCA-T Send Failure Count |
| RAR messages received/sent | Y | Y | RAR Recv Count\RAR Send Count |
| RAR messages timeout | Y | Y | RAR Timeout Count |
| RAA success messages received/sent | Y | Y | RAA Recv Success Count\RAA Send Success Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| RAA failure messages received/sent | Y | Y | RAA Recv Failure Count\RAA Send Failure Count |
| TSR messages received/sent | Y | Y | |
| TSA success messages received/sent | Y | Y | |
| TSA failure messages received/sent | Y | Y | |
| Currently active sessions | Y | N | Curr Session Count |
| Max active sessions | Y | N | Max Active Session Count |
| Diameter TDF connections | Y | Y | |

**Table 30: Diameter Sh Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | N | Conn Count |
| Currently okay peers | Y | N | Peer Okay Count |
| Currently down/suspect/reopened peers | Y | N | Peer Down Count\Peer Suspect Count\Peer Reopen Count |
| Total messages in/out | Y | N | Msg In Count\Msg Out Count |
| Messages retried | Y | N | |
| UDR messages received/sent | Y | N | UDR Messages Received Count\UDR Messages Sent Count |
| UDR messages timeout | Y | N | UDRTimeout Count |
| UDR messages retried | Y | N | |
| UDA success messages received/sent | Y | N | UDA Success Messages Received Count\UDA Success Messages Sent Count |
| UDA failure messages received/sent | Y | N | UDA Failure Messages Received Count\UDA Failure Messages Sent Count |
| PNR messages received/sent | Y | N | PNR Messages Received Count\PNR Messages Sent Count |
| PNA success messages received/sent | Y | N | PNA Success Messages Received Count\PNA Success Messages Sent Count |
| PNA failure messages received/sent | Y | N | PNA Failure Messages Received Count\PNA Failure Messages Sent Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| PUR messages received/sent | Y | N | PUR Messages Received Count\PUR Messages Sent Count |
| PUR messages timeout | Y | N | PURTimeout Count |
| PUR messages retried | Y | N | |
| PUA success messages received/sent | Y | N | PUA Success Messages Received Count\PUA Success Messages Sent Count |
| PUA failure messages received/sent | Y | N | PUA Failure Messages Received Count\PUA Failure Messages Sent Count |
| SNR messages received/sent | Y | N | SNR Messages Received Count\SNR Messages Sent Count |
| SNR messages timeout | Y | N | SNRTimeout Count |
| SNR messages retried | Y | N | |
| SNA success messages received/sent | Y | N | SNA Success Messages Received Count\SNA Success Messages Sent Count |
| SNA failure messages received/send | Y | N | SNA Failure Messages Received Count\SNA Failure Messages Sent Count |
| Currently active sessions | Y | N | Active Sessions Count |
| Max active sessions | Y | N | Maximum Active Sessions Count |
| Diameter Sh connections | | | |

**Table 31: Diameter Distributed Routing and Management Application (DRMA) Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | Y | Conn Count |
| Currently okay peers | Y | Y | Peer Okay Count |
| Currently down/suspect/reopened peers | Y | Y | Peer Down Count\Peer Suspect Count\Peer Reopen Count |
| Total messages in/out | Y | Y | Msg In Count\Msg Out Count |
| DBR messages received/sent | N | Y | DBRRecv Count\DBRSend Count |
| DBR messages timeout | N | Y | DBRTimeout Count |
| DBA success messages received/sent | N | Y | DBARecv Success Count\DBASend Success Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| DBA failure messages received/sent | N | Y | DBARecv Failure Count\DBASend Failure Count |
| DBA message received/sent–binding found | N | Y | Binding Found Recv Count\Binding Found Send Count |
| DBA messages received/sent – binding not found | N | Y | Binding Not Found Recv Count\Binding Not Found Send Count |
| DBA messages received/sent – PCRF down | N | Y | Binding Found Pcrf Down Recd Count\ Binding Found Pcrf Down Send Count |
| DBA messages received/sent – all PCRFs down | N | Y | All Pcrfs Down Recv Count\ All Pcrfs Down Send Count |
| DBR-Q messages received/sent | N | Y | |
| DBR-Q messages timeout | N | Y | |
| DBA-Q success messages received/sent | N | Y | |
| DBA-Q failure messages received/sent | N | Y | |
| DBR-QC messages received/sent | N | Y | |
| DBR-QC messages timeout | N | Y | |
| DBA-QC success messages received/sent | N | Y | |
| DBA-QC failure messages received/sent | N | Y | |
| DBR-U messages received/sent | N | Y | |
| DBR-U messages timeout | N | Y | |
| DBA-U success messages received/sent | N | Y | |
| DBA-U failure messages received/sent | N | Y | |
| DBR-T messages received/sent | N | Y | |
| DBR-T messages timeout | N | Y | |
| DBA-T success messages received/sent | N | Y | |
| DBA-T failure messages received/sent | N | Y | |
| DBR-S messages received/sent | N | Y | |

| Display | MPE | MRA | Name |
|---|---|---|---|
| DBR-S messages timeout | N | Y | |
| DBA-S success messages received/sent | N | Y | |
| DBA-S failure messages received/sent | N | Y | |
| RUR messages received/sent | Y | Y | RURRecv Count\ RURSend Count |
| RUR messages timeout | Y | Y | RURTimeout Count |
| RUA success messages received/sent | Y | Y | RUARecv Success Count\ RUASend Success Count |
| RUA failure messages received/sent | Y | Y | RUARecv Failure Count\ RUASend Failure Count |
| LNR messages received/sent | Y | Y | LNRRecv Count\ LNRSend Count |
| LNR messages timeout | Y | Y | LNRTimeout Count |
| LNA success messages received/sent | Y | Y | LNARecv Success Count\ LNASend Success Count |
| LNA failure messages received/sent | Y | Y | LNARecv Failure Count\ LNASend Failure Count |
| LSR messages received/sent | Y | Y | LSRRecv Count\ LSRSend Count |
| LSR messages timeout | Y | Y | LSRTimeout Count |
| LSA success messages received/sent | Y | Y | LSARecv Success Count\ LSASend Success Count |
| LSA failure messages received/sent | Y | Y | LSARecv Failure Count\ LSASend Failure Count |
| SQR messages received/sent | | | |
| SQR messages timeout | | | |
| SQA messages received/sent | | | |
| SQA messages timeout | | | |
| Session found received/sent | | | |
| Session not found received/sent | | | |
| Diameter DRMA connections | | | |

**Note:** The statistics listed in apply only to MRA devices.

**Table 32: Diameter DRA Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Currently active bindings | N | Y | DRABinding Count |
| Max active bindings | N | Y | Max DRABinding Count |
| Total bindings | N | Y | DRATotal Binding Count |
| Suspect bindings | N | Y | Suspect Binding Count |
| Detected duplicate bindings | N | Y | Detected Duplicate Binding Count |
| Released duplicate bindings | N | Y | Released Duplicate Binding Count |
| Diameter Release Task Statistics | N | Y | |
| Bindings Processed | N | Y | Release Bindings Processed |
| Bindings Released | N | Y | Release Bindings Removed |
| RAR messages sent | N | Y | Release RARs Sent |
| RAR messages timed out | N | Y | Release RARs Timed Out |
| RAA success messages recd | N | Y | Release RAAs Received Success |
| RAA failure messages recd | N | Y | Release RAAs Received Failure |
| CCR-T messages processed | N | Y | Release CCRTs Received |

**Table 33: Diameter Sy Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | N | Current Connections Count |
| Currently okay peers | Y | N | Peer Okay Count |
| Currently down/suspect/reopened peers | Y | N | Peer Down Count\Peer Suspect Count\Peer Reopen Count |
| Total messages in/out | Y | N | Messages In Count\Messages Out Count |
| SLR messages received/sent | Y | N | SLR Messages Received Count\SLR Messages Sent Count |
| SLR messages timeout | Y | N | SLRTimeout Count |
| SLA success messages received/sent | Y | N | SLA Success Messages Received Count\SLA Success Messages Sent Count |
| SLA failure messages received/sent | Y | N | SLA Failure Messages Received Count\SLA Failure Messages Sent Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| SNR messages received/sent | Y | N | SNR Messages Received Count\SMR Messages Sent Count |
| SNA success messages received/sent | Y | N | SNA Success Messages Received Count\SNA Success Messages Sent Count |
| SNA failure messages received/sent | Y | N | SNA Failure Messages Received Count\SNA Failure Messages Sent Count |
| STR messages received/sent | Y | N | STR Messages Received Count\STR Messages Sent Count |
| STR messages timeout | Y | N | STRTimeout Count |
| STA success messages received/sent | Y | N | STA Success Messages Received Count\STA Success Messages Sent Count |
| STA failure messages received/sent | Y | N | STA Failure Messages Received Count\STA Failure Messages Sent Count |
| Currently active sessions | Y | N | Active Sessions Count |
| Max active sessions | Y | N | Maximum Active Sessions Count |
| Diameter Sy connections | | | |

**Table 34: RADIUS Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | Y | |
| Total messages in/out | Y | Y | Messages In Count\ Messages Out Count |
| Total RADIUS messages received | Y | Y | |
| Total RADIUS messages send | | Y | |
| Messages successfully decoded | Y | Y | |
| Messages dropped | Y | Y | |
| Total errors received | Y | Y | |
| Total errors sent | Y | Y | |
| Accounting Start sent | Y | Y | |
| Accounting Start received | Y | Y | Accounting Start Count |
| Accounting Stop sent | Y | Y | |

| Display | MPE | MRA | Name |
|---|---|---|---|
| Accounting Stop received | Y | Y | Accounting Stop Count |
| Accounting Stop received for unknown reason | Y | Y | |
| Accounting On sent | Y | Y | |
| Accounting On received | Y | Y | |
| Accounting Off sent | Y | Y | |
| Accounting Off received | Y | Y | |
| Accounting Response sent | Y | Y | Accounting Response Count |
| Accounting Response received | Y | Y | |
| Duplicates detected | Y | Y | Duplicated Message Count |
| Unknown/Unsupported messages received | Y | Y | |
| Interim Update Received | Y | Y | Accounting Update Count |
| Interim Update Received for unknown reason | Y | Y | |
| Currently active sessions | Y | Y | |
| Max active sessions | Y | Y | |
| Messages with Authenticator field mismatch | Y | Y | |
| Last RADIUS message received time | Y | Y | |
| COA-request sent | Y | Y | CoA Request Count |
| COA-request received | Y | Y | |
| COA-ACK sent | Y | Y | CoA Ack Count |
| COA-ACK received | Y | Y | CoA Success Count |
| COA-NAK sent | Y | Y | |
| COA-NAK received | Y | Y | CoA Nck Count |
| Parsed under 100m(icro)s | Y | Y | |
| Parsed under 200m(icro)s | Y | Y | |
| Parsed under 500m(icro)s | Y | Y | |
| Parsed under 1m(illi)s | Y | Y | |
| Parsed over 1m(illi)s | Y | Y | |
| Total Parse Time | Y | Y | |

| Display | MPE | MRA | Name |
|---|---|---|---|
| Average Parse Time | Y | Y | |
| Maximum Parse Time | Y | Y | |
| Unknown BNG. Message dropped | Y | Y | Unknown Gateway Request Count |
| Unknown BNG. Account Start dropped | Y | Y | |
| Unknown BNG. Account Stop dropped | Y | Y | |
| Unknown BNG. Interim Update dropped | Y | Y | |
| Stale sessions deleted | Y | Y | |
| Stale sessions deleted due to missed Interim Update | Y | Y | |
| Stale sessions deleted on Account-On or Account-Off | Y | Y | |
| Invalid subscriber key. Message dropped | Y | Y | |
| Invalid subscriber identifier specified. Message dropped | Y | Y | Unknown Subscriber Request Count |

*Table 35: Diameter Latency Statistics* shows information for these Diameter Statistics:

- Application Function (AF)
- Policy and Charging Enforcement Function (PCEF)
- Bearer Binding and Event Reporting (BBERF)
- Traffic Detection Function (TDF)
- Diameter Sh protocol
- Distributed Routing and Management Application (DRMA)
- Diameter Sy protocol

**Table 35: Diameter Latency Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Connections | Y | Y | Active Connection Count |
| Max Processing Time recd/sent (ms) | Y | Y | Max Trans In Time\ Max Trans Out Time |
| Avg Processing Time recd/sent (ms) | Y | Y | Avg Trans In Time\ Avg Trans Out Time |
| Processing Time recd/sent <time frame> (ms) | Y | Y | Processing Time [0-20] ms<br>Processing Time [20-40] ms |

| Display | MPE | MRA | Name |
|---|---|---|---|
| | | | Processing Time [40-60] ms<br>Processing Time [60-80] ms<br>Processing Time [80-100] ms<br>Processing Time [100-120] ms<br>Processing Time [120-140] ms<br>Processing Time [140-160] ms<br>Processing Time [160-180] ms<br>Processing Time [180-200] ms<br>Processing Time [>200] ms |

**Table 36: Diameter Event Trigger Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Diameter Event Trigger Stats by Code | Y | N | |
| Diameter Event Trigger Stats by Application: | | | |
| Diameter PCEF Application Event Trigger | Y | N | |
| Diameter BBERF Application Event Trigger | Y | N | |

**Table 37: Diameter Protocol Error Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Total errors received | Y | Y | In Error Count |
| Total errors sent | Y | Y | Out Error Count |
| Last time for total error received | Y | Y | Last Error In Time |
| Last time for total error sent | Y | Y | Last Error Out Time |
| Diameter Protocol Errors on each error codes | Y | Y | (see specific errors listed in GUI) |

**Table 38: Diameter Connection Error Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Total errors received | Y | Y | In Error Count |
| Total errors sent | Y | Y | Out Error Count |
| Last time for total error received | Y | Y | Last Error In Time |

| Display | MPE | MRA | Name |
|---|---|---|---|
| Last time for total error sent | Y | Y | Last Error Out Time |
| Diameter Protocol Errors on each error codes | Y | Y | (see specific errors listed in GUI) |

**Table 39: LDAP Data Source Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Number of successful searches | Y | N | Search Hit Count |
| Number of unsuccessful searches | Y | N | Search Miss Count |
| Number of searches that failed because of errors | Y | N | Search Err Count |
| Max Time spent on successful search (ms) | Y | N | Search Max Hit Time |
| Max Time spent on unsuccessful search (ms) | Y | N | Search Max Miss Time |
| Average time spent on successful searches (ms) | Y | N | Search Avg Hit Time |
| Average time spent on unsuccessful searches (ms) | Y | N | Search Avg Miss Time |
| Number of successful updates | Y | N | Update Hit Count |
| Number of unsuccessful updates | Y | N | Update Miss Count |
| Number of updates that failed because of errors | Y | N | Update Err Count |
| Time spent on successful updates (ms) | Y | N | Update Total Hit Time |
| Time spent on unsuccessful updates (ms) | Y | N | Update Total Miss Time |
| Max Time spent on successful update (ms) | Y | N | Update Max Hit Time |
| Max Time spent on unsuccessful update (ms) | Y | N | Update Max Miss Time |
| Average time spent on successful update (ms) | Y | N | Update Avg Hit Time |
| Average time spent on unsuccessful updates (ms) | Y | N | Update Avg Miss Time |

**Table 40: Sh Data Source Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Number of successful searches | Y | N | Search Hit Count |
| Number of unsuccessful searches | Y | N | Search Miss Count |
| Number of searches that failed because of errors | Y | N | Search Err Count |
| Number of search errors that triggered the retry | Y | N | |
| Max Time spent on successful search (ms) | Y | N | Search Max Hit Time |
| Max Time spent on unsuccessful search (ms) | Y | N | Search Max Miss Time |
| Average time spent on successful searches (ms) | Y | N | Search Avg Hit Time |
| Average time spent on unsuccessful searches (ms) | Y | N | Search Avg Miss Time |
| Number of successful updates | Y | N | Update Hit Count |
| Number of unsuccessful updates | Y | N | Update Miss Count |
| Number of updates that failed because of errors | Y | N | Update Err Count |
| Number of update errors that triggered the retry | Y | N | |
| Time spent on successful updates (ms) | Y | N | Update Total Hit Time |
| Time spent on unsuccessful updates (ms) | Y | N | Update Total Miss Time |
| Max Time spent on successful update (ms) | Y | N | Update Max Hit Time |
| Max Time spent on unsuccessful update (ms) | Y | N | Update Max Miss Time |
| Average time spent on successful updates (ms) | Y | N | Update Avg Hit Time |
| Average time spent on unsuccessful updates (ms) | Y | N | Update Avg Miss Time |
| Number of successful subscriptions | Y | N | Subscription Hit Count |
| Number of unsuccessful subscriptions | Y | N | Subscription Miss Count |

| Display | MPE | MRA | Name |
|---|---|---|---|
| Number of subscriptions that failed because of errors | Y | N | Subscription Err Count |
| Number of subscription errors that triggered the retry | Y | N | |
| Time spent on successful subscriptions (ms) | Y | N | Subscription Total Hit Time |
| Time spent on unsuccessful subscriptions (ms) | Y | N | Subscription Total Miss Time |
| Max Time spent on successful subscriptions (ms) | Y | N | Subscription Max Hit Time |
| Max Time spent on unsuccessful subscriptions (ms) | Y | N | Subscription Max Miss Time |
| Average time spent on successful subscriptions (ms) | Y | N | Subscription Avg Hit Time |
| Average time spent on unsuccessful subscriptions (ms) | Y | N | Subscription Avg Miss Time |
| Number of successful unsubscriptions | Y | N | Unsubscription Hit Count |
| Number of unsuccessful unsubscriptions | Y | N | Unsubscription Miss Count |
| Number of unsubscriptions that failed because of errors | Y | N | Unsubscription Err Count |
| Number of unsubscription errors that triggered the retry | Y | N | |
| Time spent on successful unsubscriptions (ms) | Y | N | Unsubscription Total Hit Time |
| Time spent on unsuccessful unsubscriptions (ms) | Y | N | Unsubscription Total Miss Time |
| Max Time spent on successful unsubscription (ms) | Y | N | Unsubscription Max Hit Time |
| Max Time spent on unsuccessful unsubscription (ms) | Y | N | Unsubscription Max Miss Time |
| Average time spent on successful unsubscriptions (ms) | Y | N | Unsubscription Avg Hit Time |
| Average time spent on unsuccessful unsubscriptions (ms) | Y | N | Unsubscription Avg Miss Time |

**Table 41: Sy Data Source Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Number of successful searches | Y | N | Search Hit Count |
| Number of unsuccessful searches | Y | N | Search Miss Count |
| Number of searches that failed because of errors | Y | N | Search Err Count |
| Max Time spent on successful search (ms) | Y | N | Search Max Hit Time |
| Max Time spent on unsuccessful search (ms) | Y | N | Search Max Miss Time |
| Average time spent on successful searches (ms) | Y | N | Search Avg Hit Time |
| Average time spent on unsuccessful searches (ms) | Y | N | Search Avg Miss Time |

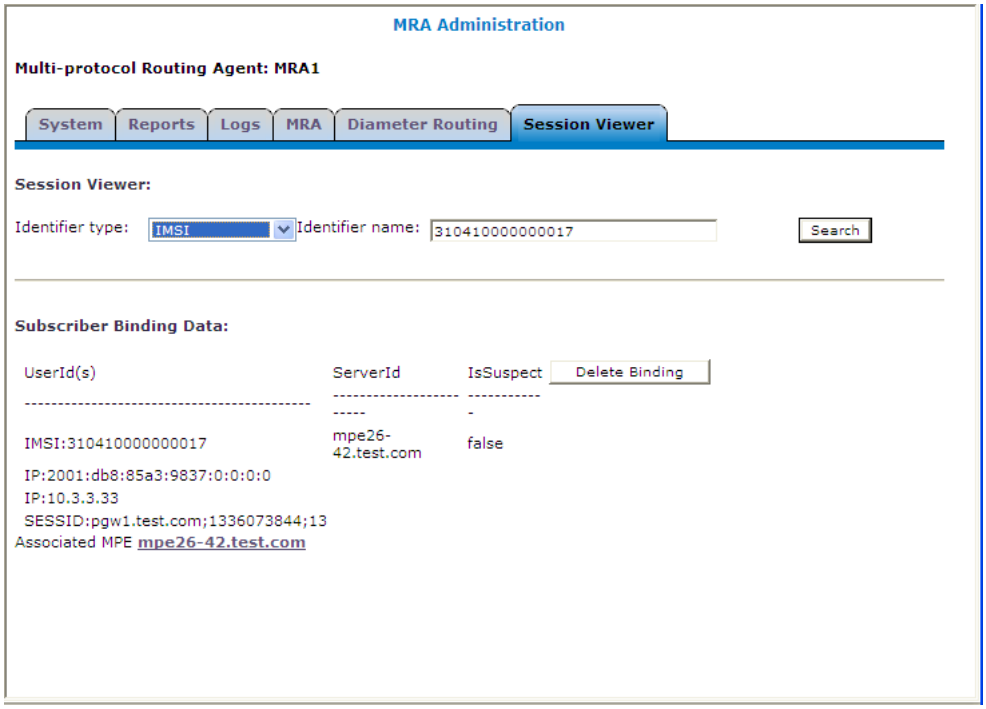
**Table 42: KPI Interval Statistics**

| Display | MPE | MRA | Name |
|---|---|---|---|
| Interval Start Time | Y | Y | Interval Start Time |
| Configured Length (Seconds) | Y | Y | Configured Length (Seconds) |
| Actual Length (Seconds) | Y | Y | Actual Length (Seconds) |
| Is Complete | Y | Y | Is Complete |
| Interval MaxTransactions Per Second | Y | Y | Interval Max Transactions Per Second |
| Interval MaxMRABinding Count | Y | Y | Interval Max MRABinding Count |
| Interval MaxSessionCount | Y | Y | Interval Max Session Count |
| Interval MaxPDNConnectionCount | Y | Y | Interval Max PDNConnection Count |

## The Subscriber Session Viewer

The Session Viewer displays detailed session information for a specific subscriber. This information is contained on the **Session Viewer** tab, located under the configuration page for both MRA and MPE devices. You can view the same subscriber session from an MRA device or its associated MPE device.

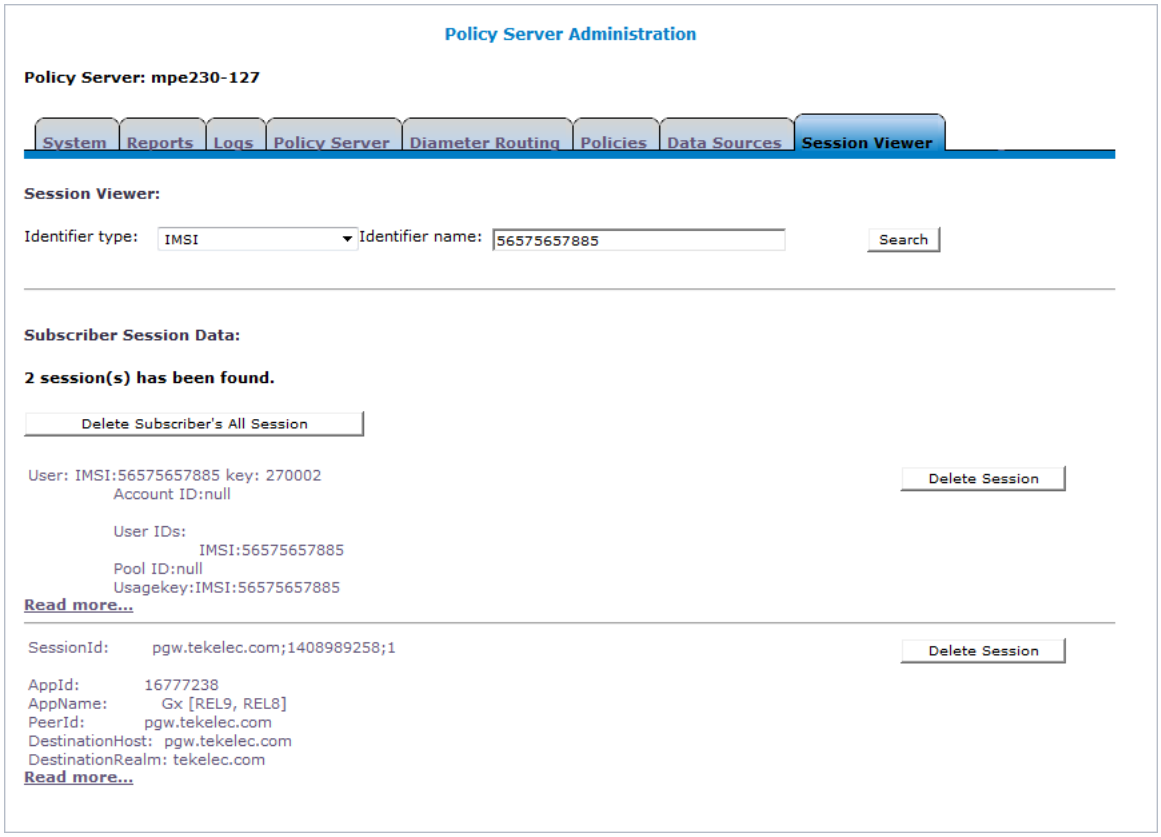
Within the session viewer, you can enter query parameters to render session data for a specific subscriber. For example:




## Viewing Session Data from the MPE

You can view the same subscriber session from an MRA device or its associated MPE device. To view session data from the MPE:

1. From the Policy Server section of the navigation pane, select **Configuration**.
2. Select the MPE device from the content tree.
3. On the **Session Viewer** tab, select the identifier type (**NAI**, **E.164(MSISDN)**, **IMSI**, **IPv4Address**, or **IPv6Address**), enter the identifier name, and click **Search**. Information about the subscriber session(s) is displayed.




The MRA device is listed by peer ID.

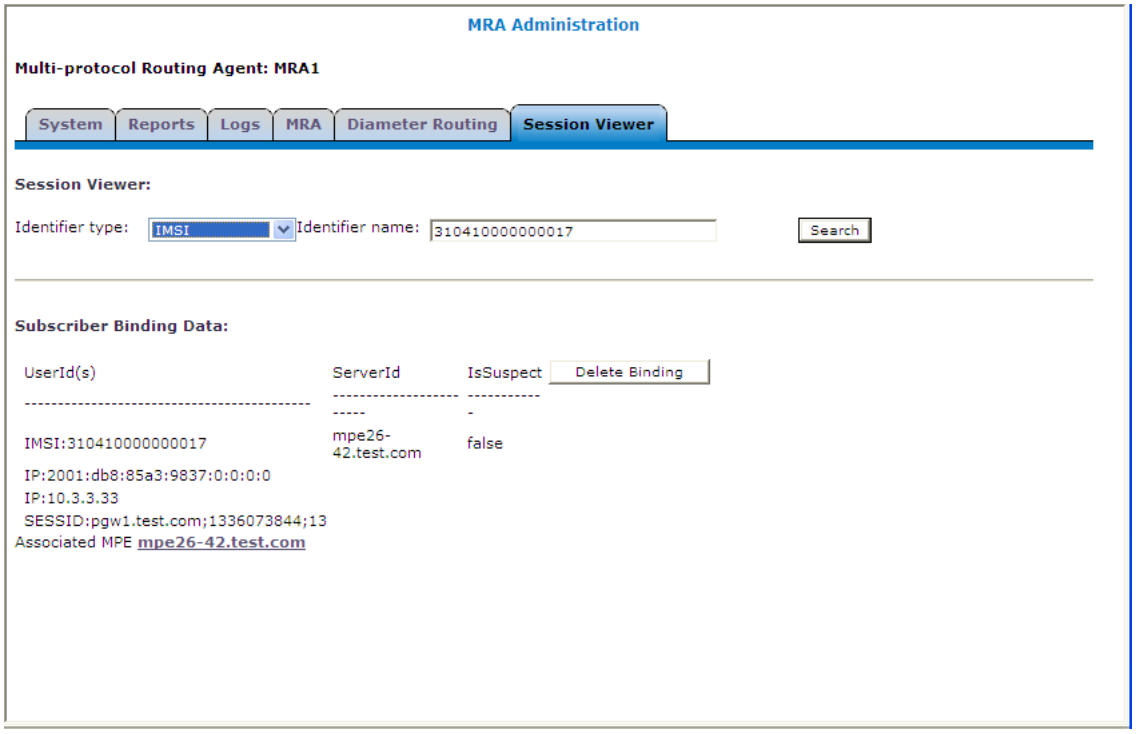
If no session data is available, the CMP returns the following message:

There are no sessions available for the subscriber.

## Viewing Session Data from the MRA

You can view the same subscriber session from an MRA device or its associated MPE device. To view session data from the MRA device:

1. From the MRA section of the navigation pane, select **Configuration**.
2. Select the MRA device from the content tree.
3. On the **Session Viewer** tab, select the Identifier Type (**NAI**, **E.164(MSISDN)**, **IMSI**, **IPv4Address**, or **IPv6Address**), enter the **Identifier name**, and click **Search**. Information about the subscriber binding data is displayed; for example:




The MPE device that is handling sessions for the subscriber is listed by its server ID.

If no session data is available, the CMP returns, "There are no bindings available for the subscriber."

## Deleting a Session from the Session Viewer Page

The Session Viewer page includes a **Delete** button that lets you delete the session (or binding data) that is being displayed. After you have clicked **Delete** and confirmed the delete operation, the CMP sends the delete request to the MRAgent/MIAgent and returns to the Session Viewer data page, displaying the delete result and the remaining session data.


**Caution:** This is an administrative action that deletes the associated record in the database and should only be used for obsolete sessions. If the session is in fact active it will not trigger any signaling to associated gateways or other external network elements.

# Glossary

**B**

| | |
|---|---|
| BBERF | Bearer Binding and Event Reporting Function: A type of Policy Client used to control access to the bearer network (AN). |

**C**

| | |
|---|---|
| charging server | An application that calculates billing charges for a wireless subscriber |
| CPU | Central Processing Unit |
| CTF | Charging Trigger Function |

**D**

| | |
|---|---|
| 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.<br>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. |

**D**

| | |
|---|---|
| DNS | Domain Name Services<br>Domain Name System<br>A system for converting Internet host and domain names into IP addresses. |
| DPI | Diameter Plug-In is a reusable Diameter stack consisting of DCL, DRL, and an application interface.<br>Deep Packet Inspection is a form of packet filtering that examines the data and/or header part of a packet as it passes an inspection point. The MPE device uses DPI to recognize the application for establishing QoS or managing quota. See also packet inspection. |

**E**

| | |
|---|---|
| E.164 | The international public telecommunication numbering plan developed by the International Telecommunication Union. |

**F**

| | |
|---|---|
| FQDN | Fully qualified domain name<br>The complete domain name for a specific computer on the Internet (for example, www.oracle.com).<br>A domain name that specifies its exact location in the tree hierarchy of the DNS. |

**G**

| | |
|---|---|
| GPRS | General Packet Radio Service<br>A mobile data service for users of GSM mobile phones. |
| GUI | Graphical User Interface |

**G**

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

**H**

| | |
|---|---|
| HSS | Home Subscriber Server<br>A central database for subscriber information. |
| HTTP | Hypertext Transfer Protocol |

**I**

| | |
|---|---|
| IMSI | International Mobile Subscriber Identity<br>A unique internal network ID identifying a mobile subscriber.<br>International Mobile Station Identity |
| IPv4 | Internet Protocol version 4 |
| IPv6 | Internet Protocol version 6 |

**K**

| | |
|---|---|
| KPI | Key Performance Indicator |

**L**

| | |
|---|---|
| LDAP | Lightweight Directory Access Protocol<br>A protocol for providing and receiving directory information in a TCP/IP network. |

**M**

**M**

| | |
|---|---|
| MPE | Multimedia Policy Engine<br>A high-performance, high-availability platform for operators to deliver and manage differentiated services over high-speed data networks. The MPE includes a protocol-independent policy rules engine that provides authorization for services based on policy conditions such as subscriber information, application information, time of day, and edge resource utilization. |
| MRA | Multi-Protocol Routing Agent<br>Scales the Policy Management infrastructure by distributing the PCRF load across multiple Policy Server devices. |

**N**

| | |
|---|---|
| NAI | Nature of Address Indicator<br>Standard method of identifying users who request access to a network.<br>Network Access Identifier<br>The user identity submitted by the client during network authentication. |

**P**

| | |
|---|---|
| PCC | Policy and Charging Control |
| PCEF | Policy and Charging Enforcement Function<br>Maintains rules regarding a subscriber's use of network resources. Responds to CCR and AAR messages. Periodically sends |

**P**

RAR messages. All policy sessions for a given subscriber, originating anywhere in the network, must be processed by the same PCRF.

PDN

Packet Data Network

A digital network technology that divides a message into packets for transmission.

**R**

RADIUS

Remote Authentication Dial-In User Service

A client/server protocol and associated software that enables remote access servers to communicate with a central server to authorize their access to the requested service. The MPE device functions with RADIUS servers to authenticate messages received from remote gateways. See also Diameter.

realm

A fundamental element in Diameter is the realm, which is loosely referred to as domain. Realm IDs are owned by service providers and are used by Diameter nodes for message routing.

**S**

server

Any computer that runs TPD. Could be a Rack Mount Server or a Blade Server.

In Policy Management, a computer running Policy Management software, or a computer providing data to a Policy Management system.

## S

| | |
|---|---|
| SMPP | Short Message Peer-to-Peer Protocol<br>An open, industry standard protocol that provides a flexible data communications interface for transfer of short message data. |
| SMTP | Simple Mail Transfer Protocol |

## X

| | |
|---|---|
| XML | eXtensible Markup Language<br>A version of the Standard Generalized Markup Language (SGML) that allows Web developers to create customized tags for additional functionality. |