# Subscriber Data Management

# Performance Measurements

**910-6540-001 Revision B**

**June 2013**

# Table of Contents

# List of Figures

# List of Tables

# Chapter 1

# Introduction

**Topics:**



This chapter provides general information about manual organization, the scope of this manual, its targeted audience, how to get technical assistance, and how to locate customer documentation on the Customer Support site.

## About this document

This document describes how traffic data is collected from the system and represented to the user for analysis of system performance. Counters represent a predefined system behavior, where each counter has its own identification number and name. The counters are grouped into counter areas such as the operating system or applications.

Use this manual to understand performance management, how to locate available counters, and how to read or view system performance measurements.

## Scope and audience

This document provides an overview of counter management, lists available SDM counters by operating system and application, describes how to view counters and edit thresholds, and provides the related entity information to make changes.

This document is intended for operators that are responsible and qualified for the subject matter of this document.

## Document organization

This document is organized into the following chapters:

- *Introduction* contains general information about this document, how to contact the Tekelec *Customer Care Center*, and *Locate Product Documentation on the Customer Support Site*.
- *Performance Management* describes counter management and list all available counters by operating system or application.
- *Statistics* describes how to obtain active HLR subscriber statistics.
- *View XML Performance Measurement Reports* describes how to view counters, edit their threshold, or view historical performance measurement reports.

Information within the same document is linked and can be reached by clicking the hyperlink.

**To follow references pointing outside of the current document**, use these guidelines:

**General:**

- Locate the referenced section in the Table of Content of the referenced document.
- If not otherwise indicated in the reference, determine the section name that contains the reference and locate the same section name in the referenced document.
- Place the PDF files in one folder or on a disc and use the powerful Adobe PDF search functions to locate related information in one or more documents simultaneously.

**Alarms**

- *SDM Alarms Dictionary*

**Product, features, concepts**

- *SDM Product Description*

**Monitoring, maintenance, or troubleshooting:**

- Procedures: *Monitoring, Maintenance, Troubleshooting User Guide*
- Entities: *Monitoring, Maintenance, Troubleshooting Reference Manual*

**Subscriber provisioning:**

- Procedures: *Subscriber Provisioning User Guide*
- Entities: *Subscriber Provisioning Reference Manual*

**System configuration:**

- Procedures: *System Configuration User Guide*
- Entities: *System Configuration Reference Manual*

**User Interfaces:**

- *User guides*
  - How to use the user interface
  - How to set up users (permissions, groups, services)
- *Reference manuals*
  - About the user interfaces
  - Entities for setting up users

To determine the components of the complete documentation set delivered with the software, refer to the *SDM Documentation Roadmap* delivered with each documentation set.

## 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**

| | |
|---|---|
|  | **DANGER**:<br>(This icon and text indicate the possibility of *personal injury*.) |
|  | **WARNING**:<br>(This icon and text indicate the possibility of *equipment damage*.) |
|  | **CAUTION**:<br>(This icon and text indicate the possibility of *service interruption*.) |

## Related publications

For a detailed description of the available SDM documentation, refer to the *SDM Documentation Roadmap* included with your SDM documentation set.

## Customer Care Center

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

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

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

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

**Tekelec - Global**

Email (All Regions): support@tekelec.com

- **USA and Canada**

  Phone:

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

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

  TAC Regional Support Office Hours:

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

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

  Phone:

  +1-919-460-2150

  TAC Regional Support Office Hours (except Brazil):

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

  - **Argentina**

    Phone:

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

  - **Brazil**

Phone:

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

TAC Regional Support Office Hours:

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

- **Chile**

  Phone:

  1230-020-555-5468

- **Colombia**

  Phone:

  01-800-912-0537

- **Dominican Republic**

  Phone:

  1-888-367-8552

- **Mexico**

  Phone:

  001-888-367-8552

- **Peru**

  Phone:

  0800-53-087

- **Puerto Rico**

  Phone:

  1-888-367-8552 (1-888-FOR-TKLC)

- **Venezuela**

  Phone:

  0800-176-6497

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

  Regional Office Hours:

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

  - **Signaling**

    Phone:

    +44 1784 467 804 (within UK)

  - **Software Solutions**

    Phone:

    +33 3 89 33 54 00

- **Asia**
  - **India**

    Phone:

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

    TAC Regional Support Office Hours:

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

    Phone:

    +65 6796 2288

    TAC Regional Support Office Hours:

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

## Emergency Response

In the event of a critical service situation, emergency response is offered by the Tekelec Customer Care Center 24 hours a day, 7 days a week. The emergency response provides immediate coverage, automatic escalation, and other features to ensure that the critical situation is resolved as rapidly as possible.

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

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

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

## Locate Product Documentation on the Customer Support Site

Access to Tekelec's Customer Support site is restricted to current Tekelec customers only. This section describes how to log into the Tekelec Customer Support site and locate a document. Viewing the document requires Adobe Acrobat Reader, which can be downloaded at www.adobe.com.

1. Log into the *Tekelec Customer Support* site.

**Note:** If you have not registered for this new site, click the **Register Here** link. Have your customer number available. The response time for registration requests is 24 to 48 hours.

2. Click the **Product Support** tab.
3. Use the Search field to locate a document by its part number, release number, document name, or document type. The Search field accepts both full and partial entries.
4. Click a subject folder to browse through a list of related files.
5. To download a file to your location, right-click the file name and select **Save Target As**.

# Chapter 2

# Performance Management

**Topics:**



Traffic data can be gathered from the system to allow an operator to analyze system behavior. The role of the counters in the SDM is to report the number of messages that have been processed successfully or unsuccessfully by the system during its runtime. This measurement is very useful to determine how an application service behaves among the other applications running on the network.

The SDM generates Performance Measurement reports (PM reports) using the XML format.

The following sections describe each method and its characteristics and also lists the counters managed using each method.

# Counter Management Using the XML Format

The SDM manages counters using XML format. This includes Operating System (OS) level information, as well as applications such as the HLR, SIP, HSS, SLF, AAA, and ENUM.

## Daily Performance Measurement Report Filenames

Different applications increment the values of the counters at different time intervals. The Network Operator can view these values in the PM report that is generated each day at 00:00 and stored in a XML file in the hard disk's `/blue/var/pm` directory. The system keeps the latest 1000 files created. The filenames are in the following format:

```
<Type><StartDate>.<StartTime>-<EndTime>_<UniqueID>_ <JobName>.xml
```

For example:

```
A20110321.000000-240000_BluesliceNetworks_HLR-Subscriber-Counters-15min.xml
```

- **Type** - Indicates the Network Element (NE) and granularity period based on the 3GPP specifications

Currently, the only supported type is "A" (single NE, single granularity period) since all the cards are located on the same shelf and the sampling rate is the same.

- **StartDate** Represents the date when the measurement job began. The StartDate is in the following format: YYYYMMDD.

  YYYY - Year in four-digit notation

  MM - Month in two-digit notation (e.g., 01-12)

  DD - Day in two digit notation (e.g., 01-31)

- **StartTime** Indicates the time when the measurement job began. The StartTime is in the following format: HHMMSS

  HH - The two-digit hour of the day (local time), based on a 24 hour clock (e.g., 00 - 23).

  MM - The two-digit minute of the hour (local time) in 5 minute intervals (e.g., 00, 05,...55).

  SS - The two-digit seconds of the minute (local time).

- **EndTime** Indicates the time when the measurement job ended. Its format corresponds to the StartTime field, however, if the EndTime is 240000 it represents the end of the current day.

- **UniqueID**

  Name of the NE, EM, or domain. In this case, it is "BluesliceNetworks"

- **JobName**

  Name of the PM counter

**Table 2: Counter Job Names and IDs**

| Job ID | Job Name | Description |
|---|---|---|

| | | |
|---|---|---|
| 1 | OS-Critical-Resource | Counts five types of operating system messages. See the OS Resource Counters table. |
| 2 | DP-Request-Stats | Counts the number of queries made to the database per request type. See the DP Request Statistics Counters table. |
| 3 | HLR-MNP-60min | Counts HLR MNP messages. See the MAP Interface Counters table. |
| 5 | LTE-Message-Counters | Counts the LTE-HSS Diameter counters. See the LTE-HSS Counters table. |
| 6 | HSS-Message-Counters | Counts the number of messages the HSS receives. See the HSS/SLF Counters table. |
| 7 | AAA-Message-Counters | Counts the RADIUS messages. See the AAA Counters table. |
| 8 | DNS-Message-Counters | Counts the DNS NAPTR queries and answers. See the DNS ENUM Counters table. |
| 9 | HLR-Subscriber-Counters-24h | Counts specific HLR subscriber counters (Counter ID 12008-12012). See the MAP Interface Counters table. |
| 10 | HLR-Subscriber-Counters-15min | Counts HLR subscriber and IMS router (HLR only) counters (Counter IDs 12000-12007, 12013-12014, and 12185-12189). See the MAP Interface Counters table. |
| 11 | HLR-Subscriber-Counters-5min | Counts the remaining HLR subscriber counters (except MNP) that are not in the HLR-Subscriber-Counter-24h and HLR-Subscriber-Counters-15min reports. See the MAP Interface Counters table. |
| 12 | SIP-REGISTRAR-10min | Counts the SIP registrar messages at 10 minute intervals. See the SIP Counters table. |
| 13 | SIP-REDIRECT-10min | Counts the SIP redirect messages at 10 minute intervals. See the SIP Counters table. |
| 14 | SIP-REGCLIENT-10min | Counts the SIP register client messages at 10 minute intervals. See the SIP Counters table. |
| 15 | Eir-Message-Counters | Counts the Eir messages (Counter IDs 42000-42013). See theLTE-HSS Counters table. |

## Contents of a Performance Measurement Report

The following is an example of the content of a performance measurement report.

**Note:** Values of 0 (zero) are not recorded and therefore do not show up in the reports.

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type='text/xsl' href='MeasDataCollection.xslt'?>
<measCollecFile
xmlns="http://www.3gpp.org/ftp/specs/archive/32_series/32.435#measCollec">
      <fileHeader fileFormatVersion="32.435. v6.1" vendorName="BluesliceNetworks"
dnPrefix="ngHlr">
```

```
            <measCollec beginTime="20110321T000000"/>
      </fileHeader>
      <measData>
            <measInfo>
                  <job jobId="10"/>
                  <granPeriod duration="PT900S" endTime="20110321T15:15:00"/>
                  <measType p="1">SriRoutingSriReceived/1/2</measType>
                  <measType p="2">SriRoutingSriReceived/1/3</measType>
                  <measType p="3">SriRoutingSriReceived/1/4</measType>
                  <measType p="4">SriRoutingSriReceived/1/10</measType>
                  <measType p="5">SriRoutingSriReceived/1/11</measType>
                  <measType p="6">SriRoutingSriReceived/1/12</measType>
                  <measType p="7">SriRoutingSriRegistered/1/2</measType>
                  <measType p="8">SriRoutingSriRegistered/1/3</measType>
                  <measType p="9">SriRoutingSriRegistered/1/4</measType>
                  <measType p="10">SriRoutingSriRegistered/1/10</measType>
                  <measType p="11">SriRoutingSriRegistered/1/11</measType>
                  <measType p="12">SriRoutingSriRegistered/1/12</measType>
                  <measValue>
                        <r p="1">48747</r>
                        <r p="2">41989</r>
                        <r p="3">48936</r>
                        <r p="4">48593</r>
                        <r p="5">48470</r>
                        <r p="6">41946</r>
                        <r p="7">48747</r>
                        <r p="8">41989</r>
                        <r p="9">48936</r>
                        <r p="10">48593</r>
                        <r p="11">48470</r>
                        <r p="12">41946</r>
                  </measValue>
            </measInfo>
      </measData>
      <fileFooter>
            <measCollec endTime="20110321T240000"/>
      </fileFooter>
</measCollecFile>
```

**Table 3: Description of PM Report**

| Content | Description |
|---|---|
| <measCollec beginTime="20110321T000000"/> | 20110321 = Start date of the counter report (YYYYMMDD) T000000 = Start time of the counter report (HHMMSS) |
| <job jobId="10"/> | jobId="10" = References the counter job name. In this example it is " HLR-Subscriber-Counters-15min". Refer to the Counter Job Names and IDs table for a list of Job IDs and names. |
| <granPeriod duration="PT900S" endTime="20110321T15:15:00"/> | PT900S = Length of period of the counter. In this example, 900s equals 15 minutes. 20110321 = End date of the counter (YYYYMMDD) T15:15:00 = End time when the counter completed the count (HH:MM:SS) |
| <measType p="1">SriRoutingSriReceived/1/2</measType> | p="1" = Reference number of the counter used to correlate the counter and the value. |

| | |
|---|---|
| | SriRoutingSriReceived = Counter name. 1 = Shelf number 2 = Slot number **NOTE:** There is an optional number that can appear after the blade number if the same counter counts different values on the same blade. |
| <r p="1">48747</r> | p="1" = Reference number of the counter. 48747 = Value of the counter. |
| <measCollec endTime="20110321T240000"/> | 20110321 = End date of the counter report (YYYYMMDD). T240000 = End time of the counter report (HHMMSS). |

### Performance Measurement Exception Reports

The SDM generates a performance measurement exception report in the scenario where the system is out of service (i.e., both System Controller blades are down, such as in the case of power failure) at 0 0:00 (12 am) , the report generation time. In this scenario, the PM exception report is generated by the first SystemController service that becomes active at system restart. This exceptional report is stored in the same directory as the other normal reports generated daily (directory: /blue/var/pm), however to differentiate them from the normal reports, the exceptional report is stored with the following name:
`<Type><Startdate>.<Starttime>-<Endtime>_<UniqueId>_<JobId>_Exception.xml`

**Note:** The date used in the PM exception report is always the date of the day prior to system restart.

### Viewing the Performance Measurement Reports

The WebCI displays these counters in the PMCounterValue window of the Oamp folder. Through this window, the operator can view, for the current day, each of the counter's count value as they are dynamically incremented. For instructions on how to view the day's current counter values using XML format, refer to *View XML Performance Measurement Reports*

Moreover, the Network Operator can edit the thresholds for the OS Resource counters, see *Edit the Thresholds for the OS Resource Counters from the WebCI*.

## Performance Measurement Counters

The following sections list the counters that are managed using the XML format.

### Operating System Counters

With the Performance Management Improvement feature, counters have been implemented in the following five counter areas:

- CPU load
- process information
- memory usage
- disk IO operations

- IP network interface utilization

  These counters monitor the above information for all of the processes running on each blade. These counters are identified by a unique name and counter ID. The current value of each of these counters can be viewed from the WebCI's PM Counter Value window. Refer to the *View XML Performance Measurement Reports* section of this document for step-by-step instructions on how to view the current counter value from the WebCI.

  Hereunder is the list of these counters and their description.

  OS Resource Counters (CPU, process, memory, disk and IP network interface utilization counters):

**Table 4: OS Resource Counters**

| Counter ID | Counter Name | Description |
|---|---|---|
| **CPU** | | |
| 1 | CpuUserLoad | Counts the CPU user load. |
| 2 | CpuNiceLoad | CPU nice load |
| 3 | CpuSystemLoad | CPU system load |
| 4 | CpuIdleLoad | CPU idle load |
| 5 | CpuOverallLoad | CPU overall load |
| **Process** | | |
| 10 | LoadAverage1Min | Load average value in 1 minute |
| 11 | LoadAverage5Min | Load average value in 5 minutes |
| 12 | LoadAverage15Min | Load average value in 15 minutes |
| 13 | ProcessListSize | Process list size |
| 14 | ProcessListSizeDelta | Process list size delta |
| 15 | ProcessRateOfChange | Process list rate of change |
| **Memory** | | |
| 20 | MemoryTotal | Total physical memory |
| 21 | MemoryFree | Free physical memory |
| 22 | MemoryUsed | Used physical memory |
| 23 | MemoryPercentFree | Percentage free physical memory |
| 24 | MemoryPercentUsed | Percentage used physical memory |
| 25 | SwapMemoryTotal | Total swap memory |

| | | |
|---|---|---|
| 26 | SwapMemoryFree | Free swap memory |
| 27 | SwapMemoryUsed | Used swap memory |
| 28 | SwapMemoryPercentFree | Percentage free swap memory |
| 29 | SwapMemoryPercentUsed | Percentage used swap memory |
| **File System** | | |
| 30 | FileSystemSize | File system size |
| 31 | FileSystemFreeSpace | File system free space |
| 32 | FileSystemUsedSpace | File system used space |
| **Disk I/O** | | |
| 40 | DiskRead | Disk read operation |
| 41 | DiskWrite | Disk write operation |
| **IP I/F** | | |
| 50 | BandwidthPublicIf | Bandwidth of public interface (in %) |
| 51 | DiscardInPacketsPublicIf | Discarded inbound packets on public interface |
| 52 | DiscardOutPacketsPublicIf | Discarded outbound packets on public interface |
| 53 | ErrorInPacketsPublicIf | Error inbound packets on public interface |
| 54 | ErrorOutPacketsPublicIf | Error outbound packets on public interface |

For some of these counters, alarms and thresholds are defined in the system. For each of these counters, a major and minor threshold or simply one single threshold are pre-defined in the system.

Hereunder are the counters and the alarms that can be generated depending on their thresholds:

**Table 5: OS Resource Counters with Thresholds**

| Counter ID | Counter Name | Counter Description | Alarm (Alarm ID) | Alarm Description |
|---|---|---|---|---|
| | **CPU** | | | |
| 5 | CpuOverallLoad | CPU overall load | CpuLoadMinor (300) | Value has reached the threshold value (default: 80%) |
| | | | CpuLoadMajor (301) | Value has reached the threshold value (default: 95%) |

| | | | | |
|---|---|---|---|---|
| | **Process** | | | |
| 10 | LoadAverage1Min | Load average value in 1 minute | ProcessLoadAverage1 MinuteMinor (302) | Value has reached the threshold value (default: 2) |
| | | | ProcessLoadAverage1 MinuteMajor (303) | Value has reached the threshold value (default: 3) |
| 11 | LoadAverage5Min | Load average value in 5 minutes | ProcessLoadAverage5 MinuteMinor (304) | Value has reached the threshold value (default: 2) |
| | | | ProcessLoadAverage5 MinuteMajor (305) | Value has reached the threshold value (default: 3) |
| 12 | LoadAverage15Min | Load average value in 15 minutes | ProcessLoadAverage15 MinuteMinor (306) | Value has reached the threshold value (default: 2) |
| | | | ProcessLoadAverage15 MinuteMajor (307) | Value has reached the threshold value (default: 3) |
| | **Memory** | | | |
| 24 | MemoryPercentUsed | Percentage used physical memory | MemoryUsedMinor (308) | Value has reached the threshold value (default: 80%) |
| | | | MemoryUsedMajor (309) | Value has reached the threshold value (default: 95%) |
| 29 | SwapMemory PercentUsed | Percentage used swap memory | SwapUsedMinor (310) | Value has reached the threshold value (default: 80%) |
| | | | SwapUsedMajor (311) | Value has reached the threshold value (default: 95%) |
| | **IP I/F** | | | |
| 50 | BandwidthPublicIf | Bandwidth of public interface | BandwidthPublicIfMinor (312) | Value has reached the threshold value (default: 60%) |
| | | | BandwidthPublicIfMajor (313) | Value has reached the threshold value (default: 80%) |

| | | | | |
|---|---|---|---|---|
| 51 | Discarded inbound<br>packets on public interface | Discarded inbound packets on public interface | InDiscardPublicIfMajor (314) | Value has reached the threshold value (default: 1) |
| 52 | DiscardOut<br>PacketsPublicIf | Discarded outbound packets on public interface | OutDiscardPublicIfMajor (315) | Value has reached the threshold value (default: 1) |
| 53 | ErrorIn<br>PacketsPublicIf | Error inbound packets on public interface | InErrorPublicIfMajor (316) | Value has reached the threshold value (default: 1) |
| 54 | ErrorOut<br>PacketsPublicIf | Error outbound packets on public interface | NicOutErrorBound0Major (317) | Value has reached the threshold value (default: 1) |

The thresholds indicate to the system when to generate and clear an alarm and can be defined with the following two values

- The Threshold value: Threshold values are already defined in the system (the threshold values set in the system for each counter are in the Alarm descriptions of the table above). If the counter value reaches or exceeds one of its corresponding threshold values, the system generates an alarm. After the alarm has already been raised, if the counter value goes back down, below this threshold value, the system clears the alarm.
- The Threshold hysteresis: By default, the threshold hysteresis is not defined, which means that only the threshold value is considered by the system to generate or clear the counter's corresponding alarms. However, threshold hysteresis can be defined in order to set a range within which the counter's corresponding alarm remains active. After the alarm has already been raised (the counter value has reached or exceeded the threshold value), if the counter value goes back down, below the threshold value, the alarm will remain active as long as the counter value is also equal or higher than the threshold hysteresis value. When the counter value goes back down, below the threshold hysteresis value, the system clears the alarm.

With the implementation of this feature, the operator can now edit the threshold value and the threshold hysteresis by accessing the PMCounterThreshold window from the Oamp folder in the WebCI. For more detailed step-by-step instructions on how to edit these thresholds, refer to the *Edit the Thresholds for the OS Resource Counters from the WebCI* section of this document.

## Data Provider Request Statistics Counters

With the Performance Management Improvement feature, counters have been implemented to count the number of queries to the database per request type.

These counters monitor the queries processed by the database for each module (process) running on each blade individually. These counters are identified by a unique name and counter ID and the CounterContext indicates the module for which it applies for. The current value of each of these counters can be viewed from the WebCI's PMCounterValue window on a per slot basis and per module basis (identified by the CounterContext). Refer to *View the Current Day's Performance Measurements from the WebCI* for instructions on how to view the current counter value from the WebCI.

**Table 6: Counter IDs**

| Counter ID | Counter Name | Description |
|---|---|---|
| 2000 | RequestSelect | Counts the number of SELECT requests queried to the database. |
| 2001 | RequestInsert | Counts the number of INSERT requests queried to the database. |
| 2002 | RequestUpdate | Counts the number of UPDATE requests queried to the database. |
| 2003 | RequestDelete | Counts the number of DELETE requests queried to the database. |
| 2004 | RequestQuery | Counts the number of QUERY requests queried to the database. |
| 2005 | RequestSql | Counts the number of SQL requests queried to the database. |
| 2006 | RequestTransaction | Counts the number of BEGIN requests queried to the database. |
| 2007 | RequestCommit | Counts the number of COMMIT requests queried to the database. |
| 2008 | RequestRollback | Counts the number of ROLLBACK requests queried to the database. |
| 2009 | RequestOperation | Counts the number of OPERATION requests queried to the database. |
| 2010 | RequestController | Counts the number of CONTROLLER requests queried to the database. |
| 2011 | RequestUndef | Counts the number of UNDEFINED requests queried to the database. |
| 2020 | TxTimeout | Counts the number of BEGIN timeouts. |
| 2021 | PreprocessFailed | Counts the number of request preprocess failure. |
| 2022 | RequestOnLocalDb | Counts the number of requests queried on the local database. |
| 2023 | RequestOnScDb | Counts the number of requests queried on the SystemController database. |
| 2024 | RequestOnLocalSs | Counts the number of requests queried on the local Subscriber Set. |
| 2025 | RequestOnRemoteSs | Counts the number of requests queried on the remote Subscriber Set. |
| 2026 | RequestOnForcedDb | Counts the number of requests queried on the forced database. |
| 2030 | RdbInUse | Number of RDB currently in use. |
| 2031 | DbConnectionInUse | Number of DB connection currently in use. |

## HLR Application Counters

The number of messages the HLR receives are counted for each blade with an HLR service running traffic. These counters are identified by a unique name and counter ID. The HLR counters have a Counter Id >= 12000. The accumulative time interval is the consequetive period of time during which the counter continuously increments its value. In between these accumulative time intervals, the counter's value is reset to '0'. Depending on the counter, the accumulative time interval may be 5 minutes, 15 minutes, 1 hour, or 24 hours.

The list of counters that keep track of the type of MAP messages sent/received to or from the HLR or of some events is given below.

**Table 7: MAP Interface Counters**

| Counter ID | Counter Name | Description | Accumulation Time Interval |
|---|---|---|---|
| 12000 | SubsRegistered PerImsiRange | Number of HLR subscribers registered per IMSI Range defined in HLR Config | 15 min |
| 12001 | SubsRegistered CSDomain | Number of HLR subscribers registered in CS domain | 15 min |
| 12002 | SubsRegistered PSDomain | Number of HLR subscribers registered in PS domain | 15 min |
| 12003 | SubsRegistered PerVLRAddress | Number of HLR subscribers registered per VLR Address | 15 min |
| 12004 | SubsRegistered PerSGSNAddress | Number of HLR subscribers registered per SGSN Address | 15 min |
| 12005 | SubsRegistered NAMGprsOnly | Number of HLR subscribers registered for NAM GPRS Only | 15 min |
| 12006 | SubsRegistered NAMNonGprsOnly | Number of HLR subscribers registered for NAM Non GPRS Only | 15 min |
| 12007 | SubsRegistered NAMNonGprsAndGprs | Number of HLR subscribers registered for NAM Non GPRS And GPRS | 15 min |
| 12008 | SIMProvisioned TypeSIM | Number of SIM cards provisioned of type SIM | 24 h |
| 12009 | SIMProvisioned TypeUSIM | Number of SIM cards provisioned of type USIM | 24 h |
| 12010 | SIMProvisioned WithoutSubsProfile | Number of SIM cards provisioned without an associated subscriber profile | 24 h |
| 12011 | IMSIProvisioned PerIMSIRange | Number of IMSI provisioned per IMSI range defined in HLR Config | 24 h |

| | | | |
|---|---|---|---|
| 12012 | MSISDNProvisioned PerCC | Number of MSISDN provisioned per Country Code | 24 h |
| 12013 | SubsCSNot Reachable | Number of HLR subscribers CS not reachable | 15 min |
| 12014 | SubsPSNot Reachable | Number of HLR subscribers PS not reachable | 15 min |
| 12015 | MnpRedirectedSri | MNP - Number of SRI - Redirected | 1 h |
| 12016 | MnpRelayedSri | MNP - Number of SRI - Relayed | 1 h |
| 12017 | MnpRelayedSrim | MNP - Number of SRISM - Relayed | 1 h |
| 12018 | MnpRelayedSmdel | MNP - Number of SMDEL - Relayed | 1 h |
| 12019 | MnpRelayedSndimsi | MNP - Number of SNDIMSI - Relayed | 1 h |
| 12020 | MnpRelayedAti | MNP - Number of ATI - Relayed | 1 h |
| 12021 | OpenInd | Number of Open Indications | 5 min |
| 12022 | OpenReq | Number of Open Requests | 5 min |
| 12023 | OpenCfm | Number of Open Confirmations | 5 min |
| 12024 | DlgCfm | Number of Dialog Confirmations | 5 min |
| 12025 | CloseInd | Number of Close Indications | 5 min |
| 12026 | CloseReq | Number of Close Requests | 5 min |
| 12027 | AbortInd | Number of Abort Indications | 5 min |
| 12028 | AbortIndUserSpec | Number of Abort Indications - reason USR_SPECIFIC | 5 min |
| 12029 | AbortIndResLimit | Number of Abort Indications - reason RESLIMIT | 5 min |
| 12030 | AbortIndResUnavail | Number of Abort Indications - reason RESUNAVAIL | 5 min |
| 12031 | AbortIndAppProCancel | Number of Abort Indications - reason APC | 5 min |
| 12032 | AbortIndPrvdrMalfunction | Number of Abort Indications - reason PROV_MALFUNC | 5 min |
| 12033 | AbortIndSupDialogRel | Number of Abort Indications - reason SUP_DLG_RLS | 5 min |
| 12034 | AbortIndPResLimit | Number of Abort Indications - reason RSRS_LIMIT | 5 min |
| 12035 | AbortIndVerIncomp | Number of Abort Indications - reason VER_INCOMP | 5 min |
| 12036 | UAbrtIndUnknReason | Number of UAbort Indications - reason UNKN_REASON | 5 min |

| | | | |
|---|---|---|---|
| 12037 | PAbrtIndUnknReason | Number of PAbort Indications - reason UNKN_REASON | 5 min |
| 12038 | AbortReqUserSpec | Number of Abort Requests - reason USR_SPECIFIC | 5 min |
| 12039 | AbortReqResLimit | Number of Abort Requests - reason RESLIMIT | 5 min |
| 12040 | AbortReqResUnavailable | Number of Abort Requests - reason RESUNAVAIL | 5 min |
| 12041 | AbortReqAppProcCancel | Number of Abort Requests - reason APC | 5 min |
| 12042 | AbrtReqPrvdrMalfunction | Number of Abort Requests - reason PROV_MALFUNC | 5 min |
| 12043 | AbrtReqSupDialogRel | Number of Abort Requests - reason SUP_DLG_RLS | 5 min |
| 12044 | AbrtReqPResLimit | Number of Abort Requests - reason RSRS_LIMIT | 5 min |
| 12045 | AbrtReqVerIncomp | Number of Abort Requests - reason VER_INCOMP | 5 min |
| 12046 | UAbrtReqUnknReason | Number of UAbort Requests - reason UNKN_REASON | 5 min |
| 12047 | PAbrtReqUnknReason | Number of PAbort Requests - reason UNKN_REASON | 5 min |
| 12048 | NoticeInd | Number of Notice Indications | 5 min |
| 12049 | DelimInd | Number of Delimiter Indications | 5 min |
| 12050 | DelimReq | Number of Delimiter Requests | 5 min |
| 12051 | AbortReq | Number of Abort Requests | 5 min |
| 12052 | UpdLocInd | Number of Update Location Indications | 5 min |
| 12053 | UpdLocRsp | Number of Update Location Ack Responses | 5 min |
| 12054 | UpdLocNeg | Number of Update Location Nack Responses | 5 min |
| 12055 | IsdReq | Number of Isd Requests | 5 min |
| 12056 | IsdReq1 | Number of Gsm Isd Segment 1 Requests | 5 min |
| 12057 | IsdReq2 | Number of Gsm Isd Segment 2 Requests | 5 min |

| | | | |
|---|---|---|---|
| 12058 | IsdReq3 | Number of Gsm Isd Segment 3 Requests | 5 min |
| 12059 | IsdReq4 | Number of Gsm Isd Segment 4 Requests | 5 min |
| 12060 | IsdReq5 | Number of Gsm Isd Segment 5 Requests | 5 min |
| 12061 | IsdReq6 | Number of Gsm Isd Segment 6 Requests | 5 min |
| 12062 | IsdReq7 | Number of Gsm Isd Segment 7 Requests | 5 min |
| 12063 | IsdReq8 | Number of Gsm Isd Segment 8 Requests | 5 min |
| 12064 | GprsIsdReq1 | Number of Gprs Isd Segment 1 Requests | 5 min |
| 12065 | GprsIsdReq2 | Number of Gprs Isd Segment 2 Requests | 5 min |
| 12066 | IsdCfm | Number of Isd Confirmations | 5 min |
| 12067 | DsdReq | Number of Dsd Requests | 5 min |
| 12068 | DsdCfm | Number of Dsd Confirmations | 5 min |
| 12069 | CancelLocReq | Number of Cancel Location Requests | 5 min |
| 12070 | CancelLocCfm | Number of Cancel Location Confirmations | 5 min |
| 12071 | PurgeMsInd | Number of PurgeMs Indications | 5 min |
| 12072 | PurgeMsRsp | Number of PurgeMs Ack | 5 min |
| 12073 | PurgeMsNeg | Number of PurgeMs Nack | 5 min |
| 12074 | GprsUpdLocInd | Number of Gprs Update Location Indications | 5 min |
| 12075 | GprsUpdLocRsp | Number of Gprs Update Location Ack | 5 min |
| 12076 | GprsUpdLocNeg | Number of Gprs Update Location Nack | 5 min |
| 12077 | SriGprsInd | Number of Gprs SRI Indications | 5 min |
| 12078 | SriGprsRsp | Number of Gprs Sri Ack | 5 min |
| 12079 | SriGprsNeg | Number of Gprs Sri Nack | 5 min |
| 12080 | FailRptInd | Number of Failure Report Indications | 5 min |
| 12081 | FailRptRsp | Number of Failure Report Ack | 5 min |
| 12082 | FailRptNeg | Number of Failure Report Nack | 5 min |

| | | | |
|---|---|---|---|
| 12083 | NoteMsPresGprsReq | Number of Gprs NoteMsPres Requests | 5 min |
| 12084 | NoteMsPresGprsCfm | Number of Gprs NoteMsPres Confirmations | 5 min |
| 12085 | SendAuthInfoInd | Number of Auth Info Indications | 5 min |
| 12086 | SendAuthInfoRsp | Number of Auth Info Ack | 5 min |
| 12087 | SendAuthInfoNeg | Number of Auth Info Nack | 5 min |
| 12088 | SndParamInd | Number of Send Param Indications | 5 min |
| 12089 | SndParamRsp | Number of Send Param Ack | 5 min |
| 12090 | SndParamNeg | Number of Send Param Nack | 5 min |
| 12091 | AuthFailRptInd | Number of Auth Fail Report Indications | 5 min |
| 12092 | AuthFailRptRsp | Number of Auth Fail Report Ack | 5 min |
| 12093 | AuthFailRptNeg | Number of Auth Fail Report Nack | 5 min |
| 12094 | RestoreInd | Number of Restore Indications | 5 min |
| 12095 | RestoreRsp | Number of Restore Ack | 5 min |
| 12096 | RestoreNeg | Number of Restore Nack | 5 min |
| 12097 | ResetReq | Number of Reset Requests | 5 min |
| 12098 | ResetCfm | Number of Reset Confirmations | 5 min |
| 12099 | SriInd | Number of Sri Indications | 5 min |
| 12100 | SriRsp | Number of Sri Ack | 5 min |
| 12101 | SriNeg | Number of Sri Nack | 5 min |
| 12102 | PrnReq | Number of Prn Requests | 5 min |
| 12103 | PrnCfm | Number of Prn Confirmations | 5 min |
| 12104 | FwdCheckSSReq | Number of Forward Check SS Requests | 5 min |
| 12105 | AtiInd | Number of Ati Indications | 5 min |
| 12106 | AtiRsp | Number of Ati Ack | 5 min |
| 12107 | AtiNeg | Number of Ati Nack | 5 min |
| 12108 | PsiReq | Number of Psi Requests | 5 min |
| 12109 | PsiCfm | Number of Psi Confirmations | 5 min |
| 12110 | AtmInd | Number of Atm Indications | 5 min |
| 12111 | AtmRsp | Number of Atm Ack | 5 min |
| 12112 | AtmNeg | Number of Atm Nack | 5 min |

| | | | |
|---|---|---|---|
| 12113 | AtsiInd | Number of Atsi Indications | 5 min |
| 12114 | AtsiRsp | Number of Atsi Ack | 5 min |
| 12115 | AtsiNeg | Number of Atsi Nack | 5 min |
| 12116 | NsdcReq | Number of Nsdc Requests | 5 min |
| 12117 | NsdcCfm | Number of Nsdc Confirmations | 5 min |
| 12118 | RegistSSInd | Number of RegisiterSS Indications | 5 min |
| 12119 | RegistSSRsp | Number of RegisiterSS Ack | 5 min |
| 12120 | RegistSSNeg | Number of RegisiterSS Nack | 5 min |
| 12121 | EraseSSInd | Number of EraseSS Indications | 5 min |
| 12122 | EraseSSRsp | Number of EraseSS Ack | 5 min |
| 12123 | EraseSSNeg | Number of EraseSS Nack | 5 min |
| 12124 | ActiveSSInd | Number of ActivateSS Indications | 5 min |
| 12125 | ActiveSSRsp | Number of ActivateSS Ack | 5 min |
| 12126 | ActiveSSNeg | Number of ActivateSS Nack | 5 min |
| 12127 | DeactiveSSInd | Number of DeactivateSS Indications | 5 min |
| 12128 | DeactiveSSRsp | Number of DeactivateSS Ack | 5 min |
| 12129 | DeactiveSSNeg | Number of DeactivateSS Nack | 5 min |
| 12130 | InterrogSSInd | Number of InterrogateSS Indications | 5 min |
| 12131 | InterrogSSRsp | Number of InterrogateSS Ack | 5 min |
| 12132 | InterrogSSNeg | Number of InterrogateSS Nack | 5 min |
| 12133 | RegistPasswdInd | Number of RegisterPasswd Indications | 5 min |
| 12134 | RegistPasswdRsp | Number of RegisterPasswd Ack | 5 min |
| 12135 | RegistPasswdNeg | Number of RegisterPasswd Nack | 5 min |
| 12136 | GetPasswdReq | Number of GetPasswd Requests | 5 min |
| 12137 | GetPasswdCfm | Number of GetPasswd Confirmations | 5 min |
| 12138 | ProcUssdReqInd | Number of UssdReq Indications | 5 min |
| 12139 | ProcUssdReqReq | Number of UssdReq Requests | 5 min |
| 12140 | ProcUssdReqRsp | Number of UssdReq Ack | 5 min |
| 12141 | ProcUssdReqNeg | Number of UssdReq Nack | 5 min |
| 12142 | ProcUssdReqCfm | Number of UssdReq Confirmations | 5 min |
| 12143 | ProcUssdDataInd | Number of UssdData Indications | 5 min |
| 12144 | ProcUssdDataReq | Number of UssdData Requests | 5 min |

| | | | |
|---|---|---|---|
| 12145 | ProcUssdDataRsp | Number of UssdData Ack | 5 min |
| 12146 | ProcUssdDataNeg | Number of UssdData Nack | 5 min |
| 12147 | ProcUssdDataCfm | Number of UssdData Confirmations | 5 min |
| 12148 | UssdReqInd | Number of UssdReq Indications | 5 min |
| 12149 | UssdReqReq | Number of UssdReq Requests | 5 min |
| 12150 | UssdReqRsp | Number of UssdReq Ack | 5 min |
| 12151 | UssdReqNeg | Number of UssdReq Nack | 5 min |
| 12152 | UssdReqCfm | Number of UssdReq Confirmations | 5 min |
| 12153 | UssdNotifyInd | Number of UssdNotify Indications | 5 min |
| 12154 | UssdNotifyReq | Number of UssdNotify Requests | 5 min |
| 12155 | UssdNotifyRsp | Number of UssdNotify Ack | 5 min |
| 12156 | UssdNotifyNeg | Number of UssdNotify Nack | 5 min |
| 12157 | UssdNotifyCfm | Number of UssdNotify Confirmations | 5 min |
| 12158 | BegSubsActivInd | Number of BeginSubscriberActivity Indications | 5 min |
| 12159 | SRISMind | Number of SriSM Indications | 5 min |
| 12160 | SriSMRsp | Number of SriSM Ack | 5 min |
| 12161 | SriSMNeg | Number of SriSM Nack | 5 min |
| 12162 | InformSvcReq | Number of InformServiceCenter Requests | 5 min |
| 12163 | InformSvcCfm | Number of InformServiceCenter Confirmations | 5 min |
| 12164 | AlertSvcReq | Number of AlertServiceCenter Requests | 5 min |
| 12165 | AlertSvcCfm | Number of AlertServiceCenter Confirmations | 5 min |
| 12166 | ReadyForSmInd | Number of ReadyForSm Indications | 5 min |
| 12167 | ReadyForSmRsp | Number of ReadyForSm Ack | 5 min |
| 12168 | ReadyForSmNeg | Number of ReadyForSm Nack | 5 min |
| 12169 | SmDeliveryReportInd | Number of SmDeliveryReport Indications | 5 min |
| 12170 | SmDeliveryReportRsp | Number of SmDeliveryReport Ack | 5 min |
| 12171 | SmDeliveryReportNeg | Number of SmDeliveryReport Nack | 5 min |
| 12172 | SendImsiInd | Number of SendImsi Indications | 5 min |

| | | | |
|---|---|---|---|
| 12173 | SendImsiRsp | Number of SendImsi Ack | 5 min |
| 12174 | SendImsiNeg | Number of SendImsi Nack | 5 min |
| 12175 | SimSwap | Number of Sim Swap | 5 min |
| 12176 | RestrictedFTN | Number of Restricted FTN | 5 min |
| 12177 | NumBlockedMap TxPerAcType | Number of Blocked Map Transactions per AC type | 5 min |
| 12178 | NumBlockedAlrReq | Number of Blocked Blocked Alr Requests | 5 min |
| 12179 | NumDenyOnUL | Number of Deny Update Location | 5 min |
| 12180 | NumOdbOnUL | Number of ODB Update Location | 5 min |
| 12181 | NumReqToDisabledSub | Number of Request To Disabled Subscriber | 5 min |
| 12182 | NumImeiSvUpdate | Number of update in Subscriber Profile | 5 min |
| 12183 | FtnNumTranslation PerRule | Number of Ftn Translations Per Rule | 5 min |
| 12184 | FtnNumTranslations | Number of Ftn Translations | 5 min |
| 12185 | MnpRangeRedirectedSri | MNP Number Range - Number of SRI - Redirected | 1 h |
| 12186 | MnpRangeRelayedSri | MNP Number Range - Number of SRI - Relayed | 1 h |
| 12187 | MnpRangeRelayedSrism | MNP Number Range - Number of SRISM - Relayed | 1 h |
| 12188 | MnpRangeRelayedSmdel | MNP Number Range - Number of SMDEL - Relayed | 1 h |
| 12189 | MnpRangeRelayedSndimsi | MNP Number Range - Number of SNDIMSI - Relayed | 1 h |
| 12190 | MnpRangeRelayedAti | MNP Number Range - Number of ATI - Relayed | 1 h |
| 12191 | MnpMismatchTypeA | MNP DB Mismatch - Type A ( Number ported to another OLO) | 1 h |
| 12192 | MnpMismatchTypeB | MNP DB Mismatch - Type B (Number is NOT ported in the network corresponding to the RgN) | 1 h |
| 12193 | MnpMismatchTypeC | MNP DB Mismatch - Type C (Number ported to another OLO that is different from the Mobile Operator indicated by the RN) | 1 h |
| 12194 | MnpAtiInfoRequest | MNP - Number of ATI Info Request | 1 h |

| | | | |
|---|---|---|---|
| 12195 | SmsRedirected | SMS Routing: Number of SRI-SM redirected | 5 min |
| 12196 | SmsRelayed | SMS Routing: Number of SRI-SM relayed | 5 min |
| 12197 | TripleRequest | Number of Requests for Triplets | 5 min |
| 12198 | TripletResponses | Number of Responses with Triplets | 5 min |
| 12199 | QuintipletRequests | Number of Requests for Quintiplets | 5 min |
| 12200 | Quintiplet Responses | Number of Responses with Quintiplets | 5 min |
| 12201 | AuthSyncRequests | Number of Auth Requests with Synch Indication | 5 min |
| 12202 | SimNotFound | Number of Auth Requests with Synch Indication | 5 min |
| 12203 | SriRoutingSriReceived | Sri Routing: Number of SRI received | 5 min |
| 12204 | SriRoutingSriRegistered | Sri Routing: Number of SRI for TAS-registered Subscribers | 5 min |
| 12205 | SriRoutingNonSri | Sri/SMS Routing: Number of MAP operations not handled | 5 min |
| 12206 | SriRoutingSri NotRegistered | Sri Routing: Number of SRI for non-TAS registered Subscribers | 5 min |
| 12207 | SriRoutingSriNotFound | Sri Routing: Number of SRI for Subscribers not found in database | 5 min |
| 12208 | EirNumberOfCheck IMEIRcvd | Number of CheckIMEI request received | 10 min |
| 12209 | EirNumberOfULImei EnforcementReceived | Number of Update Location IMEI Enforcement request received | 10 min |
| 12210 | EirNumberOfWhiteList Returned | Number of CheckIMEI sent with EquipmentStatus = WHITELIST | 10 min |
| 12211 | EirNumberOfGreyList Returned | Number of CheckIMEI sent with EquipmentStatus = GREYLIST | 10 min |
| 12212 | EirNumberOfBlackList Returned | Number of CheckIMEI sent with EquipmentStatus = BLACKLIST | 10 min |
| 12213 | EirNumberOfUnknown IMEIStatus | Number of Unkwown IMEI returned | 10 min |
| 12214 | EirNumberOfWhiteList ReturnedGlobalResp | Number of CheckIMEI answer sent with EquipmentStatus = WHITELIST due to Global Response | 10 min |

| | | | |
|---|---|---|---|
| 12215 | EirNumberOfGreyList ReturnedGlobalResp | Number of CheckIMEI answer sent with EquipmentStatus = GREYLIST due to Global Response | 10 min |
| 12216 | EirNumberOfBlackList ReturnedGlobalResp | Number of CheckIMEI answer sent with EquipmentStatus = BLACKLIST due to Global Response | 10 min |
| 12217 | EirNumberOfUnknown IMEIStatusGlobalResp | Number of unknown IMEI returned due to Global Response | 10 min |
| 12218 | EirNumberOfBlackList IMSIMatch | Number of black list IMEI with successfull IMSI override | 10 min |
| 12219 | EirNumberOfBlackList IMSIMisMatch | Number of black list IMEI with unsuccessfull IMSI override | 10 min |
| 12220 | EirNumberOfDynamic IMSIRecording | Number of Dynamic IMSI/IMEI association | 10 min |
| 12221 | EirNumberOfDynamic SVRecording | Number of Dynamic IMEI SV recording | |
| 12222 | SriLcsMsisdnInd | Number of Send Routing Info for LCS Ind with MSISDN | 5 min |
| 12223 | SriLcsImsiInd | Number of Send Routing Info for LCS Ind with IMSI | 5 min |
| 12224 | SriLcsRsp | Number of Send Routing Info for LCS Ack | 5 min |
| 12225 | SriLcsNeg | Number of Send Routing Info for LCS Nack | 5 min |
| 12226 | SriRoutingSriLcsReceived | Sri Routing: Number of SRI-LCS received | 5 min |
| 12227 | SriRoutingSriLcsRelayed | Sri Routing: Number of Send Routing Info for LCS Relayed | 5 min |
| 12228 | SriRoutingSriLcsRedirected | Sri Routing: Number of Send Routing Info for LCS Redirected | 5 min |
| 12229 | SriRoutingSriLcs Registered | Sri Routing: Number of Send Routing Info for LCS for TAS-registered Subscribers | 5 min |
| 12230 | SriRoutingSriLcsNot Registered | Sri Routing: Number of Send Routing Info for LCS for non-TAS registered Subscribers | 5 min |
| 12231 | SriRoutingSriLcsNotFound | Sri Routing: Number of Send Routing Info for LCS for Subscribers not found in database | 5 min |
| 12232 | SriRoutingAtiReceived | Sri Routing: Number of Any Time Interrogation received | 5 min |

| | | | |
|---|---|---|---|
| 12233 | SriRoutingAtiRelayed | Sri Routing: Number of Any Time Interrogation Relayed | 5 min |
| 12234 | SriRoutingAtiRegistered | Sri Routing: Number of Any Time Interrogation for TAS-registered Subscribers | 5 min |
| 12235 | SriRoutingAtiNot Registered | Sri Routing: Number of Any Time Interrogation for non-TAS registered Subscribers | 5 min |
| 12236 | SriRoutingAtiNotFound | Sri Routing: Number of Any Time Interrogation for Subscribers not found in database | 5 min |
| 12237 | SriRoutingSriRelayed | Sri Routing: Number of Send Routing Info Relayed | 5 min |
| 12238 | SriRoutingSriRedirected | Sri Routing: Number of Send Routing Info Redirected | 5 min |
| 12239 | SmsReceived | SMS Routing: Number of Send Routing Info for SM received | 5 min |
| 12240 | SmsRegistered | SMS Routing: Number of Send Routing Info for SM for TAS-registered Subscribers | 5 min |
| 12241 | SmsNotRegistered | SMS Routing: Number of Send Routing Info for SM for non-TAS registered Subscribers | 5 min |
| 12242 | SmsNotFound | SMS Routing: Number of Send Routing Info for SM for Subscribers not found in database | 5 min |

The WebCI displays these counters in the PMCounterValue window of the Oamp folder. Through this window, the operator can view each of the counter's count value reported after every 5 minutes, 15 minutes, 1 hour, or 24 hour period for the current day.

## HLR Subscriber Counters

Twelve types of HLR-specific subscriber counters have been implemented to count HLR subscribers. This dynamically keeps track of the number of HLR subscribers on a SDM system, which improves analysis based on HLR subscribers and provides the following to the operator:

- a better assessment of the activity level on a SDM system
- help for troubleshooting purposes
- detailed subscriber information to better identify and forecast subscriber trends

The HLR subscriber counters can be identified by a Counter ID or by a Counter Name and Counter Context, in the case where the counter type is dynamic.

Here are the 12 types of HLR-specific subscriber counters:

**Table 8: HLR Subscriber Counters**

| Type | Counter ID | Counter Name | Counter Context | Counter Description |
|---|---|---|---|---|
| 1 | 12000 | Number of HLR subscribers registered per IMSI Range defined in HLR Config | <*Imsi range*><br>(example: 3109104) | This counter type is dynamic, each time a new IMSI range is added in the HLR configuration and a Subscriber is registered in this new IMSI Range, a new counter is created. There are as many counters of this type as there are IMSI ranges. They count the total number of subscribers newly registered per IMSI Range (defined in HLR configuration) during a 15 minute period, after which they are reset. |
| 2 | 12001 | Number of HLR subscribers registered in CS domain | None | This counter is static and counts the number of subscribers newly registered in the CS Domain (new Current VLR (Non-Gprs) in the volatile data) during a 15 minute period, after which it is reset. |
| 3 | 12002 | Number of HLR subscribers registered in PS domain | None | This counter is static and counts the number of subscribers newly registered in the PS Domain (new Current SGSN (GPRS) in the volatile data) during a 15 minute period, after which it is reset. |
| 4 | 12003 | Number of HLR subscribers registered per VLR Address | <*VLR Address*><br>(example: 15631234567) | This counter type is dynamic, each time a new VLR address is added to the volatile data, a new counter is created.<br>There are as many counters of this type as there are VLR addresses in the ngHLR's volatile data. They count the total number of subscribers newly registered per VLR address (number) during a 15 minute period, after which they are reset. |
| 5 | 12004 | Number of HLR subscribers registered per SGSN Address | <*SGSN Address*><br>(example: 15631234567) | This counter type is dynamic, each time a new SGSN address is added to the volatile data, a new counter is created. There are as many counters of this type as there are SGSN addresses in the ngHLR's volatile data. They count the total number of subscribers newly registered per SGSN address (number) |

| Type | Counter ID | Counter Name | Counter Context | Counter Description |
|---|---|---|---|---|
| | | | | during a 15 minute period, after which they are reset. |
| 6 | 12005 | Number of HLR subscribers registered for NAM GPRS Only | None | This counter type is static, three counters of this type are always created when the HLR starts. There is one counter per Network Access Mode (NonGprsAndGprs(0), NonGprsOnly(1) and GprsOnly(2)). They count the total number of subscribers newly registered per NAM value during a 15 minute period, after which they are reset. |
| | 12006 | Number of HLR subscribers registered for NAM Non GPRS Only | | |
| | 12007 | Number of HLR subscribers registered for NAM Non GPRS And GPRS | | |
| 7 | 12013 | Number of HLR subscribers CS not reachable | None | This counter type is static, one counter of this type is always created when the HLR starts. It counts the number of HLR Subscribers becoming not reachable for Non-GPRS (CS) during a 15 minute period, after which it is reset.<br>A subscriber is defined as reachable from the HLR point of view if all the Subscriber CS Reachable flags defined in the volatile data are false (for VLR Number this mean that it is not empty).<br>The Non-GPRS (CS) Subscriber Reachable flags are: -MSC area restricted flag -MS purged flag -Roaming restriction due to unsupported feature flag -VLR Number is empty |
| 8 | 12014 | Number of HLR subscribers PS not reachable | None | This counter type is static, one counter of this type is always created when the HLR starts. It counts the number of HLR Subscribers becoming not reachable for GPRS (PS) during a 15 minute period, after which it is reset.<br>A subscriber is defined as reachable from the HLR point of view if all the Subscriber PS Reachable flags defined in the volatile data are false (for SGSN Number this mean that it is not empty). |

| Type | Counter ID | Counter Name | Counter Context | Counter Description |
|---|---|---|---|---|
| | | | | The GPRS (PS) Subscriber Reachable flags are:<br>• SGSN Subscriber Reachable flag<br>• SGSN MSC area restrited flag<br>• SGSN MS purged flag<br>• SGSN Roaming restriction due to unsupported feature flag<br>• SGSN Number is empty |
| 9 | 12008 | Number of SIM cards provisioned of type SIM | None | This counter type is static; two counters are always created when the HLR starts. They count the total number of SIM cards newly Provisioned per SimType (SIM, USIM) during a 24 hour period, after which they are reset. |
| | 12009 | Number of SIM cards provisioned of type USIM | | |
| 10 | 12010 | Number of SIM cards provisioned without an associated subscriber profile | None | This counter type is static, one single counter is always created when the HLR starts. It counts the total number of SIM cards newly provisioned without an associated subscriber profile during a 24 hour period, after which it is reset. |
| 11 | 12011 | Number of IMSI provisioned per IMSI range defined in HLR Config | <*IMSI Range*><br>(example: 3109104) | This counter type is dynamic, each time a new IMSI range is added and a Subscriber is added in the new IMSI range, a new counter is created. There are as many counters of this type as there are IMSI ranges. They count the total number of IMSI (including Multi-IMSI) newly provisioned per IMSI Range during a 24 hour period, after which they are reset.<br>For Multi-IMSI, if a multi-IMSI is added/deleted, the counter is incremented/decremented only if the Multi-IMSI is different from any other count or Alternate (multi) IMSI. |
| 12 | 12012 | Number of MSISDN provisioned per Country Code | <*Country Code*><br>(example: 7) | This counter type is dynamic, each time a new MSISDN is added to a subscriber profile, a new counter is created if the decoded Country Code is new. |

| Type | Counter ID | Counter Name | Counter Context | Counter Description |
|---|---|---|---|---|
| | | | | There are as many counters of this type as there are Country Codes. They count the total number of MSISDNs newly provisioned per Country Code during a 24 hour period, after which they are reset.<br>For Multi-IMSI (alternate MSISDN), if an alternate MSISDN is added/deleted, the counter is incremented/decremented only if the alternate MSISDN is different from any other Primary or Alternate MSISDN. |
| 13 | 12226 | SriRoutingSriLcsReceived | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Send Routing Info for LCS received |
| 14 | 12227 | SriRoutingSriLcsRelayed | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Send Routing Info for LCS Relayed |
| 15 | 12228 | SriRoutingSriLcsRedirected | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Send Routing Info for LCS Redirected |
| 16 | 12229 | SriRoutingSriLcsRegistered | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Send Routing Info for LCS for TAS-registered Subscribers |
| 17 | 12230 | SriRoutingSriLcsNotRegistered | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Send Routing Info for LCS for TAS-registered Subscribers |
| 18 | 12231 | SriRoutingSriLcsNotFound | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Send Routing Info for LCS for Subscribers not found in database |
| 19 | 12232 | SriRoutingAtiReceived | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Any Time Interrogation received |
| 20 | 12233 | SriRoutingAtiRelayed | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Any Time Interrogation Relayed |
| 21 | 12234 | SriRoutingAtiRegistered | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Any Time Interrogation for TAS-registered Subscribers |
| 22 | 12235 | SriRoutingAtiNotRegistered | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Any Time Interrogation for non-TAS registered Subscribers |

| Type | Counter ID | Counter Name | Counter Context | Counter Description |
|---|---|---|---|---|
| 23 | 12236 | SriRoutingAtiNotFound | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Any Time Interrogation for Subscribers not found in database |
| 24 | 12237 | SriRoutingSriRelayed | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Send Routing Info Relayed |
| 25 | 12238 | SriRoutingSriRedirected | 11 - HLR-Subscriber - Counters-5min | Sri Routing: Number of Send Routing Info Redirected |
| 26 | 12239 | SmsReceived | 11 - HLR-Subscriber - Counters-5min | SMS Routing: Number of Send Routing Info for SM received |
| 27 | 12240 | SmsRegistered | 11 - HLR-Subscriber - Counters-5min | SMS Routing: Number of Send Routing Info for SM for TAS-registered Subscribers |
| 28 | 12241 | SmsNotRegistered | 11 - HLR-Subscriber - Counters-5min | SMS Routing: Number of Send Routing Info for SM for non-TAS registered Subscribers |
| 29 | 12242 | SmsNotFound | 11 - HLR-Subscriber - Counters-5min | SMS Routing: Number of Send Routing Info for SM for Subscribers not found in database |

It is important to take note that the counters only report the total value that has been counted within the 15 minute period or 24 hour period, depending on the counter. When the counter is reset (after a 15 minute or a 24 hour period), its value is stored in the database in files created on a daily basis.

The WebCI displays these counters in the PMCounterValue window of the Oamp folder. Through this window, the operator can view each of the counter's count value reported after each 5 minute, 15 minute, 1 hour, or 24 hour period for the current day.

## SIP Application Counters

The SIP messages supported by the ngHLR are counted with SIP counters. The SIP counters feature aims to provide statistics about FMC related traffic processing done by the ngHLR. The statistics are gathered using the common ngHLR performance measurement framework. Specific statistics will be kept for each of the main ngHLR SIP related processing domains: the SIP Registrar and the SIP Redirect Server.

The number of different incoming and outgoing SIP messages are counted for each blade with an HLR service (with SIP application enabled) running traffic.

The number of messages the SIP Server receives are counted for each blade with an HLR service running SIP traffic. These counters are identified by a unique name and counter ID. The SIP counters have a Counter Id >= 10000.

The list of counters that keep track of the type of SIP messages sent/received to or from the HLR or of some events is given below.

**Table 9: SIP Counters**

| Counter ID | SIP Registrar Counters | Description |
|---|---|---|
| 10000 | RegisterReceived | Counter incremented for each valid REGISTER message received by the SIP stack and passed to the Registrar application. |
| 10001 | RegisterSuccess | Counter incremented for each 200 OK sent by the application in response to REGISTER message received. REGISTER message processing completed successfully. |
| 10002 | RegisterError400 | Counter incremented for each 400 error sent by the application in response to REGISTER message received. 'Error 400' is sent when the message has an erroneous format. |
| 10003 | RegisterError401 | Counter incremented for each 401 error sent by the application in response to REGISTER message received. 'Error 401' is sent when there is an error in the user authentication. |
| 10004 | RegisterError403 | Counter incremented for each 403 error sent by the application in response to REGISTER message received. 'Error 403' is sent when: - Registrar is NOT enabled (Sip Configuration::IsRegistrar Enabled) and/or - AOR found is NOT 'Service Allowed' (SipAddress OfRecord::Service Allowed) and/or - AOR found is NOT allowed to receive REGISTER (SipAddress OfRecord::isReceiveRegister Allowed) |
| 10005 | RegisterError404 | Counter incremented for each 404 error sent by the application in response to REGISTER message received. 'Error 404' is sent when REGISTER request AOR is NOT found. It can also be send when URI domain does NOT match Registrar configured domain (request reaches redirect server in this case). |
| 10006 | RegisterError416 | Counter incremented for each 416 error sent by the application in response to REGISTER message received. 'Error 416' is sent when REGISTER request URI contains invalid URI (request reaches redirect server in this case). |
| 10007 | RegisterError500 | Counter incremented for each 500 error sent by the application in response to REGISTER message received. 'Error 500' is sent when: - There was an error when we tried to send a 200 OK. (All previous/other processing completed successfully, but error occurred when trying to |

| | | |
|---|---|---|
| | | send 200 OK). - Internal error (ex: cannot find AOR in the AOR map). |
| 10008 | RegisterError503 | Counter incremented for each 503 error sent by the application in response to REGISTER message received. 'Error 503' is sent when the stack is manually disabled. |
| 10009 | RegisterError InvalidRequestReceived | Counter incremented for each INVALID REGISTER request received by SIP Stack. Message cannot be processed; stack determines appropriate SIP error code to return. Note: The counter RegisterReceived, defined above, is not incremented upon reception of an invalid REGISTER request. |
| 10010 | RegisterImsrTasNotFound | Number of IMSR REGISTER answered with 404. TAS not found. |
| **Counter ID** | **SIP Redirect Server Counters** | **Description** |
| 10100 | InviteReceived | Counter incremented for each valid INVITE message received by the SIP stack and passed to the Redirect server application. |
| 10101 | InviteProxyAttemptForLB | Counts the number of INVITE identified to be proxied (for Load Balancing purpose). |
| 10102 | InviteProxied | Counts the number of INVITE successfully proxied OUT (for Load Balancing purpose). |
| 10103 | RedirectUriSuccess300 | Counter incremented for each 300 sent in response to INVITE message received IF response is redirected to multiple SIP URI. INVITE message processing completed successfully. |
| 10104 | RedirectUriSuccess302 | Counter incremented for each 302 sent in response to INVITE message received IF response is redirected to a single SIP URI. INVITE message processing completed successfully. |
| 10105 | RedirectMsrnSuccess300 | Counter incremented for each 300 sent in response to INVITE message received IF response is redirected to MSRN AND at least one SIP URI. INVITE message processing completed successfully. |
| 10106 | RedirectMsrnSuccess302 | Counter incremented for each 302 sent in response to INVITE message received IF response is redirected to MSRN (only). INVITE message processing completed successfully. |
| 10107 | RedirectOverrideSuccess300 | Counter incremented for each SIP INVITE 300 message redirected by the ngHLR's SIP Redirection Override functionality. |

| | | |
|---|---|---|
| 10108 | RedirectOverrideSuccess302 | Counter incremented for each SIP INVITE 302 message redirected by the ngHLR's SIP Redirection Override functionality. |
| 10109 | RedirectVoipDnUriSuccess302 | Counts the number of INVITE redirected to VoIP DN AOR. |
| 10110 | RedirectNpAorUser RangePrefixSuccess302 | Counts the number of INVITE redirected with NP AOR User Range Prefix contact (302). |
| 10111 | InviteError403 | Counter incremented for each 403 error sent by the application in response to INVITE message received. 'Error 403' is sent when: - Redirect Server is NOT enabled (Sip Configuration::IsRedirect ServerEnabled) and/or - AOR found is NOT 'Service Allowed' (SipAddress OfRecord::Service Allowed) and/or - AOR found is NOT allowed to receive INVITE (SipAddress OfRecord::isReceiveInvite Allowed) - HLR eProvideRoaming AnswerError answer has MAT_CALL_BARRED (when imsi provisioned) |
| 10112 | InviteError404 | Counter incremented for each 404 error sent by the application in response to INVITE message received. 'Error 404' is sent when: - cannot find AOR. - no IMSI and no server regbindings found for AOR. - eProvideRoamingAnswerError received from HLR (when imsi provisioned) |
| 10113 | InviteError480 | Counter incremented for each 480 error sent by the application in response to an INVITE message received. 'Error 480' is sent when one of the following occurs:<br>**1.** NO GSM subscriber exists and NO SIP registration bindings<br>**2.** NO MSRN/CFU and NO SIP registration bindings<br>**3.** NO MSRN/CFU and NO SIP registration bindings |
| 10114 | InviteError486 | Counter incremented for each 486 error sent by the application in response to an INVITE message received. 'Error 486' is sent when one of the following occurs:<br>**1.** INVITE map overflow (NO response form HLR) and NO SIP registration bindings<br>**2.** HLR server overload and NO SIP registration bindings |
| 10115 | InviteError500 | Counter incremented for each 500 error sent by the application in response to INVITE message |

| | | |
|---|---|---|
| | | received. 'Error 500' is sent when: - Invalid answer received from HLR OR error occurred while building SIP response using data from HLR answer (MSRN data). - There was an error when we tried to send valid 300 or 302 response (All previous/other processing completed successfully, but error occurred when trying to send response). - Internal error (ex: cannot insert into invite context map, or error occurred on sendRoutingInfoRequest MSRN query, …) |
| 10116 | InviteVoipDnError500 | Counts the number of VoIP DN INVITE answered with 500. |
| 10117 | InviteError503 | Counter incremented for each 503 error sent by the application in response to an INVITE message received. 'Error 503' is sent when the stack is manually disabled. |
| 10150 | OptionsReceived | Counter incremented for each valid OPTIONS message received by the application. |
| 10151 | OptionsSuccess | Counter incremented for each 200 OK sent in response to OPTIONS message received. |
| 10152 | OptionsError400 | Counter incremented for each 400 error sent by the application in response to OPTIONS message received. 'Error 400' is sent when the Request-URI of OPTIONS request has an erroneous format. |
| 10153 | OptionsError403 | Counter incremented for each 403 error sent by the application in response to OPTIONS message received. 'Error 403' is sent when isOptionsMethodAllowed set to false (SipConfiguration::IsOptions MethodAllowed) |
| 10154 | OptionsError404 | Counter incremented for each 404 error sent by the application in response to OPTIONS message received. 'Error 404' is sent when OPTIONS request-URI does not match configured server domain. |
| 10155 | OptionsError416 | Counter incremented for each 416 error sent by the application in response to OPTIONS message received. 'Error 416' is sent when OPTIONS request URI contains invalid URI. |
| 10156 | OptionsError500 | Counter incremented for each 500 error sent by the application in response to OPTIONS message received. 'Error 500' is sent when there was an error when we tried to send valid 200 OK. |
| 10157 | OptionsError503 | Counter incremented for each 503 error sent by the application in response to OPTIONS message |

| | | |
|---|---|---|
| | | received. 'Error 503' is sent when the stack is manually disabled. |
| 10190 | RequestErrorInvalid RequestReceived | Counter incremented for each INVALID request received by SIP Stack. Message cannot be processed; stack can determine appropriate SIP error code to return. This counter is also incremented when request cannot be read from SIP stack ('error 500' sent back in this case) OR when unknown/unsupported SIP method received ('error 403' sent back). |
| **Counter ID** | **SIP Register Client Counters** | **Description** |
| 10200 | FirstRegReceived | Counter incremented for each GsmUpdateLocationNotification received from HLR with type eSipUaRegistration (first registration) for which IMSI maps to a FMC user (AOR provisioned for received IMSI OR subscriber ID associated to IMSI received). |
| 10201 | FirstRegSuccess | Counter incremented for each REGISTER answered with 200 OK by CSCF/Registrar. |
| 10202 | FirstRegFailedNoAorFound | Counter incremented for each FMC user (SIP subscriber ID provisioned for IMSI received) that has: no AOR provisioned and/or AOR found is NOT 'Service Allowed' (SipAddress OfRecord::Service Allowed) and/or AOR found is NOT allowed to send REGISTER (SipAddress OfRecord::IsSend RegisterAllowed) |
| 10203 | FirstRegFailedToSend | Counter incremented for each REGISTER message the application could not successfully build and/or send. |
| 10204 | FirstRegFailedNetworkError | Counter incremented for each CSCF communication Error: Network Error OR timeout OR '503 Service unavailable' error received OR Redirected answer received. |
| 10205 | FirstRegFailedSIPErrorReceived | Counter incremented for each other (see previous counter) CSCF unsuccessful Error (other than 503) or Invalid answer (ex: no GSM contact in response) received. |
| 10206 | FirstRegAuthChallengeReceived | This counter counts 401 (authentication challenge) responses received in response to a REGISTER message sent for the event First Registration. |
| 10207 | RefreshFailedToSend | Counter incremented for each REGISTER message the Stack could not successfully build OR send. |
| 10208 | RefreshFailedNetworkError | Counter incremented for each CSCF communication Error: Network Error OR timeout |

| | | |
|---|---|---|
| | | OR '503 service unavailable' error received OR Redirected answer received. |
| 10209 | RefreshFailedSIPErrorReceived | Counter incremented for each other (see previous counter) CSCF unsuccessful Error or invalid answer (ex: no GSM contact in response) received. Counter is also incremented for Un-authenticated message received AND for messages with invalid credentials. |
| 10210 | RefreshAuthChallengeReceived | This counter counts 401 (authentication challenge) responses received in response to a REGISTER message sent for the Refresh event. |
| 10211 | DeRegReceived | Counter incremented for each GsmUpdateLocationNotification received from HLR with type eSipUaDeRegistration AND for which IMSI maps to active regbinding(s). This Counter is also incremented on the de-provisioning of a GSM sub which has an IMSI that maps to active regbinding(s) (in other words eSipUaTxMgroDeAssociate message received AND regbinding(s) found) since a (de)REGISTER message is also sent in this case. Note that an IMSI can map to more than one regbinding and therefore more than one REGISTER message can be sent AND more than one of the following counters can be incremented for ONE DeRegReceived incrementation... |
| 10212 | DeRegSuccess | Counter incremented for each REGISTER answered with 200OK by CSCF/Registrar (successful). |
| 10213 | DeRegFailedToSend | Counter incremented for each REGISTER message the Stack could not successfully build OR send. |
| 10214 | DeRegFailedNetworkError | Counter incremented for each CSCF communication Error: Network Error OR timeout OR 503 received OR Redirected Answer received. |
| 10215 | DeRegFailedSIPErrorReceived | Counter incremented for each other (see previous counter) CSCF unsuccessful Error or Invalid answer (ex: no GSM contact in response) received. |
| 10216 | DeRegAuthChallengeReceived | This counter counts 401 (authentication challenge) responses received in response to a REGISTER message sent for the Deregister event. |

For instructions on how to view the values of these counters, refer to *View XML Performance Measurement Reports*.

## HSS/SLF Application Counters

There are two types of Diameter routing messages: Request and Answers. This means that the HSS can receive and initiate a series of messages classified as requests or answers. The HSS can support Cx/Dx and Sh/Dh messages. The Cx/Dx and Sh/Dh messages presently supported by the HSS and compliant with the 3GPP TS 29.228 [1], TS 29.229 [2] and TS 29.328 [8], TS 29.329 [9] Release 6, are the following:

**Table 10: HSS Cx/Dx messages**

| Message | Description |
|---|---|
| User-Authorization-Request (UAR) | Request invoked during SIP registrations between the I-CSCF and the HSS over the Cx interface or SLF over the Dx interface to obtain Authorization information. It is also used to perform a first security check, determining whether the Public User Identity in the message is associated with the Private User Identity sent in the message. |
| Server-Assignment-Request (SAR) | This message is invoked between the S-CSCF and the HSS over the Cx interface or the SLFover the Dx interface. It is used to assign an S-CSCF to a Public Identity, or to clear the name of the S-CSCF assigned to one or more Public Identities. It is also used to download from HSS the relevant user information for the S-CSCF. |
| Location-Information-Request (LIR) | Location Management command used over the Cx or Dx interfaces to perform checks on multimedia access permission, roaming agreements and perform operations on User Public Identities. |
| Multimedia-Authentication-Request (MAR) | Authentication procedure used over the Cx interface between the S-CSCF and the HSS or over the Dx interface between the S-CSCF and the SLF functionality of the HSS to exchange information to support the authentication between the end user and the home IMS network. |
| Registration-Termination-Request (RTR) | Location Management command invoked by the HSS. In case of network initiated de-registration by the HSS, the HSS changes the sate of the Public Identities to Not Registered and send a notification to the S-CSCF indicating the identities that shall be de-registered. This message is also exchanged between the S-CSCF and the SLF functionality over the Dx interface. |
| Push-Profile-Request (PPR) | Data Handling command initiated by the HSS to update user profile information and/or charging information in the S-CSCF. |

**Table 11: HSS Sh/Dh Messages**

| Message | Description |
|---|---|
| User-Data-Request (UDR) | Request invoked by the Application Server to read transparent and/or non-transparent data for a specified user from the HSS. |

| | |
|---|---|
| | It is exchanged between the AS and the HSS over the Sh interface and between the AS and SLF functionality of the HSS over the Dh interface. |
| Profile-Update-Request (PUR) | This message is invoked by the AS and used to allow the AS to update the transparent (repository) data stored at the HSS for a specified IMS Public User Identity or Public Service Identity in the HSS. It is also invoked to allow the AS to update the PSI Activation State of a Public Service Identity in the HSS. This message is also exchanged between the AS and the SLF functionality over the Dh interface. |
| Subscribe-Notification-Request (SNR) | This Subscription/Notification Command is used over the Sh interface to allow the AS to subscribe to Notifications for when particular transparent and/or non-transparent data for a specified IMS Public User Identity or Public Service Identity is updated, from the HSS. This message is also exchanged between the AS and the SLF functionality over the Dh interface. |
| Push-Notification-Request (PNR) | This message is invoked by the HSS and used to inform the AS of changes in transparent and/or non-transparent data to which the AS has previously subscribed to receive Notifications for, using a SNR message. This message is also exchanged between the AS and the SLF functionality over the Dh interface. |

Traffic data can be gathered from the HSS in order to allow an operator to analyze the system behavior. Cx/Dx and Sh/Dh messages are counted for incoming and outgoing messages.

The goal of the HSS/SLF Counters functionality is to offer the opportunity to view instantaneously or periodically:

- How many Cx and Sh Diameter requests have been received at HSS and SLF level.
- How many Cx and Sh Diameter answers have been sent by HSS and SLF.
- How many Cx and Sh Diameter answers per ResultCode depending the Request Type have been sent by the HSS and SLF.

The HSS/SLF offers four different ways to see internals counters. They are logged by module:

- If only the HSS activated, only HSS Counters are displayed.
- If only the SLF activated, only SLF Counters are displayed.
- If only the SLF activated, only SLF Counters are displayed.

The number of messages the HSS receives are counted for each blade with an HSS service running traffic. These counters are identified by a unique name and .

The following HSS/SLF counters are available:

**Table 12: HSS/SLF Counters**

| Counter ID | Name | Description |
|---|---|---|
| | **LIR (Location-Information-Request)** | |

| | | |
|---|---|---|
| 30013 | NumberOfLIR | Counts the number of LIR messages received by the HSS (HSS/SLF module). |
| | **LIA (Location-Information-Answer)** | |
| 30014 | NumberOfLIA | Counts the total number of LIA messages that have been sent by the HSS (HSS/SLF module). |
| 30015 | NumberOfLIADiamSuccess | Counts the number of LIA messages with 'DIAMETER Success' that have been sent by the HSS (HSS/SLF module). |
| 30016 | NumberOfLIADiamUserUnknown | Counts the number of LIA messages with 'DIAMETER User unknown' that have been sent by the HSS (HSS/SLF module). |
| 30017 | NumberOfLIADiamUnableToComply | Counts the number of LIA messages with 'DIAMETER Unable to comply' that have been sent by the HSS (HSS/SLF module). |
| 30018 | NumberOfLIADiamMissingAVP | Counts the number of LIA messages with 'DIAMETER Missing AVP' that have been sent by the HSS (HSS/SLF module). |
| 30019 | NumberOfLIADiamIdNotRegistered | Counts the number of LIA messages with 'DIAMETER Error identity not registered' that have been sent by the HSS (HSS/SLF module). |
| 30020 | NumberOfLIADiamRedirectInd | Counts the number of LIA messages with 'DIAMETER Redirect indication' that have been sent by the HSS (HSS/SLF module). |
| 30021 | NumberOfLIADiamTooBusy | Counts the number of LIA messages with 'DIAMETER Too Busy' that have been sent by the HSS (HSS/SLF module). |
| 30022 | NumberOfLIADiamUnregService | Counts the number of LIA messages with 'DIAMETER Unregistered service' that have been sent by the HSS (HSS/SLF module). |
| | **MAR (Multimedia-Authentication-Request)** | |
| 30023 | NumberOfMAR | Counts the number of MAR messages received by the HSS (HSS/SLF module). |

| | **MAA (Multimedia-Authentication-Answer)** | |
|---|---|---|
| 30024 | NumberOfMAA | Counts the total number of MAA messages that have been sent by the HSS (HSS/SLF module). |
| 30025 | NumberOfMAADiamSuccess | Counts the number of MAA messages with 'DIAMETER Success' that have been sent by the HSS (HSS/SLF module). |
| 30026 | NumberOfMAADiamUserUnknown | Counts the number of MAA messages with 'DIAMETER User unknown' that have been sent by the HSS (HSS/SLF module). |
| 30027 | NumberOfMAADiamUnableToComply | Counts the number of MAA messages with 'DIAMETER Unable to comply' that have been sent by the HSS (HSS/SLF module). |
| 30028 | NumberOfMAADiamMissingAVP | Counts the number of MAA messages with 'DIAMETER Missing AVP' that have been sent by the HSS (HSS/SLF module). |
| 30029 | NumberOfMAADiamIdDontMatch | Counts the number of MAA messages with 'DIAMETER Error Identities don't match' that have been sent by the HSS (HSS/SLF module). |
| 30030 | NumberOfMAASchemeNotSupported | Counts the number of MAA messages with 'DIAMETER Error Authentication Scheme not supported' that have been sent by the HSS (HSS/SLF module). |
| 30031 | NumberOfMAADiamRedirectInd | Counts the number of MAA messages with 'DIAMETER Redirect Indication' that have been sent by the HSS (HSS/SLF module). |
| 30032 | NumberOfMAADiamTooBusy | Counts the number of MAA messages with 'DIAMETER Too Busy' that have been sent by the HSS (HSS/SLF module). |
| | **UAR (User-Authorization-Request)** | |
| 30000 | NumberOfUAR | Counts the number of UAR messages received by the HSS (HSS/SLF module). |
| | **UAA (User-Authorization-Answer)** | |

| | | |
|---|---|---|
| 30001 | NumberOfUAA | Counts the total number of UAA messages that have been sent by the HSS (HSS/SLF module). |
| 30002 | NumberOfUAADiamSuccess | Counts the number of UAA messages with 'DIAMETER Success' that have been sent by the HSS (HSS/SLF module). |
| 30003 | NumberOfUAADiamUserUnknown | Counts the number of UAA messages with 'DIAMETER User unknown' that have been sent by the HSS (HSS/SLF module). |
| 30004 | NumberOfUAADiamUnableToComply | Counts the number of UAA messages with 'DIAMETER Unable to comply' that have been sent by the HSS (HSS/SLF module). |
| 30005 | NumberOfUAADiamMissingAVP | Counts the number of UAA messages with 'DIAMETER Missing AVP' that have been sent by the HSS (HSS/SLF module). |
| 30006 | NumberOfUAADiamIdDontMatch | Counts the number of UAA messages with 'DIAMETER Error Identities don't match' that have been sent by the HSS (HSS/SLF module). |
| 30007 | NumberOfUAADiamAuthRejected | Counts the number of UAA messages with 'DIAMETER Authorization rejected' that have been sent by the HSS (HSS/SLF module). |
| 30008 | NumberOfUAADiamRoamNotAllowed | Counts the number of UAA messages with 'DIAMETER Error roaming not allowed' that have been sent by the HSS (HSS/SLF module). |
| 30009 | NumberOfUAADiamSubsRegistration | Counts the number of UAA messages with 'DIAMETER Subsequent registration' that have been sent by the HSS (HSS/SLF module). |
| 30010 | NumberOfUAADiamIdNotRegistered | Counts the number of UAA messages with 'DIAMETER Error identity not registered' that have been sent by the HSS (HSS/SLF module). |
| 30011 | NumberOfUAADiamFirstReg | Counts the number of UAA messages with 'DIAMETER First registration' that have been sent by the HSS (HSS/SLF module). |

| | | |
|---|---|---|
| 30012 | NumberOfUAADiamRedirectInd | Counts the number of UAA messages with 'DIAMETER Redirect Indication' that have been sent by the HSS (HSS/SLF module). |
| 30113 | NumberOfUAADiamTooBusy | Counts the number of UAA messages with 'DIAMETER Too Busy' that have been sent by the HSS (HSS/SLF module). |
| | **SAR (Server-Assignment-Request)** | |
| 30033 | NumberOfSAR | Counts the number of SAR messages received by the HSS (HSS/SLF module). |
| | **SAA ( Server-Assignment-Answer )** | |
| 30034 | NumberOfSAA | Counts the total number of SAA messages that have been sent by the HSS (HSS/SLF module). |
| 30035 | NumberOfSAADiamSuccess | Counts the number of SAA messages with 'DIAMETER Success' that have been sent by the HSS (HSS/SLF module). |
| 30036 | NumberOfSAADiamUserUnknown | Counts the number of SAA messages with 'DIAMETER User unknown' that have been sent by the HSS (HSS/SLF module). |
| 30037 | NumberOfSAADiamUnableToComply | Counts the number of SAA messages with 'DIAMETER Unable to comply' that have been sent by the HSS (HSS/SLF module). |
| 30038 | NumberOfSAADiamMissingAVP | Counts the number of SAA messages with 'DIAMETER Missing AVP' that have been sent by the HSS (HSS/SLF module). |
| 30039 | NumberOfSAADiamIdDontMatch | Counts the number of SAA messages with 'DIAMETER Error Identities don't match' that have been sent by the HSS (HSS/SLF module). |
| 30040 | NumberOfSAADiamIdAlreadyReg | Counts the number of SAA messages with 'DIAMETER Error Identity already registered' that have been sent by the HSS (HSS/SLF module). |
| 30041 | NumberOfSAADiamAVPOccursTooManyTimes | Counts the number of SAA messages with 'DIAMETER AVP occurs too many times' that have been sent by the HSS (HSS/SLF module). |

| | | |
|---|---|---|
| 30042 | NumberOfSAADiamErrAssigType | Counts the number of SAA messages with 'DIAMETER Error in assignment type' that have been sent by the HSS (HSS/SLF module). |
| 30043 | NumberOfSAADiamRedirectInd | Counts the number of SAA messages with 'DIAMETER Redirect Indication' that have been sent by the HSS (HSS/SLF module). |
| 30044 | NumberOfSAADiamTooBusy | Counts the number of SAA messages with 'DIAMETER Too Busy' that have been sent by the HSS (HSS/SLF module). |
| | **RTA (Registration-Termination-Answer)** | |
| 30053 | NumberOfRTA | Counts the number of RTA messages received by the HSS (HSS/SLF module). |
| 30054 | NumberOfRTAFailed | Counts the number of RTA messages with 'DIAMETER Failed' that have been received by the HSS (HSS/SLF module). |
| | **RTR (Registration-Termination-Request)** | |
| 30050 | NumberOfRTR | Counts the number of RTR messages sent by the HSS (HSS/SLF module). |
| 30051 | NumberOfRTRRemoteRcvd | Counts the number of RTR messages received from remote peers. |
| 30052 | NumberOfRTRRemoteSent | Counts the number of RTR messages sent to remote peers. |
| | **PPA (Push-Profile-Answer)** | |
| 30048 | NumberOfPPA | Counts the number of PPA messages received by the HSS (HSS/SLF module). |
| 30049 | NumberOfPPAFailed | Counts the number of PPA messages with 'DIAMETER Failed' that have been received by the HSS (HSS/SLF module). |
| | **PPR (Push-Profile-Request)** | |
| 30045 | NumberOfPPR | Counts the number of PPR messages sent by the HSS (HSS/SLF module). |
| 30046 | NumberOfPPRRemoteRcvd | Counts the number of PPR messages received from remote peers. |

| | | |
|---|---|---|
| 30047 | NumberOfPPRRemoteSent | Counts the number of PPR messages sent to remote peers. |
| | **UDR (User-Data-Request)** | |
| 30077 | NumberOfUDR | Counts the number of UDR messages received by the HSS (HSS/SLF module). |
| | **UDA (User-Data-Answer)** | |
| 30078 | NumberOfUDA | Counts the total number of UDA messages that have been sent by the HSS (HSS/SLF module). |
| 30079 | NumberOfUDADiamSuccess | Counts the number of UDA messages with 'DIAMETER Success' that have been sent by the HSS (HSS/SLF module). |
| 30080 | NumberOfUDADiamUserUnknown | Counts the number of UDA messages with 'DIAMETER User unknown' that have been sent by the HSS (HSS/SLF module). |
| 30081 | NumberOfUDADiamUnableToComply | Counts the number of UDA messages with 'DIAMETER Unable to comply' that have been sent by the HSS (HSS/SLF module). |
| 30082 | NumberOfUDADiamMissingAVP | Counts the number of UDA messages with 'DIAMETER Missing AVP' that have been sent by the HSS (HSS/SLF module). |
| 30083 | NumberOfUDADiamOpNotAllowed | Counts the number of UDA messages with 'DIAMETER Error Operation not allowed' that have been sent by the HSS (HSS/SLF module). |
| 30084 | NumberOfUDADiamDataCannotBeRead | Counts the number of UDA messages with 'DIAMETER Error user data cannot be read' that have been sent by the HSS (HSS/SLF module). |
| 30085 | NumberOfUDADiamRedirectInd | Counts the number of UDA messages with 'DIAMETER Redirect Indication' that have been sent by the HSS (HSS/SLF module). |
| 30086 | NumberOfUDADiamTooBusy | Counts the number of UDA messages with 'DIAMETER Too Busy' that have been sent by the HSS (HSS/SLF module). |
| | **PUR (Profile-Update-Request)** | |

| | | |
|---|---|---|
| 30055 | NumberOfPUR | Counts the number of PUR messages received by the HSS (HSS/SLF module). |
| | **PUA (Profile-Update-Answer)** | |
| 30056 | NumberOfPUA | Counts the total number of PUA messages that have been sent by the HSS (HSS/SLF module). |
| 30057 | NumberOfPUADiamSuccess | Counts the number of PUA messages with 'DIAMETER Success' that have been sent by the HSS (HSS/SLF module). |
| 30058 | NumberOfPUADiamUserUnknown | Counts the number of PUA messages with 'DIAMETER User unknown' that have been sent by the HSS (HSS/SLF module). |
| 30059 | NumberOfPUADiamUnableToComply | Counts the number of PUA messages with 'DIAMETER Unable to comply' that have been sent by the HSS (HSS/SLF module). |
| 30060 | NumberOfPUADiamMissingAVP | Counts the number of PUA messages with 'DIAMETER Missing AVP' that have been sent by the HSS (HSS/SLF module). |
| 30061 | NumberOfPUADiamCannotBeModified | Counts the number of PUA messages with 'DIAMETER Error user data cannot be modified' that have been sent by the HSS (HSS/SLF module). |
| 30062 | NumberOfPUADiamOpNotAllowed | Counts the number of PUA messages with 'DIAMETER Error Operation not allowed' that have been sent by the HSS (HSS/SLF module). |
| 30063 | NumberOfPUADiamDataOutOfSync | Counts the number of PUA messages with 'DIAMETER Error transparent data out of sync' that have been sent by the HSS (HSS/SLF module). |
| 30064 | NumberOfPUADiamTooMuchData | Counts the number of PUA messages with 'DIAMETER Error too much data' that have been sent by the HSS (HSS/SLF module). |
| 30065 | NumberOfPUADiamRedirectInd | Counts the number of PUA messages with 'DIAMETER Redirect Indication' that have been sent by the HSS (HSS/SLF module). |

| | | |
|---|---|---|
| 30066 | NumberOfPUADiamTooBusy | Counts the number of PUA messages with 'DIAMETER Too Busy' that have been sent by the HSS (HSS/SLF module). |
| | **SNR (Subscribe-Notification-Request)** | |
| 30067 | NumberOfSNR | Counts the number of SNR messages received by the HSS (HSS/SLF module). |
| | **SNA (Subscribe-Notification-Answer)** | |
| 30068 | NumberOfSNA | Counts the total number of SNA messages that have been sent by the HSS (HSS/SLF module). |
| 30069 | NumberOfSNADiamSuccess | Counts the number of SNA messages with 'DIAMETER Success' that have been sent by the HSS (HSS/SLF module). |
| 30070 | NumberOfSNADiamUserUnknown | Counts the number of SNA messages with 'DIAMETER User unknown' that have been sent by the HSS (HSS/SLF module). |
| 30071 | NumberOfSNADiamUnableToComply | Counts the number of SNA messages with 'DIAMETER Unable to comply' that have been sent by the HSS (HSS/SLF module). |
| 30072 | NumberOfSNADiamMissingAVP | Counts the number of SNA messages with 'DIAMETER Missing AVP' that have been sent by the HSS (HSS/SLF module). |
| 30073 | NumberOfSNADiamDataCannotBeNotified | Counts the number of SNA messages with 'DIAMETER Error user data cannot be modified' that have been sent by the HSS (HSS/SLF module). |
| 30074 | NumberOfSNADiamOpNotAllowed | Counts the number of SNA messages with 'DIAMETER Error Operation not allowed' that have been sent by the HSS (HSS/SLF module). |
| 30075 | NumberOfSNADiamRedirectInd | Counts the number of SNA messages with 'DIAMETER Redirect Indication' that have been sent by the HSS (HSS/SLF module). |
| 30076 | NumberOfSNADiamTooBusy | Counts the number of SNA messages with 'DIAMETER Too Busy' that have been sent by the HSS (HSS/SLF module). |

| | | |
|---|---|---|
| | **PNA (Push-Notification-Answer)** | |
| 30090 | NumberOfPNA | Counts the number of PNA messages received by the HSS (HSS/SLF module). |
| 30091 | NumberOfPNAFailed | Counts the number of PNA messages with 'DIAMETER Failed' that have been received by the HSS (HSS/SLF module). |
| | **PNR (Push-Notification-Request)** | |
| 30087 | NumberOfPNR | Counts the number of PNR messages sent by the HSS (HSS/SLF module). |
| 30088 | NumberOfPNRRemoteRcvd | Counts the number of PNR messages received from remote peers. |
| 30089 | NumberOfPNRRemoteSent | Counts the number of PNR messages sent to remote peers. |
| | **Auto Enrollments** | |
| 30092 | NumberOfAutoEnrollmentSuccess | Number of Successful Auto Enrollments. |
| 30093 | NumberOfAutoEnrollmentFailure | Number of Failed Auto Enrollments. |
| | **Connect-Active-Peers** | |
| | Number of Active Peers | Number of Active Peers connected to the HSS (HSS/SLF module) |
| | **Active-Sessions** | |
| | Number of Active Sessions | Number of active Diameter Sessions in the HSS (HSS/SLF module) |
| | **Applications** | |
| | Number of Applications | Number of Diameter Application roles assumed by the HSS (HSS/SLF module).(Cx and Sh). |
| | **Backup-Peers** | |
| | Number of Backup Peers | Number of backup Peers. |
| | **Connections-Accepted** | |
| | Number of Connections Accepted | Number of Diameter Connections accepted by HSS (HSS/SLF module) |
| | **Connections-Created** | |
| | Number of Connections Created | Number of Diameter Connections created by the HSS (HSS/SLF module) |
| | **Current-Connections** | |

| | | |
|---|---|---|
| | Number of Current Connections | Number of current Diameter Connections handled by HSS (HSS/SLF module) |
| | **Rejected-Requests-Discarded** | |
| | Number of Rejected Requests Discarded due to License | Number of messagess discarded by Diameter Stack due to lack of license tokens. |
| | **Routes** | |
| | Number of Routes | Number of Routes that can be used by HSS (HSS/SLF module) to send outgoing Diameter requests. |
| | **Transactions** | |
| | Number of Transactions | Number of Diameter Transactions processed by the HSS (HSS/SLF module) |

For instructions on how to view the values of these counters, refer to *View the Current Day's Performance Measurements from the WebCI*.

## DNS ENUM Application Counters

The DNS ENUM performance management, being integrated in the HSS process, is integrated in the SDM Performance framework.

The DNS ENUM server integrated in the HSS supports the DNS NAPTR queries and answers with the provisioned NAPTR records.

The goal of the DNS ENUM Counters functionality is to offer the opportunity to view instantaneously or periodically:

- How many DNS NAPTR queries have been received.
- How many DNS NAPTR answers have been sent by the DNS ENUM Server.

The number of messages the DNS receives are counted for each blade with an HSS service running traffic. These counters are identified by a unique name and counter ID.

The following DNS ENUM counters are available:

**Table 13: DNS ENUM Counters**

| Counter ID | Name | Description |
|---|---|---|
| 31000 | NumberOfQueryDnsRcvd | Counts the total number of DNS queries received by the ENUM Server. |
| 31001 | NumberOfQuery DnsValidRespSent | Counts the total number of successful DNS answers sent by the ENUM Server. |
| 31002 | NumberOfQuery DnsErrorRespSent | Counts the total number of DNS answers encoded as errors sent by the ENUM Server. |

| | | |
|---|---|---|
| 31003 | NumberOfConfig DnsRemoteRcvd | Counts the total number of Config DNS messages received from the remote peer. |
| 31004 | NumberOfDelete DnsRemoteRcvd | Counts the total number of Delete DNS received from the remote peer. |
| 31005 | NumberOfConfig DnsRemoteSent | Counts the total number of Config DNS messages sent to the remote peer. |
| 31006 | NumberOfDelete DnsRemoteSent | Counts the total number of Delete DNS messages sent to the remote peer. |
| 31007 | NumberOfQueryDnsBlack ListNxDomainRespSent | Number of DNS Black List hit with NxDomain response sent |

For instructions on how to view the values of these counters, refer to *View XML Performance Measurement Reports*.

## AAA Application Counters

The AAA performance management, being integrated in the HSS process, is integrated in the SDM Performance framework.

The AAA server integrated in the HSS supports the following RADIUS message types:

- Access-Request
- Access-Accept
- Access-Reject
- Disconnect-Request
- Disconnect-Ack
- Disconnect-Nack
- Accounting-Request
- Accounting- Response.
- Access-Challenge

Traffic data can be gathered from the AAA server in order to allow an operator to analyze the system behavior. RADIUS messages are counted for incoming and outgoing messages.

The goal of the AAA Counters functionality is to offer the opportunity to view instantaneously or periodically:

- How many RADIUS requests have been received at AAA level.
- How many RADIUS answers have been sent by AAA

The following AAA counters are available:

**Table 14: AAA Counters**

| **Counter ID** | **Name** | **Description** |
|---|---|---|
| **Counter ID** | **AAA Access-Accept** | **Description** |
| 40020 | NumberOfAccessAccept | Number of Access-Accept messages sent. |

| Counter ID | AAA Access-Accept-Remote-Received | Description |
|---|---|---|
| 40096 | NumberOfAccessAcceptRemoteRcvd | Number of Access-Accept-Remote messages received. |
| **Counter ID** | **AAA Access-Challenge** | **Description** |
| 40027 | NumberOfAccessChallenge | Number of Access-Challenge messages sent. |
| **Counter ID** | **AAA Access-Reject** | **Description** |
| 40035 | NumberOfAccessRejectRadiusTooBusy | Number of Access-Reject-Radius-Too-Busy messages sent . |
| 40038 | NumberOfAccessRejectInvalidPassword | Number of Access-Reject-Invalid-Password messages sent . |
| 40039 | NumberOfAccessRejectCannotProcess | Number of Access-Reject-Cannot-Process messages sent . |
| 40040 | NumberOfAccessRejectInvalidUserName | Number of Access-Reject-Invalid-Username messages sent . |
| 40041 | NumberOfAccessRejectUserServiceDisabled | Number of Access-Reject-User-Service-Disabled messages sent . |
| 40042 | NumberOfAccessRejectServiceValuesNot Provisioned | Number of Access- Reject-Service-Values- Not-Provisioned messages sent . |
| 40043 | NumberOfAccessRejectConflictingService Types | Number of Access-Reject-Conflicting-Service-Types messages sent . |
| 40044 | NumberOfAccessRejectConflictingFramed Protocols | Number of Access-Reject-Conflicting-Framed-Protocols messages sent . |
| 40045 | NumberOfAccessRejectConflictingAccess Requests | Number of Access-Reject-Conflicting-Access-Requests messages sen t. |
| 40046 | NumberOfAccessRejectStaticIpNasChange | Number of Access-Reject-Static-IP-NAS-Change messages sent . |
| 40049 | NumberOfAccessRejectCannotAllocate Address | Number of Access-Reject-Cannot-Allocate-IP-Address messages sent . |

| | | |
|---|---|---|
| 40050 | NumberOfAccessRejectMissingChap Challenge | Number of Access-Reject-Missing-Chap-Challenge messages sent . |
| 40051 | NumberOfAccessRejectMissingUserData | Number of Access-Reject-Missing-User-Data messages sent . |
| 40052 | NumberOfAccessRejectBadChapPassword | Number of Access-Reject-Bad-Chap-Password messages sent . |
| 40036 | NumberOfAccessRejectClientNotAuthorized | Number of Access-Reject-Client-Not-Authorized messages sent . |
| 40037 | NumberOfAccessRejectInvalidAccessRequest | Number of Access-Reject-Invalid-Access-Request messages se nt. |
| 40034 | NumberOfAccessReject | Number of Access-Reject messages sent. |
| **Counter ID** | **AAA Access-Reject-Remote-Received** | **Description** |
| 40095 | NumberOfAccessRejectRemoteRcvd | Number of Access-Reject-Remote messages received. |
| **Counter ID** | **AAA Access-Request** | **Description** |
| 40016 | NumberOfAccessRequest | Number of access requests received. |
| **Counter ID** | **AAA Accounting-Request-Remote-Received** | **Description** |
| 40092 | NumberOfAccountingRequestRemoteRcvd | Number of Accounting-Request-Remote messages received. |
| **Counter ID** | **AAA Accounting-Answer-Remote-Received** | **Description** |
| 40093 | NumberOfAccountingAnswerRemoteRcvd | Number of Accounting-Answer-Remote messages received |
| **Counter ID** | **AAA Accounting-Request-Received** | **Description** |
| 40029 | NumberOfAccountingReqRcvd | Number of Accounting-Request messages received from the remote peers. |
| **Counter ID** | **AAA Accounting-Request-Sent** | **Description** |
| 40030 | NumberOfAccountingReqSent | Number of Accounting-Request messages sent. |
| **Counter ID** | **AAA Accounting-Response-Received** | **Description** |

| | | |
|---|---|---|
| 40031 | NumberOfAccountingRespRcvd | Number of Accounting-Response messages received from the remote peers. |
| **Counter ID** | **AAA Accounting-Response-Returned** | **Description** |
| 40033 | NumberOfAccountingRespReturned | Number of Accounting-Response messages returned. |
| **Counter ID** | **AAA Accounting-Response-Sent** | **Description** |
| 40032 | NumberOfAccountingRespSent | Number of Accounting-Response messages sent. |
| **Counter ID** | **AAA Config-NAS-Remote-Received** | **Description** |
| 40078 | NumberOfConfigNasRemoteRcvd | Number of Configure-NAS-Remote messages received. |
| **Counter ID** | **AAA Config-NAS-Remote-Sent** | **Description** |
| 40084 | NumberOfConfigNasRemoteSent | Number of Configure-NAS-Remote messages sent. |
| **Counter ID** | **AAA Data-Context-Timeout** | **Description** |
| 40097 | NumberOfDataContextTimeout | Number of Data-Context-Timeouts. |
| **Counter ID** | **AAA Delete-NAS-Remote-Received** | **Description** |
| 40079 | NumberOfDeleteNasRemoteRcvd | Number of Delete-NAS-Remote messages received. |
| **Counter ID** | **AAA Delete-NAS-Remote-Sent** | **Description** |
| 40086 | NumberOfDeleteNasRemoteSent | Number of Delete-NAS-Remote messages sent. |
| **Counter ID** | **AAA Disconnect-NAS-Remote-Received** | **Description** |
| 40076 | NumberOfDiscNasRemoteRcvd | Number of Disconnect-NAS-Remote messages received. |
| **Counter ID** | **AAA Disconnect-NAS-Remote-Sent** | **Description** |
| 40082 | NumberOfDiscNasRemoteSent | Number of Disconnect-NAS-Remote messages sent. |
| **Counter ID** | **AAA Disconnect-User-Remote-Received** | **Description** |
| 40077 | NumberOfDiscUserRemoteRcvd | Number of Disconnect-User-Remote messages received. |

| Counter ID | AAA Disconnect-User-Remote-Sent | Description |
|---|---|---|
| 40083 | NumberOfDiscUserRemoteSent | Number of Disconnect-User-Remote messages sent. |
| **Counter ID** | **AAA Discarded-Packets** | **Description** |
| 40098 | NumberOfDiscardPackets | Number of Discarded-Packets. |
| 40099 | NumberOfUnknownMsgCodeDiscard | Number of Unknown-Msg-Code-Discarded-Packets. |
| 40100 | NumberOfAccountingAppNotConfigured Discard | Number of Accounting-App-Not-Configured-Discarded-Packets. |
| 40101 | NumberOfMissingSecretDiscard | Number of Missing-Secret-Discarded-Packets. |
| 40102 | NumberOfValidationFailedDiscard | Number of Validation-Failed-Discarded-Packets. |
| **Counter ID** | **AAA Node-Active-Remote-Received** | **Description** |
| 40081 | NumberOfNodeActiveRemoteRcvd | Number of Node-Active-Remote messages received. |
| **Counter ID** | **AAA Node-Active-Remote-Sent** | **Description** |
| 40088 | NumberOfNodeActiveRemoteSent | Number of Node-Active-Remote messages sent. |
| **Counter ID** | **AAA Radius-Disconnect-Ack-Received** | **Description** |
| 40075 | NumberOfRadiusDisconnectAck | Number of Radius-Disconnect-Ack messages received. |
| **Counter ID** | **AAA Radius-Disconnect-Nack-Received** | **Description** |
| 40085 | NumberOfRadiusDisconnectNack | Number of Radius-Disconnect-Nack messages received. |
| **Counter ID** | **AAA Radius-Disconnect-Sent** | **Description** |
| 40074 | NumberOfRadiusDisconnect | Number of Radius-Disconnect messages sent. |
| **Counter ID** | **AAA Radius-Disconnect-Remote-Received** | **Description** |
| 40094 | NumberOfRadiusDisconnectRemoteRcvd | Number of Radius-Disconnect-Remote messages received |
| **Counter ID** | **AAA Radius-Packet-Remote-Received** | **Description** |

| | | |
|---|---|---|
| 40089 | NumberOfRadiusPacketRemoteRcvd | Number of Radius-Packet-Remote messages received. |
| **Counter ID** | **AAA Radius-Packet-Remote-Sent** | **Description** |
| 40091 | NumberOfRadiusPacketRemoteSent | Number of Radius-Packet-Remote messages sent. |
| **Counter ID** | **AAA Stop-NAS-Remote-Received** | **Description** |
| 40080 | NumberOfStopNasRemoteRcvd | Number of Stop-NAS-Remote messages received. |
| **Counter ID** | **AAA Stop-NAS-Remote-Sent** | **Description** |
| 40087 | NumberOfStopNasRemoteSent | Number of Stop-NAS-Remote messages sent. |

For instructions on how to view the values of these counters, refer to the *View XML Performance Measurement Reports* section of this document.

## LTE-HSS Application Counters

The LTE-HSS performance management is integrated in the SDM Performance framework.

The LteHssServer integrated in the LTE-HSS supports the following Diameter message types:

- Update Location Request/Answer (ULR/ULA)
- Cancel Location Request/Answer (CLR/CLA)
- Purge UE Request/Answer (PUR/PUA)
- Delete Subscriber Data Request/Answer (DSR/DSA)
- Insert Subscriber Data Request/Answer (IDR/IDA)
- Reset Subscriber Request/Answer (RSR/RSA)
- NotifyRequest/Answer (NOR/NOA)
- Authentication Information Retrieval/Answer (AIR/AIA)
- Routing Information Request/Answer (RIR/RIA)

Traffic data can be gathered from the LteHssServer in order to allow an operator to analyze the system behavior. Diameter messages are counted for incoming and outgoing messages.

Each counter is incremented upon a received Diameter request, a received diameter answer, a sent diameter request and a sent diameter answer.

The goal of the LTE-HSS Counters functionality is to offer the opportunity to view instantaneously or periodically:

- How many Diameter requests have been received at LTE-HSS level.
- How many Diameter answers have been sent by LTE-HSS.

The number of messages the LTE-HSS receives are counted for each blade with an LteHss service running traffic. These counters are identified by a unique name and counter ID.

The following LTE-HSS counters are available:

**Table 15: LTE-HSS Counters**

| Counter ID | Name | Description |
|---|---|---|
| **Authentication Information Retrieval/Answer (AIR/AIA)** | | |
| 41001 | NumberOfAIR | Number of Authentication-Information-Request messages received. |
| 41010 | NumberOfAIA | Number of Authentication-Information-Answer messages sent. |
| 41064 | NumberOfAIR_OK | Counts the number of correct AIR request received by the LTE-HSS. |
| 41016 | NumberOfAIR_INVALID_ PARAMETER | Counts the number of AIR received by the LTE-HSS with invalid attributes. |
| 41017 | NumberOfAIR_MISSING_ MANDATORY_PARAMETER | Counts the number of AIR received by the LTE-HSS with missing mandatory attributes. |
| 41018 | NumberOfAIA_MISSING_AVP | Counts the number of AIA sent by the LTE-HSS with diameter result code set to DIAMETER_MISSING_AVP. |
| 41020 | NumberOfAIA_UNABLE_TO_ COMPLY | Counts the number of AIA sent by the LTE-HSS with diameter result code set to UNABLE_TO_COMPLY (internal error, cannot access database, etc.). |
| 41021 | NumberOfAIA_ AUTHORIZATION_REJECTED | Counts the number of AIA sent by the LTE-HSS with diameter result code set to DIAMETER_AUTHORIZATION_REJECTED. (Ex: Received request for E-UTRAN vectors and SIM type is GERAN) |
| 41022 | NumberOfAIA_ FEATURE_UNSUPPORTED | Number of specific Authentication-Information-Answer messages sent |
| 41023 | NumberOfAIA_SUCCESS | Counts the number of AIA sent by the LTE-HSS with diameter result code set to DIAMETER_SUCCESS. Authentication vector have been successfully computed. |
| 41083 | NumberOfAIA_USER_UNKNOWN | Counts the number of AIA sent by the LTE-HSS with diameter result code set to DIAMETER_ERROR_USER_UNKNOWN . IMSI does not exist in DB. |
| 41084 | NumberOfNOA_UNKOWN_ SERVING_NODE | Number of specific Notify-Answer messages sent. |
| 41024 | NumberOfAIA_UNKNOWN_ EPS_SUBSCRIPTION | Counts the number of AIA sent by the LTE-HSS with diameter result code set to DIAMETER_ERROR_UNKNOWN_EPS |

| Counter ID | Name | Description |
|---|---|---|
| | | _SUBSCRIPTION. IMSI exists in DB but has no EPS subscription defined. |
| **Cancel Location Request/Answer (CLR/CLA)** | | |
| 41004 | NumberOfCLA | Number of Cancel-Location-Answer messages received. |
| 41013 | NumberOfCLR | Number of Cancel-Location-Request messages sent. |
| 41065 | NumberOfCLA_OK | Counts the number of CLA received by the LTE-HSS with result code set to DIAMETER_SUCCESS. |
| 41066 | NumberOfCLA_INVALID_ PARAMETER | Counts the number of CLA received by the LTE-HSS with result code set to DIAMETER_INVALID_PARAMETER. |
| 41067 | NumberOfCLA_MISSING_ MANDATORY_PARAMETER | Counts the number of CLA received by the LTE-HSS with result code set to DIAMETER_MISSING_ MANDATORY_PARAMETER. |
| 41025 | NumberOfCLR_MME_ UPDATE_PROCEDURE | Counts the number of CLR request sent by the LTE-HSS for cancellation type set to MME_UPDATE_PROCEDURE. (Ex: MME/MME roaming) |
| 41026 | NumberOfCLR_SGSN_ UPDATE_PROCEDURE | Counts the number of CLR request sent by the LTE-HSS for cancellation type set to SGSN_UPDATE_PROCEDURE. (Ex: SGSN/SGSN roaming) |
| 41027 | NumberOfCLR_ SUBSCRIPTION_WITHDRAWAL | Counts the number of CLR request sent by the LTE-HSS for cancellation type set to SUBSCRIPTION_WITHDRAWAL. (Ex: Subscription has been deleted). |
| 41028 | NumberOfCLR_UPDATE_ PROCEDURE_IWF | Counts the number of CLR request sent by the LTE-HSS for cancellation type set to UPDATE_PROCEDURE_IWF. (No used). |
| 41029 | NumberOfCLR_INITIAL_ ATTACH_PROCEDURE | Counts the number of CLR request sent by the LTE-HSS for cancellation type set to INITIAL_ATTACH_PROCEDURE. (When a user attaches first time on the network). |
| **Update Location Request/Answer (ULR/ULA)** | | |
| 41000 | NumberofULR | Number of Update-Location-Request messages received. |

| Counter ID | Name | Description |
|---|---|---|
| 41009 | NumberOfULA | Number of Update-Location-Answer messages sent. |
| 41030 | NumberOfULR_OK | Counts the number of ULR request received by the LTE-HSS without errors in attributes. |
| 41031 | NumberOfULR_INVALID_ PARAMETER | Counts the number of ULR request received by the LTE-HSS with invalid attributes. |
| 41032 | NumberOfULR_MISSING_ MANDATORY_PARAMETER | Counts the number of ULR request received by the LTE-HSS with missing mandatory parameters. |
| 41033 | NumberOfULA_SUCCESS | Counts the number of ULA sent by the LTE-HSS with result code set to DIAMETER_SUCCESS. (Ex: ULR request has been successfully processed). |
| 41034 | NumberOfULA_MISSING_AVP | Counts the number of ULA sent by the LTE-HSS with result code set to DIAMETER_MISSING_MANDATORY_AVP. (Ex: ULR received with missing mandatory attribute). |
| 41035 | NumberOfULA_UNABLE_TO_ COMPLY | Counts the number of ULA sent by the LTE-HSS with result code set to DIAMETER_UNABLE_TO_COMPLY. (Ex: ULR was ok, but when processing it an error occurred, cannot access to database, ect…). |
| 41036 | NumberOfULA_RAT_NOT_ ALLOWED | Counts the number of ULA sent by the LTE-HSS with result code set to DIAMETER_ERROR_RAT_NOT_ALLOWED. ULR has been received with Radio Access Type set to UTRAN and in the subscriber profile, UTRAN RAT is set to not allowed. |
| 41037 | NumberOfULA_ ROAMING_NOT_ALLOWED | Counts the number of ULA sent by the LTE-HSS with result code set to DIAMETER_ERROR_ ROAMING_NOT_ALLOWED. The user is roaming in an unauthorized VLMN network. |
| 41040 | NumberOfULA_ UNKNOWN_EPS_SUBSCRIPTION | Counts the number of ULA sent by the LTE-HSS with result code set to DIAMETER_ERROR_ UNKNOWN_EPS_SUBSCRIPTION. The user is known in the DB but there is not EPS subscription defined. |
| 41038 | NumberOfULA_USER_UNKNOWN | Counts the number of ULA sent by the LTE-HSS with result code set to DIAMETER_ERROR_USER_UNKNOWN. The user is not defined in the database. |

| Counter ID | Name | Description |
|---|---|---|
| 41039 | NumberOfULA_FEATURE_ UNSUPPORTED | Counts the number of ULA sent by the LTE-HSS with result code set to DIAMETER_ERROR_ FEATURE_UNSUPPORTED. The MME/SGSN did not send any supported feature AVP in the ULR and the "featureNotSupportedAcceptMessage" option in the LteHssConfig entity is set to true. |
| **NotifyRequest/Answer (NOR/NOA)** | | |
| 41002 | NumberOfNOR | Number of Notify-Request messages received. |
| 41011 | NumberOfNOA | Number of Notify-Answer messages sent. |
| 41041 | NumberOfNOR_OK | Counts the number of NOR request received by the LTE-HSS without errors in attributes. |
| 41042 | NumberOfNOR_INVALID_ PARAMETER | Counts the number of NOR request received by the LTE-HSS with invalid attributes. |
| 41043 | NumberOfNOR_MISSING_ MANDATORY_PARAMETER | Counts the number of NOR request received by the LTE-HSS with missing mandatory parameters. |
| 41044 | NumberOfNOA_SUCCESS | Counts the number of NOA sent by the LTE-HSS with result code set to DIAMETER_SUCCESS. (Ex: NOR request has been successfully processed). |
| 41045 | NumberOfNOA_MISSING_AVP | Counts the number of NOA sent by the LTE-HSS with result code set to DIAMETER_MISSING_MANDATORY_AVP. (Ex: NOA received with missing mandatory attribute). |
| 41046 | NumberOfNOA_UNABLE_TO_ COMPLY | Counts the number of NOA sent by the LTE-HSS with result code set to DIAMETER_UNABLE_TO_COMPLY. (Ex: NOA was ok, but when processing it an error occurred, cannot access to database, etc…). |
| 41047 | NumberOfNOA_USER_UNKNOWN | Counts the number of NOA sent by the LTE-HSS with result code set to DIAMETER_ERROR_USER_UNKNOWN. The user is not defined in the database. |
| **Purge UE Request/Answer (PUR/PUA)** | | |
| 41003 | NumberOfPUR | Number of Purge-UE-Request messages received. |
| 41012 | NumberOfPUA | Number of Purge-UE-Answer messages sent. |
| 41048 | NumberOfPUR_OK | Counts the number of PUR request received by the LTE-HSS without errors in attributes. |

| Counter ID | Name | Description |
|---|---|---|
| 41049 | NumberOfPUR_INVALID_ PARAMETER | Counts the number of PUR request received by the LTE-HSS with invalid attributes. |
| 41050 | NumberOfPUR_MISSING_ MANDATORY_PARAMETER | Counts the number of PUR request received by the LTE-HSS with missing mandatory parameters. |
| 41051 | NumberOfPUA_SUCCESS | Counts the number of PUA sent by the LTE-HSS with result code set to DIAMETER_SUCCESS. (Ex: PUR request has been successfully processed). |
| 41052 | NumberOfPUA_MISSING_AVP | Counts the number of PUA sent by the LTE-HSS with result code set to DIAMETER_MISSING_MANDATORY_AVP. (Ex: PUA received with missing mandatory attribute). |
| 41063 | NumberOfPUA_UNABLE_TO_ COMPLY | Counts the number of PUA sent by the LTE-HSS with result code set to DIAMETER_UNABLE_TO_COMPLY. (Ex: PUA was ok, but when processing it an error occurred, cannot access to database, etc.). |
| 41053 | NumberOfPUA_USER_ UNKNOWN | Counts the number of PUA sent by the LTE-HSS with result code set to DIAMETER_ERROR_USER_UNKNOWN. The user is not defined in the database. |
| **Insert Subscriber Data Request/Answer (IDR/IDA)** | | |
| 41005 | NumberOfIDA | Number of Insert-Subscriber-Data-Answer messages received. |
| 41014 | NumberOfIDR | Number of Insert-Subscriber-Data-Request messages sent. |
| 41054 | NumberOfIDA_OK | Counts the number of IDA received by the LTE-HSS with result code set to DIAMETER_SUCCESS. (IDR previously sent has been accepted by MME/SGSN). |
| 41055 | NumberOfIDA_INVALID_ PARAMETER | Counts the number of IDA received by the LTE-HSS with result code set to DIAMETER_ERROR_INVALID_PARAMETER. (IDR previously sent has been rejected by |
| 41056 | NumberOfIDA_MISSING_ MANDATORY_PARAMETER | Counts the number of IDA received by the LTE-HSS with result code set to DIAMETER_ERROR_MISSING_PARAMETER. (IDR previously sent has been rejected by MME/SGSN). |
| **Delete Subscriber Data Request/Answer (DSR/DSA)** | | |

| Counter ID | Name | Description |
|---|---|---|
| 41006 | NumberOfDSA | Number of Delete-Subscriber-Data-Answer messages received. |
| 41015 | NumberOfDSR | Number of Delete-Subscriber-Data-Request messages sent. |
| 41057 | NumberOfDSA_OK | Counts the number of DSA received by the LTE-HSS with result code set to DIAMETER_SUCCESS. (DSR previously sent has been accepted by MME/SGSN). |
| 41058 | NumberOfDSA_INVALID_ PARAMETER | Counts the number of DSA received by the LTE-HSS with result code set to DIAMETER_ERROR_INVALID_PARAMETER. (DSR previously sent has been rejected by MME/SGSN). |
| 41059 | NumberOfDSA_MISSING_ MANDATORY_PARAMETER | Counts the number of DSA received by the LTE-HSS with result code set to DIAMETER_ERROR_MISSING_PARAMETER. (DSR previously sent has been rejected by by MME/SGSN). |
| **Reset Subscriber Request/Answer (RSR/RSA)** | | |
| 41007 | NumberOfRSR | Number of Reset-Request messages sent. |
| 41008 | NumberOfRSA | Number of Reset-Answer messages received. |
| 41060 | NumberOfRSA_OK | Counts the number of RSA received by the LTE-HSS with result code set to DIAMETER_SUCCESS. (RSR previously sent has been accepted by MME/SGSN). |
| 41061 | NumberOfRSA_INVALID_ PARAMETER | Counts the number of RSA received by the LTE-HSS with result code set to DIAMETER_ERROR_INVALID_PARAMETER. (RSR previously sent has been rejected by MME/SGSN). |
| 41062 | NumberOfRSA_MISSING_ MANDATORY_PARAMETER | Counts the number of RSA received by the LTE-HSS with result code set to DIAMETER_ERROR_MISSING_PARAMETER. (RSR previously sent has been rejected by MME/SGSN). |
| **Routing Information Request/Answer (RIR/RIA)** | | |
| 41085 | NumberOfRIR | Total number of RIR received. |
| 41086 | NumberOfRIA | Total number of RIA sent. |
| 41087 | NumberOfRIR_OK | Number of correct RIR received. |

| Counter ID | Name | Description |
|---|---|---|
| 41088 | NumberOfRIR_INVALID_PARAMETER | Number of RIR received with invalid parameter. |
| 41089 | NumberOfRIR_MISSING _MANDATORY_PARAMETER | Number of RIR received with missing mandatory parameter. |
| 41090 | NumberOfRIA_SUCCESS | Number of RIA sent with diameter code set to DIAMETER_SUCCESS. |
| 41091 | NumberOfRIA_MISSING_AVP | Number of RIA sent with diameter code set to DIAMETER_MISSING_AVP. |
| 41092 | NumberOfRIA_UNABLE_TO_COMPLY | Number of RIA sent with diameter code set to DIAMETER_UNABLE_TO_COMPLY. |
| 41093 | NumberOfRIA_UNAUTHORIZED_ REQUESTING_NETWORK | Number of RIA sent with diameter code set to DIAMETER_UNAUTHORIZED_ REQUESTING_NETWORK. |
| 41094 | NumberOfRIA_USER_UNKNOWN | Number of RIA sent with diameter code set to DIAMETER_USER_UNKNOWN. |
| 41095 | NumberOfRIA_ABSENT_USER | Number of RIA sent with diameter code set to DIAMETER_ABSENT_USER. |
| **The following counters are provided to count messages received from and sent to a remote node:** | | |
| **IPC Messages counters between the SDM's LTE-HSS/ngHLR (HLR-Proxy)** | | |
| 41068 | NumberOfCancelLocationAck RemoteRcvd | Counts the number of MAP-Cancel-Location-Ack received by the SDM's HLR proxy. This is considering that the LTE-HSS has previously requested the HLR proxy to send a MAP-CL to the external legacy HLR. |
| 41069 | NumberOfCancelLocationReq RemoteRcvd | Counts the number of Cancel-Location received by the SDM's HLR proxy. The HLR proxy is requesting the LTE-HSS to send a Diameter Cancel Location to the MME. |
| 41070 | NumberOfAuthInfoAckRemote Rcvd | Counts the number of MAP-SAI-Ack received from the SDM's HLR proxy. This is considering that the LTE-HSS has previously requested the HLR proxy to send a MAP-SAI to the external legacy HLR in order to retrieve authentication vectors from the legacy AuC. |
| 41071 | NumberOfDSRRemoteSent | Counts the number of DSR messages sent to the remote HSS that handles an expected Diameter connection. The local LTE-HSS doesn't have the Diameter connection to the Diameter peer, to which the DSR has to be sent. |

| Counter ID | Name | Description |
|---|---|---|
| 41072 | NumberOfIDRRemoteSent | Counts the number of IDR messages sent to remote HSS that handles an expected Diameter connection. The local LTE-HSS doesn't have the Diameter connection to the Diameter peer to which the IDR has to be sent. |
| 41073 | NumberOfCLRRemoteSent | Counts the number of CLR messages sent to the remote HSS that handles an expected Diameter connection. The local LTE-HSS doesn't have the Diameter connection to the Diameter peer to which the CLR has to be sent. |
| 41074 | NumberOfCancelLocationReq RemoteSent | Number of Cancel Location requests sent remote. |
| 41075 | NumberOfAuthInfo RemoteSent | Number of Auth Info requests sent remote. |
| 41076 | NumberOfAuthInfo RemoteRcvd | Number of Auth Info requests received remote. |
| 41077 | NumberOfDSRRemoteRcvd | Number of DSR received remote. |
| 41078 | NumberOfIDRRemoteRcvd | Number of IDR received remote. |
| 41079 | NumberOfCLRRemoteRcvd | Number of CLR received remote. |
| 41080 | NumberOfMapSaiRemoteSent | Counts the number of AIR sent to the SDM's HLR-Proxy to retrieve Authentication vectors from the external legacy HLR. |
| 41081 | NumberOfMapUlAckRemote Rcvd | Counts the number of MAP-UL-Ack that the LTE-HSS has received from the SDM's HLR-Proxy after having requested a MAP-UL upon 3G 4G roaming. |
| 41082 | NumberOfMapUlRemoteSent | Counts the number of MAP-UL that the LTE- HSS asked to send towards the HLR-Proxy to the legacy HLR. This counter is incremented upon 3G to 4G roaming. |
| 41083 | NumberOfAIA_USER_ UNKNOWN | Number of specific Authentication-Information-Answer messages sent. |
| 42000 | NumberOfMEIdentityCheckRcvd | Number of ME-Identity-Check requests received. |
| 42001 | NumberOfWhiteListReturned | Number of ME-Identity-Check answer sent with EquipmentStatus = WHITELIST. |
| 42002 | NumberOfGreyListReturned | Number of ME-Identity-Check answer sent with EquipmentStatus = GREYLIST. |
| 42003 | NumberOfBlackListReturned | Number of ME-Identity-Check answer sent with EquipmentStatus = BLACKLIST. |

| Counter ID | Name | Description |
|---|---|---|
| 42004 | NumberOfBlackListIMSIMatch | Number of black list IMEI with successful IMSI override. |
| 42005 | NumberOfBlackListIMSIMis Match | Number of black list IMEI with unsuccessful IMSI override. |
| 42006 | NumberOfUnknownIMEI Status | Number of unknown IMEI returned. |
| 42007 | NumberOfNoMatchForIMEI | Number of IMEI not found in database. |
| 42008 | NumberOfMapCheckImeiRcvd | Number of MAP_CHECK_IMEI received. |
| 42009 | NumberOfWhiteListReturned GlobalResp | Number of ME-Identity-Check answer sent with EquipmentStatus = WHITELIST due to Global Response. |
| 42010 | NumberOfGreyListReturned GlobalResp | Number of ME-Identity-Check answer sent with EquipmentStatus = GREYLIST due to Global Response. |
| 42011 | NumberOfBlackListReturned GlobalResp | Number of ME-Identity-Check answer sent with EquipmentStatus = BLACKLIST due to Global Response. |
| 42012 | NumberOfUnknownIMEI StatusGlobalResp | Number of unknown IMEI returned due to Global Response. |
| 42013 | NumberOfDynamicIMSI Recording | Number of Dynamic IMSI/IMEI association. |
| 42014 | NumberOfDynamicSV Recording | Number of Dynamic IMEI SV recording. |

For instructions on how to view the values of these counters, refer to *View the Current Day's Performance Measurements from the WebCI*. Operations are also available from the CLI to retrieve the result of each one of these counters. For instructions on these operations, refer to the 'LteStatistics' entity in the "LTE-HSS Operations" section of the *SDM System Configuration - Reference Manual*.

# Chapter 3

# Statistics

**Topics:**

## Number of Active HLR Subscriber Statistics

In addition to the HLR counters, the operator can obtain, either through the Tekelec CLI or WebCI, statistics on the number of active HLR subscribers. The License Manager creates an entry in the LicenseLog[] entity at the beginning of each calendar month and creates up to a maximum of 12 entries, one for each calendar month. It updates the date and the number of active HLR subscribers on a daily basis. At the end of each calendar month, there is an entry in the LicenseLog[] entity that indicates the total number of subscribers that were active during that month. The LicenseLog[] entity keeps the number of active HLR subscribers on a monthly basis over the past year.

For information on how to obtain the number of active subscribers on the ngHLR, refer to the procedure that shows how to view the license logs in the "Viewing the number of active HLR subscribers" section of the *SDM Monitoring, Maintaining, Troubleshooting - User Guide.*

# Chapter 4

# View XML Performance Measurement Reports

**Topics:**

## View the System's Daily Performance Measurements

Data can be gathered from the system to allow the operator to analyze the system's behavior. The SDM counters report the number of messages that have been processed successful, or unsuccessful, by the system during its runtime. This shows how an application service behaves among the other applications running on the network.

Counters can be viewed from the following:

- The WebCI's PM Counter Value window accessible from the Oamp folder.
- **Note:** In the current release, only the OS Resource counters, some HLR application counters and the HLR Subscriber counters are displayed in the WebCI.

  For instructions on how to view the counters from the WebCI, refer to *View the Current Day's Performance Measurements from the WebCI*.

- The daily XML file created by the system's applications are located in the /blue/var/pm directory. These files can be accessed using an SSH session. Only the historical files can be viewed using the SSH session. For instructions on how to view the counters using a SSH session, refer to *View historical performance measurement reports through SSH interface*.

## View the Current Day's Performance Measurements from the WebCI

The following procedure describes how to view the current performance measurements (counters) from the WebCI.

**Note: The counters that can be displayed in this window are only the ones that have been reported in the current day. In order to view the values reported in previous days, refer to the View Historical Performance Measurement Reports Through SSH section.**

1. From the main menu, navigate to **Oamp ➤ PMCounterValue**. The PM Counter Value window is displayed.
2. Select or enter a value for one or all of these options to display a list or a specific counter. The Network Operator can choose to display counters that have one, or all of the following characteristics:

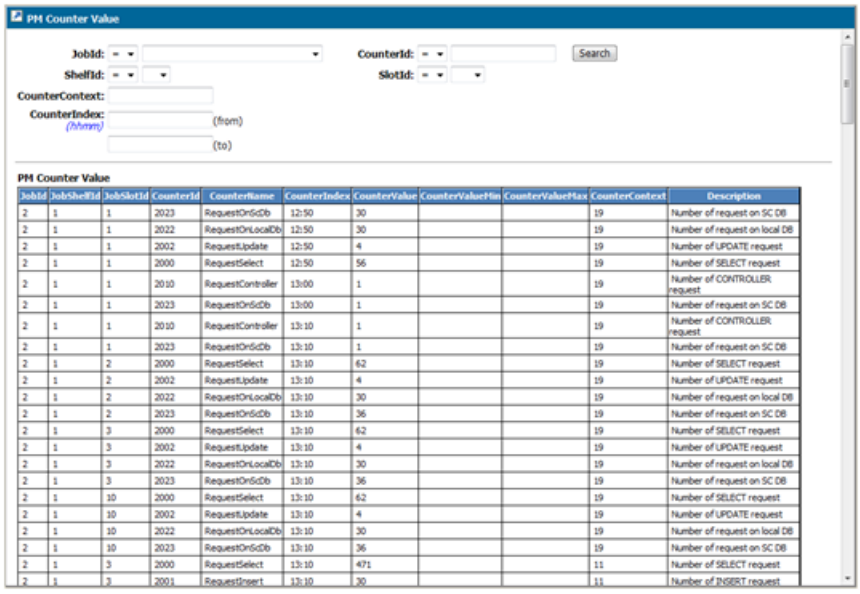
   The following procedure describes how to view the current performance measurements (counters) from the WebCI.

   - JobId
     - 1: OS Resource counters
     - 2: DP Request Statistics
     - 3: HLR-MNP counters that are reset every 60 minutes
     - 5: LTE message counters
     - 6: HSS message counters
     - 7: AAA message counters
     - 8: DNS message counters
     - 9: HLR subscriber counters that are reset every 24 hours

- 10: HLR subscriber counters that are reset every 15 minutes
- 11: HLR subscriber counters that are reset every 5 minutes
- 12: SIP Registrar counters that are reset every 10 minutes
- 13: SIP Redirect counters that are reset every 10 minutes
- 14: SIP Reg Client counters that are reset every 10 minutes
- 15: Eir message counters

- ShelfId: Counters that have been reported on a specific shelf.
- CounterContext: Specifies in which context this counter applies for (i.e., for which module or for which IMSI range,etc.
- CounterIndex: Counters that have been reported during a specific period of time (hhmm).
- CounterId: Counter with a specific CounterId.
- SlotId: Counters that have been reported on a specific slot.

3. Click the **Search** button. The PM Counter Value table is displayed with the list of counters corresponding to the characteristic(s) specified in the search engine.




| JobId | JobShelfId | JobSlotId | CounterId | CounterName | CounterIndex | CounterValue | CounterValuePeg | CounterValueMax | CounterContext | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 1 | 1 | 2023 | RequestOnScDb | 12:50 | 30 | | | 19 | Number of request on SC DB |
| 2 | 1 | 1 | 2022 | RequestOnLocalDb | 12:50 | 30 | | | 19 | Number of request on local DB |
| 2 | 1 | 1 | 2002 | RequestUpdate | 12:50 | 4 | | | 19 | Number of UPDATE request |
| 2 | 1 | 1 | 2000 | RequestSelect | 12:50 | 56 | | | 19 | Number of SELECT request |
| 2 | 1 | 1 | 2010 | RequestController | 13:00 | 1 | | | 19 | Number of CONTROLLER request |
| 2 | 1 | 1 | 2023 | RequestOnScDb | 13:00 | 1 | | | 19 | Number of request on SC DB |
| 2 | 1 | 1 | 2010 | RequestController | 13:10 | 1 | | | 19 | Number of CONTROLLER request |
| 2 | 1 | 1 | 2023 | RequestOnScDb | 13:10 | 1 | | | 19 | Number of request on SC DB |
| 2 | 1 | 2 | 2000 | RequestSelect | 13:10 | 62 | | | 19 | Number of SELECT request |
| 2 | 1 | 2 | 2002 | RequestUpdate | 13:10 | 4 | | | 19 | Number of UPDATE request |
| 2 | 1 | 2 | 2022 | RequestOnLocalDb | 13:10 | 30 | | | 19 | Number of request on local DB |
| 2 | 1 | 2 | 2023 | RequestOnScDb | 13:10 | 36 | | | 19 | Number of request on SC DB |
| 2 | 1 | 3 | 2000 | RequestSelect | 13:10 | 62 | | | 19 | Number of SELECT request |
| 2 | 1 | 3 | 2002 | RequestUpdate | 13:10 | 4 | | | 19 | Number of UPDATE request |
| 2 | 1 | 3 | 2022 | RequestOnLocalDb | 13:10 | 30 | | | 19 | Number of request on local DB |
| 2 | 1 | 3 | 2023 | RequestOnScDb | 13:10 | 36 | | | 19 | Number of request on SC DB |
| 2 | 1 | 10 | 2000 | RequestSelect | 13:10 | 62 | | | 19 | Number of SELECT request |
| 2 | 1 | 10 | 2002 | RequestUpdate | 13:10 | 4 | | | 19 | Number of UPDATE request |
| 2 | 1 | 10 | 2022 | RequestOnLocalDb | 13:10 | 30 | | | 19 | Number of request on local DB |
| 2 | 1 | 10 | 2023 | RequestOnScDb | 13:10 | 36 | | | 19 | Number of request on SC DB |
| 2 | 1 | 3 | 2000 | RequestSelect | 13:10 | 471 | | | 11 | Number of SELECT request |
| 2 | 1 | 3 | 2001 | RequestInsert | 13:10 | 30 | | | 11 | Number of INSERT request |

**Note: Since the HLR-Subscriber-Counters-24h jobs are generated once a day, no values will appear if this counter is selected in the WebCI.**

**Figure 1: PM Counter Value Window From the WebCI**

4. (Optional) If the list of counters is long, click on the yellow arrows to navigate the multiple pages.

## PM Counter Value Table

This table displays the current counter values that have been reported in the current day. For a list of these counters, refer to the *Performance Measurement Counters* section of this document.

**Operations Permitted:** Display.

**Table 16: PMCounterValue attributes**

| Attributes | Value Range | Default | Description |
|---|---|---|---|
| JobId | Enum:<br>1 (OS-Critical-Resource)<br>2 (DP-Request-Stats)<br>4 (HLR-MNP-60min)<br>5 (LTE-Message-Counters)<br>6 (HSS-Message-Counters)<br>7 (AAA-Message-Counters)<br>8 (DNS-Message-Counters)<br>9 (HLR-Subscriber-Counters-24h)<br>10 (HLR-Subscriber-Counters-15min)<br>11 (HLR-Subscriber-Counters-5min)<br>12 (SIP-REGISTRAR-10min)<br>13 (SIP-REDIRECT-10min)<br>14 (SIP-REGCLIENT-10min)<br>15 (Eir-Message-Counters) | N/A | Numerical identifier of the job. |
| JobShelfId | Integer | N/A | Identifies the shelf on which the job has been configured to run.<br>In the current release, only one shelf is supported.<br>This is mostly for future use when multi-shelf deployments will be supported. |
| JobSlotId | Integer (1-15) | N/A | Identifies the slot on which the job has been configured to run. |
| CounterId | Integer | N/A | Numerical identifier of the counter. |

| Attributes | Value Range | Default | Description |
|---|---|---|---|
| CounterIndex | hh:mm | N/A | Period of time when the counter value has been reported. |
| CounterName | String | N/A | Name of the counter. |
| CounterValue | Integer or decimal | N/A | Value of the counter currently reported. For some counters, this can be an average between the time it was reset and the time it was reported. If this is the case, the CounterValueMin and CounterValueMax will be populated. |
| CounterValueMin | Integer or decimal | N/A | In the case where the CounterValue is reported as an average, this indicates the minimum value the counter has reached between the time it was reset and reported. |
| CounterValueMax | Integer or decimal | N/A | In the case where the CounterValue is reported as an average, this indicates the maximum value the counter has reached between the time it was reset and reported. |
| CounterContext | Integer<br>0 Unknown<br>1 Framework<br>2 SchemaManager<br>4 SystemManager<br>5 DataProvider<br>6 DpController<br>7 OampEventViewer<br>8 OampEventMgr<br>9 OampManager<br>10 OampPerformanceManager | N/A | This applies either to the DP Request Statistics counters or the HLR Subscriber counters.<br>For the DP Request Statistics counters:<br>This parameter is the ID of the module for which the count applies for.<br>For example, the DP Request statistics counters can be used by any application. This counter context will indicate for which application the value of the counter applies for. |

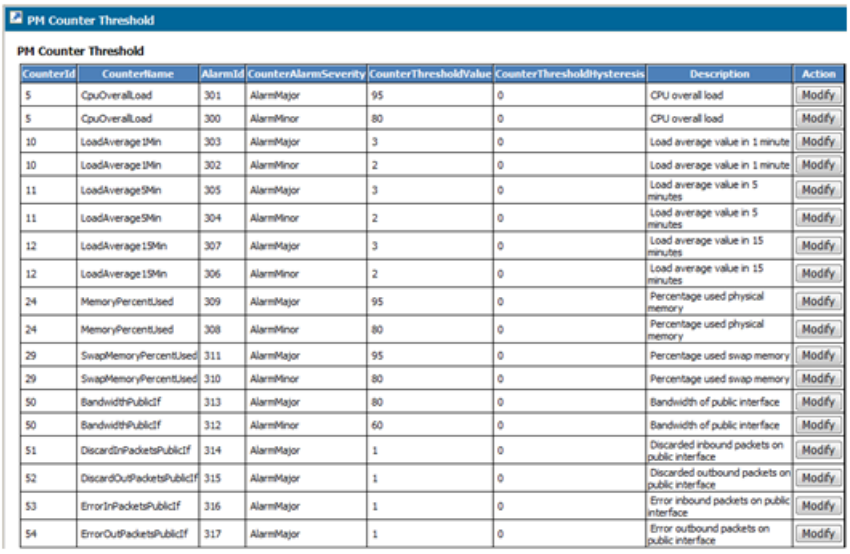
| Attributes | Value Range | Default | Description |
|---|---|---|---|
| | 11 HlrServer<br>12 HlrProvManager<br>13 HlrWgs<br>14 AucServer<br>15 SS7Manager<br>16 SipServer<br>17 SipProvManager<br>19 NodeManager<br>20 TestModuleType<br>21 DpReplicator<br>22 BlueCli<br>23 WebCI<br>24 SOAP<br>25 CmdFileLoader<br>26 SNMP<br>27 HssServer<br>28 HssProvManager<br>29 SipUa<br>30 XmlDataServer<br>31 DpProxy<br>32 SubscriberManager<br>33 LdapDataServer<br>34 LteHssServer<br>35 LteHssProvManager<br>36 Drm<br>37 DataAccessServer | | For the HLR Subscriber counters:<br>This parameter indicates the context of the counter (i.e., VLR number, Imsi Range, etc.). |
| Description | String | N/A | Description of the counter name. |

## Edit the Thresholds for the OS Resource Counters from the WebCI

The following procedure shows how to edit the thresholds defined in the system for the OS Resource counters listed in Table OS Resource Counters with Thresholds.

For details on the Counter Threshold attributes and the different values it supports, refer to the *SDM Reference Manual*.

1. From the main menu, navigate to Oamp > PMCounterThreshold. The PM Counter Threshold window is displayed.


PM Counter Threshold

PM Counter Threshold

| CounterId | CounterName | AlarmId | CounterAlarmSeverity | CounterThresholdValue | CounterThresholdHysteresis | Description | Action |
|---|---|---|---|---|---|---|---|
| 5 | CpuOverallLoad | 301 | AlarmMajor | 95 | 0 | CPU overall load | Modify |
| 5 | CpuOverallLoad | 300 | AlarmMinor | 80 | 0 | CPU overall load | Modify |
| 10 | LoadAverage1Min | 303 | AlarmMajor | 3 | 0 | Load average value in 1 minute | Modify |
| 10 | LoadAverage1Min | 302 | AlarmMinor | 2 | 0 | Load average value in 1 minute | Modify |
| 11 | LoadAverage5Min | 305 | AlarmMajor | 3 | 0 | Load average value in 5 minutes | Modify |
| 11 | LoadAverage5Min | 304 | AlarmMinor | 2 | 0 | Load average value in 5 minutes | Modify |
| 12 | LoadAverage15Min | 307 | AlarmMajor | 3 | 0 | Load average value in 15 minutes | Modify |
| 12 | LoadAverage15Min | 306 | AlarmMinor | 2 | 0 | Load average value in 15 minutes | Modify |
| 24 | MemoryPercentUsed | 309 | AlarmMajor | 95 | 0 | Percentage used physical memory | Modify |
| 24 | MemoryPercentUsed | 308 | AlarmMinor | 80 | 0 | Percentage used physical memory | Modify |
| 29 | SwapMemoryPercentUsed | 311 | AlarmMajor | 95 | 0 | Percentage used swap memory | Modify |
| 29 | SwapMemoryPercentUsed | 310 | AlarmMinor | 80 | 0 | Percentage used swap memory | Modify |
| 50 | BandwidthPublicIf | 313 | AlarmMajor | 80 | 0 | Bandwidth of public interface | Modify |
| 50 | BandwidthPublicIf | 312 | AlarmMinor | 60 | 0 | Bandwidth of public interface | Modify |
| 51 | DiscardInPacketsPublicIf | 314 | AlarmMajor | 1 | 0 | Discarded inbound packets on public interface | Modify |
| 52 | DiscardOutPacketsPublicIf | 315 | AlarmMajor | 1 | 0 | Discarded outbound packets on public interface | Modify |
| 53 | ErrorInPacketsPublicIf | 316 | AlarmMajor | 1 | 0 | Error inbound packets on public interface | Modify |
| 54 | ErrorOutPacketsPublicIf | 317 | AlarmMajor | 1 | 0 | Error outbound packets on public interface | Modify |

**Figure 2: Counter Threshold Window from the WebCI**

2. Click the **Modify** button corresponding to the counter threshold to edit.
3. When the PmCounterThreshold Provisioning window is displayed, enter the new values and click **Commit.** Below is a description of the CounterThreshold entity and more details on the attributes and the values supported.

## PM counter threshold table

The PM Counter Threshold table describes the PM Counter Threshold attributes and supported values. The table is used by the Network Operator to view and edit the thresholds for the alarms of the OS Resource counters. For a list of the OS Resource counters with defined thresholds, refer to *Table 5: OS Resource Counters with Thresholds*.

**Operations Permitted:** Display and modify.

**Table 17: PMCounterThreshold mandatory attributes**

| Attributes | Value Range | Default | Description |
|---|---|---|---|
| `CounterId` | Integer | N/A | Numerical identifier of the counter. |
| `CounterAlarmSeverity` | Enum:<br>`1` (Trace)<br>`2` (Debug)<br>`3` (Info)<br>`4` (Notice)<br>`5` (Warning)<br>`6` (Error)<br>`7` (Alarm Warning)<br>`8` (Alarm Minor)<br>`9` (Alarm Major)<br>`10` (Alarm Critical) | N/A | Severity of the alarm this counter's threshold triggers. |

**Table 18: PMCounterThreshold optional attributes**

| Attributes | Value Range | Default | Description |
|---|---|---|---|
| `CounterThreshold Value` | `0-100` | Default thresholds are defined on a per counter basis. Refer to the section 10.3 of this document for the threshold values set by default for each OS Resource counter. | Value in percentage of the threshold for this counter. When a threshold is reached, the corresponding alarm is raised.<br>**Important:** When modifying the threshold value, if the new value is lower than the hysteresis value, you must also modify the hysteresis value and make sure it is lower than the threshold value. |
| `CounterThreshold Hysteresis` | Integer (<max threshold value) | N/A | By default, the threshold hysteresis is not defined, which means that only the threshold value is considered by the system to generate or clear the counter's corresponding alarms. However, the threshold hysteresis can be defined for |

| Attributes | Value Range | Default | Description |
|---|---|---|---|
| | | | each counter in order to set a range within which the counter's corresponding alarm remains active. After the alarm has already been raised (the counter value has reached or exceeded the threshold value), if the counter value goes back down, below the threshold value, the alarm will remain active as long as the counter value is also equal or higher than the threshold hysteresis value. When the counter value goes back down, below the threshold hysteresis value, the system clears the alarm. |

## View historical performance measurement reports through SSH interface

- Must be member of Operation or Admin user group
- Login through SSH client with a username and password

This procedure describes how to view the historical performance measurements files through the SSH interface.

1. Go to the bin directory by typing

   `# cd /blue/var/pm`

2. List the performance logs in the directory by typing

   `# ls`

3. View the current counts by typing

   `# more <filename>.xml`

   where filename has the following formats:

   - Format of a Normal PM Report:

     `<Type><StartDate>.<StartTime>-<EndTime>_<UniqueID>_<JobName>`

     For example:

     `A20110321.000000-240000_BluesliceNetworks_HLR-Subscriber-Counters-15min`

     **OR**

   - Format of an Exception PM Report:

     `<Type><StartDate>.<StartTime>-<EndTime>_<UniqueID>_<JobName>_Exception`

For example:

```
A20110321.000000-240000_BluesliceNetworks_HLR-Subscriber-Counters-15min
_Exception
```

# Glossary

**A**

| | |
|---|---|
| AAA | Authentication, Authorization, and Accounting (Rx Diameter command) |
| ATI | Any Time Interrogation<br>An ATI message allows an external server to interrogate an HLR and obtain information about the location and/or state of a GSM subscriber.<br>Incoming application-terminated |

**C**

| | |
|---|---|
| CSCF | Call Session Control Function |

**E**

| | |
|---|---|
| ENUM | T**E**lephone **NU**mber **M**apping |

**H**

| | |
|---|---|
| HLR | Home Location Register |
| HSS | Home Subscriber Server<br>A central database for subscriber information. |

**I**

| | |
|---|---|
| IMSI | International Mobile Subscriber Identity |

**L**

| | |
|---|---|
| LIA | Link Interface Applique |

**M**

| | |
|---|---|
| MAA | Management ATM Adaptation |

**O**

| | |
|---|---|
| OLO | Other Licensed Operator |
| OS | Operations Systems |

**P**

| | |
|---|---|
| PNA | Push-Notification-Answer<br>Sent by a client in response to the Push-Notification-Request command. |
| PNR | Push Notification Request on Sh Interface<br>Sent by a Diameter server to a Diameter client in order to notify changes in the user data in the server. |
| PUA | Profile-Update-Answer<br>Command sent by a client in response to the Profile-Update-Request command. |
| PUR | Profile Update Request on Sh Interface<br>Command sent by a Diameter client to a Diameter server in order to update user data in the server. |

**R**

| | |
|---|---|
| RN | Routing Number |
| RTR | Router<br>Routes all types of SMS traffic. |

**S**

| | |
|---|---|
| SAR | Segmentation and Reassembly |

**S**

| | |
|---|---|
| SIM | Subscriber Identity Module<br>An ID card the size of a credit card for GSM network subscribers, and is typically referred to as a chip card or smartcard. |
| SIP | Session Initiation Protocol |
| SLF | Subscription Locator Function |
| SNA | Subscribes Notification Answer on Sh Interface |
| SNR | Subscriber Notification Request on Sh Interface |

**U**

| | |
|---|---|
| UDA | User-Data-Answer<br>Sent by a server in response to the User-Data-Request command. |
| UDR | User-Data-Request<br>A user-identity and service indication sent by a Diameter client to a Diameter server in order to request user data. |

**W**

| | |
|---|---|
| WebCI | Web Craft Interface |

**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. |