**Oracle® Diameter Signaling Router**

DSR Network Impact Report

Release 7.3

**DSR**-**7.3.0.0.0-73.18.0**

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Oracle Diameter Signaling Router DSR Network Impact Report, Release 7.3

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**TABLE OF CONTENTS**

[1 Introduction 6](#_Toc459646692)

[***1.1*** ***Purpose/Scope*** 6](#_Toc459646693)

[**1.1.1** ***Compatibility*** 6](#_Toc459646694)

[**1.1.2** Product Compatibility 6](#_Toc459646695)

[***1.2*** ***Disclaimers*** 6](#_Toc459646696)

[2 Overview of DSR 7.3 Features 6](#_Toc459646697)

[2.1 Enhancements to DSR 7.3 functionality by category 7](#_Toc459646698)

[2.2 Priority-based Per-Connection Ingress MPS Control 7](#_Toc459646699)

[2.3 DSR support for ngn-ps 8](#_Toc459646700)

[2.4 IDIH Enhancements 8](#_Toc459646701)

[2.5 DSR/iDih upgrade enhancements 8](#_Toc459646702)

[2.11 Hardware Changes 9](#_Toc459646703)

[2.12 Software Changes 9](#_Toc459646704)

[2.13 Firmware Changes 10](#_Toc459646705)

[2.14 Upgrade Overview 11](#_Toc459646706)

[2.15 Migration of DSR Data 12](#_Toc459646707)

[3 Feature OAM Changes 12](#_Toc459646708)

[3.1 Priority-Based Per-Connection Ingress MPS Control (PCIMC) 12](#_Toc459646709)

[3.2 DSR Support for NGN-PS 15](#_Toc459646710)

[4 OAM Change Summary (Release 7.3) 18](#_Toc459646711)

[This section will summarize the changes to Alarms, Measurements and KPIs. In the following inserts pertain to DSR release 7.3 and deltas with releases 5.1, 6.0, 7.0, 7.1, & 7.2 Alarms, Measurements, KPIs, and MIBs. 18](#_Toc459646712)

[**4.1** **Alarms Delta (Release 7.3)** 18](#_Toc459646713)

[**4.2** **Measurements Delta (Release 7.3)** 19](#_Toc459646714)

[**4.3** **KPIs (Release 7.3)** 19](#_Toc459646715)

[**4.4** **MIB Notifications (Release 7.3)** 20](#_Toc459646716)

[**4.5** **MEAL Snapshot for DSR 7.3** 20](#_Toc459646717)

[**4.6** **Meal Deltas (7.3)** 20](#_Toc459646718)

[5 Reference List 20](#_Toc459646719)

**LIST OF TERMS**

ASGU …………………….Automated Server Group Upgrade

AVP ………………………Attribute Value Pair

CLI ………………………..Command Line Interface

GUI ……………………….Graphical User Interface

HSS .....................................Home Subscriber Server

iLO ………………………..Integrated Lights Out

IMI ......................................Internal Management Interface

IOT ………………………..Interoperability Tests

KPI ………………………..Key Performance Indicator

LTE ……………………….Long Term Evolution

MEAL..................................Measurements, Events, Alarms, and Logging

MME ……………………...Mobility Management Entity

MP.......................................Message Processor

MPS ………………………Messages per Second

NE ………………………...Network Element

NMS ………………………Network Management System

OAM……………………...Operations, Administration, Maintenance

OAM&P .............................Operations, Administration, Maintenance and Provisioning

PDRA ……………………..Policy Diameter Relay Agent

PCRF ……………………..DSR Control and Charging Rules Function

PCIMC.................................Per Connection Ingress Message Control

PDU ………………………Protocol Data Unit

PM&C …………………….Platform, Management and Control

PS………………………….Priority Service (NGN-PS)

ROS ……………………….Routing Option Set

TPD ……………………….ORACLE Platform Distribution

VIP ......................................Virtual IP Address

XMI......................................External Management Interface

XSI.......................................External Signaling Interface

1. **Introduction**
   1. ***Purpose/Scope***

Purpose of this Feature Guide document is to highlight the changes of the product that may have impact on the customer network operations, and should be considered by the customer during planning for this release.

* + 1. ***Compatibility***
    2. Product Compatibility

DSR 7.3 is compatible with IDIH 6.0, 7.0, 7.1, 7.2, and 7.3

DSR 7.3 is compatible with SDS 5.0, 7.1, 7.2, and 7.3

DSR 7.3 is compatible with Platform 7.0.3

* 1. ***Disclaimers***

This document summarizes Release 7.3 new and enhancement features as compared to Release 7.2, and the operations impacts of these features, at a high level. The Feature Requirements (FRS) documents remain the defining source for the expected behavior of these features.

*Note that feature implementations may chang**e slightly during product test.*

1. **Overview of DSR 7.3 Features**

This section provides an overview of the DSR 7.3 release features that may impact OAM interfaces and activities.

For a list of all features, please see Release Notes for DSR 7.3 found at the following link:

**http://docs.oracle.com/en/industries/communications/diameter-signaling-router/index.html**

## Enhancements to DSR 7.3 functionality by category

Note: For information on Upgrade planning and required steps before upgrade, please refer to the DSR 7.3 Software Upgrade Guide on the public Oracle Documentation Site:

Docs.oracle.com 🡪 Industries 🡪 Oracle Communications documentation 🡪 Diameter Signaling Router 🡪 Release 7.3.

Table 1 DSR 7.3 New Features/Enhancements

|  |
| --- |
| **DSR 7.3 Feature/Enhancement Name** |
|
| Priority-based Per-Connection Ingress MPS Control (PCIMC) |
| User Configurable Ingress Throttling Convergence Time |
| DSR Support for NGN Priority Service |
| iDIH Support for NGN-PS AVP Decode |
| DSR Parallel Server Group Upgrade |

## 2.2 Priority-based Per-Connection Ingress MPS Control

|  |  |  |
| --- | --- | --- |
| Name | Description | Scope |
| PR 19086763  Priority-based Per-Connection Ingress MPS Control | This feature updates the existing Per-Connection ingress MPS Control feature (PR 197779) to provide an option to prefer discarding messages based on message priority. |  |
| PR 20839417  User Configurable Ingress/OC Convergence Time | A system level configuration parameter named “Convergence Time” used for Ingress MPS rate computation by PCIMC. Default value = 1 sec. |  |

## DSR support for ngn-ps

|  |  |  |
| --- | --- | --- |
| Name | Description | Scope |
| PR 19103148  DSR Support For Priority Service | NGN-PS as specified in IMS-GIR and LTE-GIR allows (NS/EP) users to make priority calls using the public networks.  NGN-PS -- Next Generation Network Priority Service  IMS-GIR -- Internet Protocol Multimedia Subsystem /Core Network Government Industry Requirements  LTE-GIR – Long Term Evolution Government Industry Requirements  NS/EP – National Security/Emergency Preparedness | Major feature enhancement |

## IDIH Enhancements

|  |  |  |
| --- | --- | --- |
| Name | Description | Scope |
| PR 22011575  NGN-PS Addition of MessagePriority field to the Payload header | Decode and display of NGN-PS related AVP’s are supported by IDIH |  |

## DSR/iDih upgrade enhancements

|  |  |  |
| --- | --- | --- |
| Name | Description | Scope |
| DSR Upgrade Guide Parallel Server Group Upgrade Guidance. | The DSR 7.3 Upgrade Guide is revised to include procedure steps which describe parallel upgrades of C-level server groups. |  |

## Hardware Changes

* + 1. **Hardware Supported**

|  |  |
| --- | --- |
| **Hardware** | **Comment** |
| HP BL460c Gen8 | c-Class |
| **HP BL460c Gen9** | **c-Class** |
| HP DL360/380 Gen6 | Rack Mount Server |
| HP DL360/380 Gen8 | Rack Mount Server |
| **HP DL380 Gen9** | **Rack Mount Server** |
| Sun Netra X3-2 | Rack Mount Server |
| **Sun Netra X5-2** | **Rack Mount Server** |
| HP 6125, 6120 | Enclosure Switch |
| Cisco 3020 | Enclosure Switch |

Note: Gen9 and Gen 8 v2 hardware (with upgraded processors) are also supported, when purchased by a customer.

Note: mixed Sun/HP deployments are not generally supported.

* + 1. **Hardware Upgrade**

No hardware upgrades are required with this release.

Deployment of certain Optional features may require additional hardware.

## Software Changes

Software changes include a new release of the software Platform components, and new DSR release.

|  |  |
| --- | --- |
| Component | Release |
| TPD 64 Bit | 7.0.3 |
| COMCOL | 6.4 |
| PM&C | 6.0.3 |
| TVOE | 3.0.3 |
| AppWorks | 6.0.1 |
| Networking | 6.0.3 |
| HP Firmware FUP | 2.2.9 (Minimum[[1]](#footnote-1)) |
| Oracle Firmware | 3.1.5 (Minimum[[2]](#footnote-2)) |

* + 1. **DSR Release 7.3**

DSR Release 7.3 inherits all functionality from DSR7.2.

|  |  |
| --- | --- |
| Component | Release |
| DSR Release | 7.3 |

* + 1. **iDIH 7.3**

|  |  |
| --- | --- |
| Component | Release |
| Oracle | 7.3.0.0.0\_73.X.0 |
| Mediation | 7.3.0.0.0\_73.X.0 |
| Applications | 7.3.0.0.0\_73.X.0 |

* + 1. **SDS Release Compatability**

DSR Release 7.3 is compatible with the SDS releases listed below:.

|  |  |
| --- | --- |
| Component | Release |
| SDS | 5.0 |
| SDS | 7.1 |
| SDS | 7.2 |
| SDS | 7.3 |

## Firmware Changes

Firmware release guidance is provided via DSR 7.3 Release Notice which can be found at the following link:

[*http://docs.oracle.com/en/industries/communications/diameter-signaling-router/index.html*](http://docs.oracle.com/en/industries/communications/diameter-signaling-router/index.html)

and then navigating to the Release 7.3.x link.

## Upgrade Overview

This section provides an overview of the Upgrade activities for Release 7.3.

* + 1. **Upgrade Path**

The supported upgrade paths for DSR 7.3 are:

6.0 🡪 7.3

7.0 🡪 7.3

7.1 🡪 7.3

7.2 🡪 7.3

7.3.x 🡪 7.3.y

The supported upgrade paths for SDS 7.3 are:

5.0 🡪 7.3

7.1 🡪 7.3

7.2 🡪 7.3

7.3.x 🡪 7.3.y

Recommendation is to upgrade SDS prior to DSR upgrades. iDIH upgrade can be scheduled prior to or following the DSR upgrade. If iDIH upgrade is defered until after DSR upgrades then any new capture elements existing within the upgraded DSR will not be decoded by iDIH until after the iDIH upgrade.

* + 1. **Upgrade Execution**

The procedures for site upgrades have been significantly modified for DSR 7.3 to emphasize parallel upgrades of C-level server groups (DA-MP’s, IPFE’s, SS7-MP’s, SBR’s). Additionally, there are separate procedures described to support either a manual or automated approach to upgrading any particular server group. The use of automated server group upgrade for DA-MP server groups should be carefully considered regarding potential negative traffic impacts. If there are any traffic flows which are limited to a sub-set of DA-MP’s then it is recommended to use the manual upgrade procedures.

* + 1. **Active/Standby DA-MP Redundancy Model supported**

Active/Standby DA-MP server architecture (1+1) continues to be supported in DSR 7.3.

Migration to Multi-active (N+0) DA-MP server architecture is recommended for all customers, and required for activating PDRA functionality.

## Migration of DSR Data

As in prior releases, the existing DSR Data will be preserved during the upgrade.

1. **Feature OAM Changes**

At the time of upgrade to DSR 7.3, a number of features and enhancements will become visible on the interfaces to the DSR and may change certain existing OAM behaviors of the system.

OAM changes include: User Interfaces (NO GUI, SO GUI), Measurements Reports, Alarms, and KPIs.

Note: this section covers OAM changes that will be visible after upgrade to the 7.3 release, and does not include changes that will be seen only as new Optional Features are Activated on the system (post-upgrade activity, and customer specific).

## Priority-Based Per-Connection Ingress MPS Control (PCIMC)

#### Description

Previous DSR releases introduced the following features:

* Per-Connection Ingress MPS Control (PCIMC)
* User Configurable Message Priority - via Message Priority Configuration Set

DSR releases prior to 7.3 supported the PCIMC feature which provided a method for limiting the volume of Diameter Request traffic that DSR will attempt to process from DSR peers. This feature enabled DSR to partition DA-MP MPS capacity among peer connections, providing some user-configurable control of DSR traffic handling. The PCIMC feature provides the ability to provision (via Capacity Configuration Set) both a reserve MPS rate and a maximum MPS rate for each connection. Messages ingressing a connection at a rate above that connection’s maximum rate are discarded by PCIMC.

The pre-existing PCIMC feature is enhanced in DSR 7.3 with the following new capabilities:

* Priority based message discard
* Configurable error answers for the messages discarded - via existing Routing Option Set (ROS) “Resource Exhausted Action” setting
* User Configurable Ingress/Overload Control Convergence Time

Message priorities are established as the message ingresses into the DSR. DSR releases prior to 7.3 have priority assignments ranging from P0 (lowest) to P3 (highest). Diameter answer messages are assigned a priority of P3 while request messages can be assigned P0, P1, or P2 priority. As of DSR 7.3 there is a new P4 priority reserved for diameter messages associated with the NGN-PS feature described in section 3.2. Message priority assignments are used to guide discard decisions related to various congestion control mechanisms within the DSR including PCIMC.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | Pre-DSR 7.3 Priority | | | Request Priority | Answer Priority | | 0 | 3 | | 1 | 3 | | 2 | 3 | |  |  | | DSR 7.3 Priority (NGN-PS enabled) | | | Request Priority | Answer Priority | | 0 | 3 | | 1 | 3 | | 2 | 3 | | 4 | 4 | |

Figure 1 DSR Message Priorities

Another PCIMC enhancement for DSR 7.3 is “User Configurable Ingress/OC Convergence Time”. This setting can be found in the SOAM 🡪 Diameter 🡪 Configuration 🡪 Configuration Sets 🡪 Capacity Configuration Sets screen (Figures 2 & 3 below).

“Convergence Time” is a system level configuration parameter used by the “Sliding Historic Algorithm” for Ingres MPS rate computation by PCIMC. It has a user configurable range between 250 ms to 4000 ms. Allowed values are (250, 500, 1000, 2000 and 4000 ms) Default value is 1000 ms. See figures 2 & 3 below.

#### SOAM GUI

|  |
| --- |
|  |

Figure 2 PCIMC Convergence Time Setting

|  |
| --- |
|  |

Figure 3 Capacity Configuration Set Insert Screen

Previous releases have supported the use of ROS (Routing Option Set) configuration associated with various DSR congestion control mechanisms. ROS settings are now also enabled for use by PCIMC. In particular, the “Resource Exhausted Action” value (Abandon|Send an Answer) can be used to influence DSR behaviour upon occurrances of PCIMC discarded requests. See figure 4 below for GUI configuration. Note that messages successfully passing the PCIMC stage of processesing remain eligible for triggering congestion treatment at a later stage of processing prior to eventual egress from DSR.

|  |
| --- |
|  |

Figure 4 Routing Option Set

## DSR Support for NGN-PS

#### Description

The US Government has directed that commercial service providers support a service called NGN-PS (Next Generation Network – Priority Service). The intention of this service is to allow NS/EP (National Security/Emergency Preparedness) users to make priority calls using the public networks. DSR support for NGN-PS is comprised of two major functions:

* Identify NGN-PS Diameter messages upon ingress
* Provide priority treatment to NGN-PS messages under conditions of DSR congestion

NGN-PS subscription information is stored in databases such as HSS and SPR. This information is conveyed to entities such as MME’s and PCRF’s which are responsible for marking associated Diameter transaction messages via inclusion of an NGN-PS AVP. Upon detection of ingress Diameter messages marked as such, DSR ensures that all associated Diameter transaction messages remain immune to congestion control treatment.

There are multiple congestion control mechanisms operating within the various software components of the DSR. Resources such as CPU, memory, MPS (messages per second) processing, and message queues are continuously monitored and measured against pre-defined engineered and/or user configured thresholds. At the time of ingress, messages are assigned both a priority and a color. DSR releases prior to 7.3 supported PCIMC assignment of priority based upon either a user configured MPCS (Message Priority Configuration Set) or by scanning the messages for the presence of a previous priority assignment by an upstream DSR. Prior to DSR 7.3, messages could be assigned a priority value from 0 (lowest) to 3 (highest). In addition to receiving a priority assignment, messages are also given a color assignment. Green is assigned if the current ingress MPS rate is below the “reserved” configured MPS threshold. Otherwise, yellow is assigned if the rate is above the reserved value but below the “maximum” user configured rate. Whenever a DSR software process determines that congestion mitigation needs to occur in the form of message discards, message candidates are selected based upon priority and coloring. DSR 7.3 includes an additional PCIMC priority assignment mechanism based upon the presence of an NGN-PS AVP within an ingress message. Such messages are assigned a priority value of 4 and are considered to be “inviolable”. This designation is recognized by each of the congestion control mechanisms within the DSR and means that the message is exempt from discard actions. Other priority assignment configurations in place are prevented from altering the priority assignment of priority 4 messages. To limit to the percentage of overall traffic that can be considered inviolable there is an NGN-PS configuration option “Maximum Message Rate Percent” which can be set to a value within the range of 1-15%.

DSR to DSR connections convey message priority by setting the value of the last 3 bits of the Hop-by-Hop (HBH) ID in all outgoing Request messages. With DSR Priority Service disabled – or on pre-7.3 DSR releases, the maximum priority of a Request message was 2 (represented by Hex 2 in the HbH ID). With PS enabled, egress P4 messages are indicated with an HbH ID (Hex 4). Downstream DSRs without PS capability, or with PS disabled, will not recognize the value of 4 in the HbH ID, and will treat the message as P0. Preferably, upstream DSRs should instead set the HbH ID (Hex 2) for PS messages prior to egress. To arrange for this, a new ‘DSR Feature Status AVP’ parameter has been added to the CEx Configuration Set in DSR 7.3. Checking this parameter and applying the CEx Configuration Set to a connection will cause a Vendor specific AVP to be sent in the CER/CEA message exchange. This AVP conveys the status of various features such as NGN-PS support to a Peer DSR. If the peer DSR is on a release prior to 7.3, no AVP will be sent in the CEx from that peer. If the peer DSR I s on release 7.3 but with Priority Service feature disabled, the CEx will contain the AVP, but with value set to ‘0’. Either way, the 7.3 DSR with PS enabled will know to send all P4 requests on that connection with HbH ID priority of ‘2’. This causes the downstream DSR to treat the Priority Service Request as P2 instead of P0, since P2 is the highest known priority for request messages supported by that DSR. See Figures 6 & 7.

#### 3.2.2 Configuration

**User configurable aspects of the NGN-PS feature:**

Enablement/Disablement for the NGN-PS feature is managed via a new tab “Priority Service Options” found on the SOAM under Diameter 🡪 Configuation 🡪 System Options.

Priority Service configuration highlights include:

* NGN-PS Admin State
* NGN\_PS Maximum Message Rate Percent
* Diameter Application Specific Settings
  + Gx
  + Rx
  + Cx/Dx
  + Dh/Sh

|  |
| --- |
|  |

Figure 5 Priority Services Options

|  |
| --- |
|  |

Figure 6 CEX Configuration Sets

|  |
| --- |
|  |

Figure 7 CEX Configuration Set Selection for DSR<->DSR Connection

## 4 OAM Change Summary (Release 7.3)

This section will summarize the changes to Alarms, Measurements and KPIs. In the following inserts pertain to DSR release 7.3 and deltas with releases 5.1, 6.0, 7.0, 7.1, & 7.2 Alarms, Measurements, KPIs, and MIBs.

* 1. **Alarms Delta (Release 7.3)**

**NGN-PS Feature**

|  |  |  |
| --- | --- | --- |
| **Alarm Name** | **Description** | Group |
| MpRxNgnPsOfferedRate | DA-MP ingress NGN-PS message rate threshold crossed. | Diameter |
| MpNgnPsStateMismatch | DA-MP NGN-PS administrative and operational state mismatch. | Diameter |
| MpNgnPsDrop | DA-MP NGN-PS message discarded or rejected. | Diameter |
| NgnPsMsgMisrouted | NGN-PS message routed to peer DSR lacking NGN-PS support. | Diameter |
| NgnPsOfferedRate | Connection ingress NGN-PS request rate threshold crossed. | Diameter |

**<See section 4.5 and the embedded spread sheets>**

* 1. **Measurements Delta (Release 7.3)**

**NGN-PS Feature**

|  |  |
| --- | --- |
| **Measurement Name** | **Description** |
| MpRxNgnPsOffered | DA-MP ingress NGN-PS messages offered. |
| MpRxNgnPsOfferedRateAvg | DA-MP ingress NGN-PS messages offered rate average. |
| MpRxNgnPsOfferedRatePeak | DA-MP ingress NGN-PS messages offered rate peak. |
| MpRxNgnPsAccepted | DA-MP ingress NGN-PS messages accepted. |
| MpRxNgnPsAcceptedRateAvg | DA-MP ingress NGN-PS messages accepted rate average. |
| MpRxNgnPsAcceptedRatePeak | DA-MP ingress NGN-PS messages accepted rate peak. |
| RxNgnPsOffered | Connection ingress NGN-PS messages offered. |
| RxNgnPsAccepted | Connection ingress NGN-PS messages accepted. |
| RxNgnPsRequestsOffered | Connection ingress NGN-PS requests offered. |
| MpNgnPsXactionPassAvg | DA-MP NGN-PS transaction success rate average. |
| MpNgnPsXactionFailPeersAvg | DA-MP NGN-PS transaction failure rate by peers average. |

**<See section 4.5 and the embedded spread sheets>**

* 1. **KPIs (Release 7.3)**

**PCIMC Enhancment Feature**

Priority based message ingress rate and discard via ingress control has new associated KPI metrics.

|  |  |
| --- | --- |
| **KPI Name** | **Description** |
| IcRateP0 | Connection ingress message rate with Priority 0 |
| IcRateP1 | Connection ingress message rate with Priority 1 |
| IcRateP2 | Connection ingress message rate with Priority 2 |
| IcRateP3 | Connection ingress message rate with Priority 3 |
| IcRateP4 | Connection ingress message rate with Priority 4 |

|  |  |
| --- | --- |
| **KPI Name** | **Description** |
| IcDropP0 | P0 ingress messages dropped for exceeding connection max MPS |
| IcDropP1 | P1 ingress messages dropped for exceeding connection max MPS |
| IcDropP2 | P2 ingress messages dropped for exceeding connection max MPS |
| IcDropP3 | P3 ingress messages dropped for exceeding connection max MPS |
| IcDropP4 | P4 ingress messages dropped for exceeding connection max MPS |

**NGN-PS Feature**

|  |  |
| --- | --- |
| Metric Name | Description |
| MpRxNgnPsOfferedRate | DA-MP ingress NGN-PS messages offered rate. |

**<See section 4.5 and the embedded spread sheets>**

* 1. **MIB Notifications (Release 7.3)**

**<See section 4.5 and the embedded spread sheets>**

* 1. **MEAL Snapshot for DSR 7.3**



* 1. **Meal Deltas (7.3)**













## Reference List

**DSR 7.3 User Guides for DSR (see customer documentation)**

<http://docs.oracle.com/en/industries/communications/diameter-signaling-router/index.html>

**Diameter Signaling Router (DSR) 7.3 Core Document Set**

*DSR 7.3 Release Notice*

*DSR 7.3 Licensing Information User Manual*

*Planning, Installation, Upgrade, and Disaster Recovery*

*DSR Hardware and Software Installation Procedure 1/2*

*DSR Software Installation and Configuration Procedure 2/2*

*DSR 7.3 Software Upgrade Guide*

*Three-tier Disaster Recovery Guide*

*RMS Productization Installation Guide*

*RMS Productization Disaster Recovery Guide*

*PCA Configuration*

*GLA Feature Activation Procedure*

*CPA Feature Activation Procedure*

*Mediation Feature Activation Procedure*

*FABR Feature Activation Procedure*

*RBAR Feature Activation Procedure*

*MAP-Diameter Feature Activation Procedure*

*DSR Network Impact ReportWord*

*Diameter Signaling Router 7.1 Core Document Set*

*Operation, Administration, and Maintenance (OAM) Guide*

*Communication Agent User's Guide*

*Roadmap to Hardware Documentation (Gen8)*

*Policy and Charging Application User's Guide*

*Diameter User's Guide*

*Mediation User's Guide*

*Range Based Address Resolution (RBAR) User's Guide*

*Full Address Based Resolution (FABR) User's Guide*

*Charging Proxy Application (CPA) and Offline Charging Solution User's Guide*

*IP Front End (IPFE) User's Guide*

*DSR Alarms and KPIs Reference*

*Diameter Measurements Reference*

*Diameter Common User's Guide*

*Diameter Administrator's Guide*

*MAP-Diameter IWF User's Guide*

*SS7/SIGTRAN User's Guide*

*Transport Manager User's Guide*

*Gateway Location Application (GLA) User's Guide*

*Related Publications Reference*

**Integrated Diameter Intelligence Hub (IDIH) 7.3 Document Set**

IDIH User's Guide

IDIH Audit Viewer Administrator's Guide

IDIH Alarm Forwarding Administrator's Guide

IDIH Operations, Administration and Maintenance Administrator’s Guide

IDIH ProTrace User's Guide

IDIH System Alarms User's Guide

IDIH Log Viewer User's Guide

1. This represents the minimum release of the Tekelec HP FUP 2.2.x series to support all content in the Platform 7.0.3 release. It is recommended that the latest firmware release always be used in order to address known security issues. [↑](#footnote-ref-1)
2. This represents the minimum release of the Oracle firmware series to support all content in the Platform 7.0.3 release. It is recommended that the latest firmware release always be used in order to address known security issues. [↑](#footnote-ref-2)