

# Measurements

Ericsson Service-Aware Policy Controller

USER GUIDE

**Copyright**

© Ericsson España, S.A. 2018. All rights reserved. No part of this document may be reproduced in any form without the written permission of the copyright owner.

**Disclaimer**

The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing. Ericsson shall have no liability for any error or damage of any kind resulting from the use of this document.

**Trademark List**

All trademarks mentioned herein are the property of their respective owners. These are shown in the document Trademark Information.



# Contents

<b>1</b>	<b>Measurements Introduction</b>	<b>1</b>
<b>2</b>	<b>Measures</b>	<b>2</b>
2.1	Gx Protocol Measures	3
2.2	Rx Protocol Measures	7
2.3	Sy Protocol Measures	12
2.4	Smp Protocol Measures	13
2.5	Sd Protocol Measures	15
2.6	Fair Usage Control Measures	17
2.7	Notification Measures	18
2.8	Capacity Measures	18
2.9	Resources Measures	20
2.10	External Database Measures	20
2.11	EBM Measures	21
2.12	Optional Measures	22
2.13	REST Provisioning Measures	23
2.14	Other Measures	23
<b>3</b>	<b>Measurements Configuration</b>	<b>24</b>
3.1	Managing Measurement Collection	25
3.2	Managing Threshold Monitoring	25
<b>4</b>	<b>Performance Measurement Reports</b>	<b>27</b>





## List of Tables

Table	Title	Page
1	Measure Tables Contents	2
2	Gx Protocol Measures	3
3	Rx Protocol Measures	7
4	Sy Protocol Measures	12
5	Smp Protocol Measures	14
6	Sd Protocol Measures	15
7	Fair Usage Measures	17
8	Notification Measures	18
9	Capacity Measures	19
10	Resources Measures	20
11	ExtDb Measures	21
12	EBM Measures	22
13	Optional Measures	22
14	REST Provisioning Measures	23
15	Other Measures	23
16	The SAPC Measure Table Contents vs Reported Data XML Elements	27





# 1 Measurements Introduction

The purpose of any Performance Management activity is to collect data, which can be used to verify the physical and logical configuration of the network and to locate potential problems as early as possible.

This document provides information on how to use measures that are collected by the SAPC for performance management. For more information, refer to [Performance Management](#).



## 2 Measures

The SAPC provides statistic measures related to several interface protocol messages and functions. This chapter describes each measure that can be collected by the SAPC.

The following table explains the measures information explained in measures related tables along subsequent chapters.

Table 1 Measure Tables Contents

<b>Measure Name</b>	Name (identification) of the measure type. Indicates what is measured.
<b>Measure Meaning</b>	It explains the data collected in this measure.
<b>Measured Object Instance</b>	<p>String key identifying the measured object (MOID).</p> <p>For example, a measure can be collected for a specific network element (Peer) that communicates to or from the SAPC using an external interface. Its corresponding MOID is the network identifier of the peer. For those cases, this document states &lt;Network Peer&gt;, for example &lt;PcefDN PeerDN&gt;.</p> <p>In other cases, the measure is collected in general for a concept in the SAPC, and in this case its MOID takes a fixed string value, for example "Sessions".</p>
<b>Alarm Id</b>	<p>For Fault Detection related measures, identifier of the associated alarm.</p> <p>A dash means that there is not any alarm related to it.</p>
<b>Measurement Type</b>	<p>It indicates the collection method for the measure:</p> <ul style="list-style-type: none"><li>• Cumulative Counter.</li><li>• Gauge.</li><li>• Status Inspection.</li><li>• Discrete Event Registration.</li></ul> <p>Definitions of these measurement types in <a href="#">Performance Management</a>.</p>





The measurements are read-only data, they show the information related to the SAPC and cannot be modified.

## 2.1 Gx Protocol Measures

The following table describes the measures provided by the SAPC belonging to the measure group: "policyControlFunctionGxMeasuresGroup".

Table 2 Gx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
gxAdcStartEvents	The number of ADC start events received.	<Pcef Peer>	-	Cumulative Counter
gxAdcStopEvents	The number of ADC stop events received.	<Pcef Peer>	-	Cumulative Counter
gxCcasErrorInitialParameters	The number of CCAs initial sent indicating error with initial parameters (Experimental-Result-Code AVP set to 5140).	<Pcef Peer>	-	Cumulative Counter
gxCcasInitEmergencyFailed	The number of CCAs initial for emergency services sent indicating not success (Result-Code AVP set to a value different than 2001).	<Pcef Peer>	-	Cumulative Counter
gxCcasInitEmergencySuccess	The number of CCAs initial for emergency services sent indicating success (Result-Code AVP set to 2001).	<Pcef Peer>	-	Cumulative Counter
gxCcasInitEmergencyTooBusy	The number of CCAs initial for emergency services sent indicating too busy (Result-Code AVP set to 3004).	<Pcef Peer>	-	Cumulative Counter
gxCcasInitFailed	The number of initial CCAs sent indicating not success (Result-Code AVP set to a value different than 2001).	<Pcef Peer>	-	Cumulative Counter
gxCcasInitInvalidAvp	The number of initial CCAs sent indicating invalid AVP (Result-Code AVP set to 5004).	<Pcef Peer>	-	Cumulative Counter



Table 2 Gx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
gxCcasInitMissingAvp	The number of initial CCAs sent indicating missing AVP (Result-Code AVP set to 5005).	<Pcef Peer>	-	Cumulative Counter
gxCcasInitMultimediaPriorityTooBusy	The number of initial CCAs sent for Multimedia Priority Services indicating too busy (Result-Code AVP set to 3004).	<Pcef Peer>	-	Cumulative Counter
gxCcasInitSuccess	The number of initial CCAs sent indicating success (Result-Code AVP set to 2001).	<Pcef Peer>	-	Cumulative Counter
gxCcasInitTooBusy	The number of CCAs initial sent indicating too busy (Result-Code AVP set to 3004).	<Pcef Peer>	Major Type: 193 Minor Type: 7077899	Cumulative Counter
gxCcasInitUnableToComply	The number of CCAs sent indicating unable to comply (Result-Code AVP set to 5012) for IP-CAN session establishment.	<Pcef Peer>	-	Cumulative Counter
gxCcasInvalidInfo	The number of CCAs sent indicating errors (Result-Code AVP set to 5004, 5005, 5007 or 5008). Incremented when receiving a message with a missing AVP or an AVP that does not have the correct value	<Pcef Peer>	-	Cumulative Counter
gxCcasRejected	The number of CCAs sent indicating authorization rejected (Result-Code AVP set to 5003).	<Pcef Peer>	Major Type: 193 Minor Type: 7077890	Cumulative Counter
gxCcasSuccess	The number CCAs sent indicating success (Result-Code AVP set to 2001).	<Pcef Peer>	-	Cumulative Counter
gxCcasTerminateSuccess	The number of termination CCAs sent indicating success (Result-Code AVP set to 2001).	<Pcef Peer>	-	Cumulative Counter



Table 2 Gx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
gxCcasTerminateTooBusy	The number of termination CCAs sent indicating too busy (Result-Code AVP set to 3004).	<Pcef Peer>	-	Cumulative Counter
gxCcasUnableToComply	The number of CCAs sent indicating unable to comply (Result-Code AVP set to 5012).	<Pcef Peer>	-	Cumulative Counter
gxCcasUnknownSession	The number of CCAs sent indicating unknown session (Result-Code AVP set to 5002).	<Pcef Peer>	-	Cumulative Counter
gxCcasUpdateEmergencyTooBusy	The number of CCAs update for emergency services sent indicating too busy (Result-Code AVP set to 3004).	<Pcef Peer>	-	Cumulative Counter
gxCcasUpdateMultimediaPriorityTooBusy	The number of update CCAs sent for Multimedia Priority Services indicating too busy (Result-Code AVP set to 3004).	<Pcef Peer>	-	Cumulative Counter
gxCcasUpdateSuccess	The number of CCAs sent indicating successful (Result-Code AVP set to 2001) IP-CAN session modification.	<Pcef Peer>	-	Cumulative Counter
gxCcasUpdateTooBusy	The number of update CCAs sent indicating too busy (Result-Code AVP set to 3004).	<Pcef Peer>	-	Cumulative Counter
gxCcrsInit	The number of initial CCRs received (CC-Request-Type AVP set to value INITIAL).	<Pcef Peer>	-	Cumulative Counter
gxCcrsTerminate	The number of termination CCRs received (CC-Request-Type AVP set to value TERMINATION).	<Pcef Peer>	-	Cumulative Counter
gxCcrsUpdate	The number of update CCRs received (CC-Request-Type AVP set to value UPDATE).	<Pcef Peer>	-	Cumulative Counter
gxChargingCharsRequested	The number of CCRs requesting Charging Characteristics.	<Pcef Peer>	-	Cumulative Counter
gxPushQosChange	The number of RARs including a network initiated Qos change for the bearer.	<Pcef Peer>	-	Cumulative Counter



Table 2 Gx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
gxPushRulesInstallation	The number of RARs installing Pcc Rules.	<Pcef Peer>	-	Cumulative Counter
gxQosAccepted	The number of CCAs returning QoS accepted.	<Pcef Peer>	-	Cumulative Counter
gxQosChanged	The number of CCAs returning QoS changed. At least a QoS parameter is upgraded and some other QoS parameter is downgraded.	<Pcef Peer>	-	Cumulative Counter
gxQosDowngraded	The number of CCAs returning QoS downgraded.	<Pcef Peer>	-	Cumulative Counter
gxQosRequests	The number of CCRs requesting Bearer QoS control. QoS for default bearer or APN.	<Pcef Peer>	-	Cumulative Counter
gxQosUpgraded	The number of CCAs returning QoS upgraded.	<Pcef Peer>	-	Cumulative Counter
gxRaas	The number of RAAs received.	<Pcef Peer>	-	Cumulative Counter
gxRaasFailed	The number of RAAs received indicating not success (Result-Code AVP set to a value different than 2001).	<Pcef Peer>	-	Cumulative Counter
gxRaasOutOfSpace	The number of RAAs received indicating out of space (Result-Code AVP set to 4002).	<Pcef Peer>	-	Cumulative Counter
gxRaasPendingTransaction	The number of RAAs received indicating pending transaction (Experimental-Result-Code AVP set to 4144).	<Pcef Peer>	-	Cumulative Counter
gxRaasSuccess	The number of RAAs received indicating success (Result-Code AVP set to 2001).	<Pcef Peer>	-	Cumulative Counter



Table 2 Gx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
gxRaasUnableToDeliver	The number of RAAs received indicating unable to deliver (Result-Code AVP set to 3002).	<Pcef Peer>	-	Cumulative Counter
gxRaasUnknownSessionId	The number of Gx RAAs received indicating unknown session (Result-Code AVP set to 5002).	<Pcef Peer>	-	Cumulative Counter
gxRars	The number of RARs sent.	<Pcef Peer>	-	Cumulative Counter
gxRarsTimeout	The number of RARs that did not reach the peer.	<Pcef Peer>	-	Cumulative Counter
gxRuleSpaceChanged	The number of CCAs sent changing the received suggested Rulespace.	<Pcef Peer>	-	Cumulative Counter
gxRuleSpaceSuggestedRequests	The number of CCRs received requesting RuleSpace suggestion negotiation.	<Pcef Peer>	-	Cumulative Counter

(1) The peer identifier is the value received from the PCEF in Origin-Host AVP

## 2.2 Rx Protocol Measures

The following table describes the measures provided by the SAPC belonging to the measure group: "policyControlFunctionRxMeasuresGroup".

Table 3 Rx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
rxAaasAfSignallingSuccess	The number of AAAs sent indicating the successful establishment or modification of an AF signalling session (Result-Code AVP set to 2001). The SAPC also increments rxAaasSuccess measure.	<Af Peer>	-	Cumulative Counter



Table 3 Rx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
rxAasFailed	The number of AAAs sent indicating not success (Result-Code AVP set to a value different than 2001).	<Af Peer >	Major Type: 193 Minor Type: 7077894	Cumulative Counter
rxAasInitEmergency Failed	The number of AAAs for emergency services sent indicating not successful emergency AF session creation (Result-Code AVP set to a value different than 2001).	<Af Peer >	-	Cumulative Counter
rxAasInitEmergency Success	The number of AAAs for emergency services sent indicating successful emergency AF session creation (Result-Code AVP set to 2001).	<Af Peer >	-	Cumulative Counter
rxAasInitEmergency TooBusy	The number of initial AAAs for emergency services sent indicating too busy (Result-Code AVP set to 3004).	<Af Peer >	-	Cumulative Counter
rxAasInitMultimedia PriorityFailed	The number of initial AAAs sent for Multimedia Priority Services indicating not success (Result-Code AVP set to a value different than 2001).	<Af Peer >	-	Cumulative Counter
rxAasInitMultimedia PriorityTooBusy	The number of initial AAAs sent for Multimedia Priority Services indicating too busy (Result-Code AVP set to 3004).	<Af Peer >	-	Cumulative Counter
rxAasInitSuccess	The number of initial AAAs sent indicating success (Result-Code AVP set to 2001).	<Af Peer >	-	Cumulative Counter
rxAasInitTooBusy	The number of AAAs initial sent indicating too busy (Result-Code AVP set to 3004).	<Af Peer >	Major Type: 193 Minor Type: 7077900	Cumulative Counter



Table 3 Rx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
rxAasInvalidInfo	The number of AAAs sent indicating invalid information (Result-Code AVP set to 5004, 5005, 5007 or 5008).	<Af Peer >	-	Cumulative Counter
rxAasIpSessionNotAvailable	The number of AAAs indicating Ip Session not available (Result-Code AVP set to 5065).	<Af Peer >	-	Cumulative Counter
rxAasMultimediaPrioritySuccess	The number of initial or update AAAs sent for Multimedia Priority Services indicating success (Result-Code AVP set to 2001).	<Af Peer >	-	Cumulative Counter
rxAasServiceNotAuthorized	The number of AAAs sent indicating dynamic service authorization rejected (Result-Code AVP set to 5063).	<Af Peer >	-	Cumulative Counter
rxAasSuccess	The number of AAAs sent indicating success (Result-Code AVP set to 2001).	<Af Peer >	-	Cumulative Counter
rxAasUnableToComply	The number of AAAs sent indicating unable to comply (Result-Code AVP set to 5012).	<Af Peer >	-	Cumulative Counter
rxAasUnauthorizedNonEmergency	The number of initial AAAs for emergency services sent indicating unauthorized non emergency session (Experimental-Result-Code AVP set to 5066).	<Af Peer >	-	Cumulative Counter
rxAasUnknownSessionId	The number of AAAs sent indicating unknown session (Result-Code AVP set to 5002).	<Af Peer >	-	Cumulative Counter
rxAasUpdateEmergencyTooBusy	The number of AAAs update for emergency services sent indicating too busy (Result-Code AVP set to 3004).	<Af Peer >	-	Cumulative Counter
rxAasUpdateMultimediaPriorityTooBusy	The number of update AAAs sent for Multimedia Priority Services indicating too busy (Result-Code AVP set to 3004).	<Af Peer >	-	Cumulative Counter



Table 3 Rx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
rxAasUpdateTooBusy	The number of AAAs update sent indicating too busy (Result-Code AVP set to 3004).	<Af Peer >	-	Cumulative Counter
rxAarsAfSignalling	The number of AARs received to establish or modify an AF signalling session. The SAPC also increments rxAarsInit or rxAarsUpdate measure, respectively.	<Af Peer >	-	Cumulative Counter
rxAarsInit	The number of AARs received for AF session creation. Incremented for AARs received with Rx-Request-Type set to INITIAL_REQUEST (0) or for AARs without Rx-Request-Type AVP that create the AF session.	<Af Peer >	-	Cumulative Counter
rxAarsMultimediaPriority	The number of initial or update AARs received for Multimedia Priority Services.	<Af Peer >	-	Cumulative Counter
rxAarsUpdate	The number of AARs received for AF session update. Incremented for AARs received with Rx-Request-Type set to UPDATE_REQUEST (1) or for AARs without Rx-Request-Type that modify an existing AF Session.	<Af Peer >	-	Cumulative Counter
rxAsasAfSignallingSuccess	The number of ASAs received indicating successful reception of the request to abort an AF signalling session (Result-Code AVP set to 2001). The SAPC also increments rxAsasSuccess measure.	<Af Peer >	-	Cumulative Counter
rxAsasFailed	The number of ASAs received indicating not success (Result-Code AVP set to a value different than 2001).	<Af Peer >	-	Cumulative Counter
rxAsasSuccess	The number of ASAs received indicating success (Result-Code AVP set to 2001).	<Af Peer >	-	Cumulative Counter





Table 3 Rx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
rxAsrs	The number of ASRs sent.	<Af Peer >	-	Cumulative Counter
rxAsrsAfSignalling	The number of ASRs sent to abort an AF signalling session. The SAPC also increments rxAsrs measure.	<Af Peer >	-	Cumulative Counter
rxAsrsTimeout	The number of ASRs that did not reach the peer.	<Af Peer >	-	Cumulative Counter
rxRaasFailed	The number of RAAs received indicating not success (Result-Code AVP set to a value different than 2001).	<Af Peer >	-	Cumulative Counter
rxRaasSuccess	The number of RAAs received indicating success (Result-Code AVP set to 2001).	<Af Peer >	-	Cumulative Counter
rxRars	The number of Rx RARs sent.	<Af Peer >	-	Cumulative Counter
rxRarsTimeout	The number of RARs that did not reach the peer.	<Af Peer >	-	Cumulative Counter
rxStasAfSignallingSuccess	The number of STAs sent indicating successful termination of an AF signalling session (Result-Code AVP set to 2001). The SAPC also increments rxStasSuccess measure.	<Af Peer >	-	Cumulative Counter
rxStasSuccess	The number of STAs sent indicating success (Result-Code AVP set to 2001).	<Af Peer >	-	Cumulative Counter
rxStasTooBusy	The number of STAs sent indicating too busy (Result-Code AVP set to 3004).	<Af Peer >	-	Cumulative Counter
rxStasUnknownSessionId	The number of STAs sent indicating unknown session (Result-Code AVP set to 5002).	<Af Peer >	-	Cumulative Counter



Table 3 Rx Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance <sup>(1)</sup>	Alarm Id	Measurement Type
rxStrs	The number of STRs received.	<Af Peer>	-	Cumulative Counter
rxStrsAfSignalling	The number of STRs received to terminate an AF signalling session. The SAPC also increments rxStrs measure.	<Af Peer>	-	Cumulative Counter

(1) The peer identifier is the value received from the AF in Origin-Host AVP

## 2.3 Sy Protocol Measures

The following table describes measures provided by the SAPC belonging to the measure group: "policyControlFunctionSyMeasuresGroup".

Table 4 Sy Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
sySlasFailed	The number of SLAs received indicating not success (Result-Code AVP set to a value different than 2001).	<OCS Peer>	-	Cumulative Counter
sySlasSuccess	The number of SLAs received indicating success (Result-Code AVP set to 2001).	<OCS Peer>	-	Cumulative Counter
sySlrs	The number of SLRs sent.	<OCS Peer>	-	Cumulative Counter
sySlrsTimeout	The number of SLRs that did not reach the peer.	<OCS Peer>	-	Cumulative Counter
sySnasFailed	The number of SNAs sent indicating not success (Result-Code AVP set to a value different than 2001).	<OCS Peer>	-	Cumulative Counter



Table 4 Sy Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
sySnasSuccess	The number of SNAs sent indicating success (Result-Code AVP set to 2001).	<OCS Peer>	-	Cumulative Counter
sySnasTooBusy	The number of SNAs sent indicating too busy (Result-Code AVP set to 3004).	<OCS Peer>	-	Cumulative Counter
sySnrs	The number of SNRs received.	<OCS Peer>	-	Cumulative Counter
syStasFailed	The number of STAs received indicating not success (Result-Code AVP set to a value different than 2001).	<OCS Peer>	-	Cumulative Counter
syStasSuccess	The number of STAs received indicating success (Result-Code AVP set to 2001).	<OCS Peer>	-	Cumulative Counter
syStrs	The number of STRs sent.	<OCS Peer>	-	Cumulative Counter
syStrsTimeout	The number of STRs that did not reach the peer.	<OCS Peer>	-	Cumulative Counter

**Note:** When the SAPC sends an SLR but does not receive the corresponding SLA after a time-out, it increases sySlrs and sySlasFailed counters. In this case, the SAPC uses Destination-Realm value as MOI, because Origin-Host value of the SLA is not known (SLA message is not received).

## 2.4 Smp Protocol Measures

The following table describes the measures provided by the SAPC belonging to the measure group: "policyControlFunctionSxMeasuresGroup".



Table 5 Smp Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
sxCcasInitDropSxSession	The number of initial CCAs sent indicating drop Sx session (Result-Code AVP set to 4011).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasInitFailed	The number of initial CCAs sent indicating not success (Result-Code AVP set to value different than 2001).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasInitInvalidAvp	The number of initial CCAs sent indicating invalid AVP (Result-Code AVP set to 5004).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasInitMissingAvp	The number of initial CCAs sent indicating missing AVP (Result-Code AVP set to 5005).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasInitSuccess	The number of initial CCAs sent indicating success (Result-Code AVP set to 2001).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasInitTooBusy	The number of initial CCAs sent indicating that Diameter peer is too busy (Result-Code AVP set to 3004).	<SGSN-MME Peer>	Major Type: 193 Minor Type: 7077901	Cumulative Counter
sxCcasInitUnableToComply	The number of initial CCAs sent indicating unable to comply (Result-Code AVP set to 5012).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasInvalidInfo	The number of CCAs sent indicating errors (Result-Code AVP set to 5004, 5005, 5007 or 5008) owing to: An AVP is missing, an AVP does not have the correct value.	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasSuccess	The number of CCAs sent indicating success (Result-Code AVP set to 2001).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasTerminateSuccess	The number of termination CCAs sent indicating success (Result-Code AVP set to 2001).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcasUnknownSession	The number of CCAs sent indicating unknown session (Result-Code AVP set to 5002).	<SGSN-MME Peer>	-	Cumulative Counter



Table 5 Smp Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
sxCcasUpdateSuccess	The number of update CCAs sent indicating success (Result-Code AVP set to 2001).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcrsInit	The number of initial CCRs received (CC-Request-Type AVP set to value INITIAL).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcrsTerminate	The number of termination CCRs received (CC-Request-Type AVP set to value TERMINATION).	<SGSN-MME Peer>	-	Cumulative Counter
sxCcrsUpdate	The number of update CCRs received (CC-Request-Type AVP set to value UPDATE).	<SGSN-MME Peer>	-	Cumulative Counter

## 2.5 Sd Protocol Measures

The following table describes the measures provided by the SAPC belonging to the measure group: "policyControlFunctionSdMeasuresGroup".

Table 6 Sd Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
sdAdcStartEvents	The number of ADC start events received through Sd.	<TDF Peer>	-	Cumulative Counter
sdAdcStopEvents	The number of ADC stop events received through Sd.	<TDF Peer>	-	Cumulative Counter
sdCcasInvalidInfo	The number of CCAs sent indicating errors (Result-Code AVP set to 5004 or 5005). Incremented when receiving a message with a missing AVP or an AVP that does not have the correct value.	<TDF Peer>	-	Cumulative Counter



Table 6 Sd Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
sdCcasSuccess	The number of CCAs sent indicating success (Result-Code AVP set to 2001).	<TDF Peer>	-	Cumulative Counter
sdCcasTerminateSuccess	The number of termination CCAs sent indicating success (Result-Code AVP set to 2001).	<TDF Peer>	-	Cumulative Counter
sdCcasUnableToComply	The number of CCAs sent indicating unable to comply (Result-Code AVP set to 5012).	<TDF Peer>	-	Cumulative Counter
sdCcasUnknownSession	The number of CCAs sent indicating unknown session (Result-Code AVP set to 5002).	<TDF Peer>	-	Cumulative Counter
sdCcasUpdateSuccess	The number of update CCAs sent indicating success (Result-Code AVP set to 2001).	<TDF Peer>	-	Cumulative Counter
sdCcasUpdateTooBusy	The number of update CCAs sent indicating too busy (Result-Code AVP set to 3004).	<TDF Peer>	-	Cumulative Counter
sdCcrsTerminate	The number of termination CCRs received (CC-Request-Type AVP set to value TERMINATION).	<TDF Peer>	-	Cumulative Counter
sdCcrsUpdate	The number of update CCRs received (CC-Request-Type AVP set to value UPDATE).	<TDF Peer>	-	Cumulative Counter
sdRaasFailed	The number of RAAs received indicating not success (Result-Code AVP set to a value different than 2001).	<TDF Peer>	-	Cumulative Counter
sdRaasSuccess	The number of RAAs received indicating success (Result-Code AVP set to 2001).	<TDF Peer>	-	Cumulative Counter
sdRaasUnknownSessionId	The number of RAAs received indicating unknown session (Result-Code AVP set to 5002).	<TDF Peer>	-	Cumulative Counter
sdRars	The number of RARs sent.	<TDF Peer>	-	Cumulative Counter



Table 6 Sd Protocol Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
sdRarsTimeout	The number of RARs that did not reach the peer.	<TDF Peer>	-	Cumulative Counter
sdTsasFailed	The number of TSAs received indicating not success (Result-Code AVP set to a value different than 2001).	<TDF Peer>	-	Cumulative Counter
sdTsasSuccess	The number of TSAs received indicating success (Result-Code AVP set to 2001).	<TDF Peer>	-	Cumulative Counter
sdTsrs	The number of TSRs sent.	<TDF Peer>	-	Cumulative Counter
sdTsrsTimeout	The number of TSRs that did not reach the peer.	<TDF Peer>	-	Cumulative Counter

## 2.6 Fair Usage Control Measures

The following table describes the measures provided by the SAPC belonging to the measure group: "policyControlFunctionFairUsageMeasuresGroup".

Table 7 Fair Usage Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
usageLimitSurpassed	The number of times a given usage limit is surpassed by a subscriber.	<PceF Peer>	Major Type: 193 Minor Type: 7077889	Cumulative Counter



## 2.7 Notification Measures

The following table describes measures provided by the SAPC belonging to the measure group: "policyControlFunctionNotificationsMeasuresGroup".

Table 8 Notification Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
smsNotificationsFailed	The number of SMS subscriber notifications not delivered to a SMS center. Increased when SMS notifications are generated at a higher rate than the SAPC can deliver.	<SMS Center Id>	-	Cumulative Counter
smsNotificationsSent	The number of SMS subscriber notifications successfully sent to a SMS destination. If the SMS notification message is fragmented, each SMS segment increments the value of this measure.	<SMS Destination IP>	-	Cumulative Counter
soapNotificationsFailed	The number of SOAP notifications not delivered to a web service end point. Increased when SOAP notifications are generated at a higher rate than the SAPC can deliver.	<Web Service Endpoint>	-	Cumulative Counter
soapNotificationsSent	The number of SOAP notifications successfully sent to a web service end point destination.	<Web Service Url>	-	Cumulative Counter

## 2.8 Capacity Measures

The following table describes measures provided by the SAPC belonging to the measure group: "policyControlFunctionCapacityMeasuresGroup".





Table 9 Capacity Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
afActiveSessions	The total number of simultaneous active AF sessions created through Rx.	Sessions	-	Gauge
afEmergencyActiveSessions	The total number of simultaneous active emergency AF sessions created through Rx.	Sessions	-	Gauge
afSignallingActiveSessions	The total number of simultaneous active AF signalling sessions.	Sessions	-	Gauge
fixedActiveSessions	The total number of simultaneous active fixed sessions. The SAPC counts as a fixed session an IP-CAN Session created via Gx, whose IP-CAN-Type is Non-3GPP-EPS and RAT-Type is WLAN, or IP-CAN-Type is DOCSIS or IP-CAN-Type is xDSL or IP-CAN-Type is FBA.	Sessions	-	Gauge
ipCanAuthenticatedEmergencyActiveSessions	The total number of simultaneous authenticated active emergency IP-CAN sessions. The SAPC counts as an authenticated session, sessions including Subscription-Id AVP.	Sessions	-	Gauge
ipCanUnauthenticatedEmergencyActiveSessions	The total number of simultaneous unauthenticated active emergency IP-CAN sessions. The SAPC counts as an unauthenticated session, sessions including Subscription-Id AVP missing.	Sessions	-	Gauge
mobileActiveSessions	The total number of simultaneous active mobile sessions. The SAPC counts as a mobile session an IP-CAN session created via Gx whose IP-CAN-Type is 3GPP-GPRS, WiMAX, 3GPP2, 3GPP-EPS. The SAPC also counts as mobile sessions, those whose IP-CAN-Type is Non-3GPP-EPS and RAT-Type is not WLAN.	Sessions	-	Gauge
sdActiveSessions	The total number of simultaneous active Sd sessions in the SAPC.	Sessions	-	Gauge



Table 9 Capacity Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
subscribers	The total number of subscribers provisioned in the SAPC internal database.	Subscribers	-	Gauge
sxActiveGlobalSessions	The total number of simultaneous global active Sx sessions in the SAPC.	Sessions	-	Gauge

## 2.9 Resources Measures

The following table describes measures provided by the SAPC related to resources consumption.

Table 10 Resources Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
CPULoad.Total	Total CPU usage (percentage).	<SAPC Cluster Node>	-	Gauge
Mem.PercentUsed	Used memory (percentage).	<SAPC Cluster Node>	-	Gauge

### 2.10 External Database Measures

The following table describes the measures provided by the SAPC belonging to the measure group: "policyControlFunctionExtDbMeasuresGroup".



Table 11 ExtDb Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
ldapModifyRequests	The number of LDAP modify requests sent to an LDAP peer.	<LDAP Peer URL>	-	Cumulative Counter
ldapModifyResponses Failed	The number of received unsuccessful LDAP modify responses. The SAPC considers an unsuccessful response any result code different than 'non-error' result codes (listed in RFC 4511, except noSuchObject (32)) or a modify request dropped due to time-out or TCP-RST conditions.	<LDAP Peer URL>	-	Cumulative Counter
ldapSearchRequests	The number of LDAP search requests sent to an LDAP peer.	<LDAP Peer URL>	-	Cumulative Counter
ldapSearchResponses Failed	The number of received unsuccessful LDAP search responses. The SAPC considers an unsuccessful response any result code different than 'non-error' result codes (listed in RFC 4511, except noSuchObject (32)) or a search request dropped due to time-out or TCP-RST conditions.	<LDAP Peer URL>	-	Cumulative Counter
soapExtDbNotificationResponsesFailed	The number of unsuccessful SOAP notification responses (HTTP result code 500) sent to the external database.	<Ext DB SOAP Peer>	-	Cumulative Counter
soapExtDbNotificationnsReceived	The number of SOAP notification requests received from the external database.	<Ext DB SOAP Peer>	-	Cumulative Counter
soapExtDbNotificationnsReceivedTooBusy	The number of SOAP notifications not processed due to overload protection.	<Ext DB SOAP Peer>	-	Cumulative Counter

## 2.11 EBM Measures

The following table describes measures provided by the SAPC belonging to the measure group: "policyControlFunctionEbmMeasuresGroup".



Table 12 EBM Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
ebmBusinessEvents	The number of EBM events generated by the SAPC.	<EBM ServerName>	-	Cumulative Counter
ebmBusinessEventsNotSent	The number of dropped EBM events due to EBM component queue size exceeded.	<EBM ServerName>	-	Cumulative Counter

## 2.12 Optional Measures

The following table describes measures provided by the SAPC belonging to the measure group: "policyControlFunctionOptionalMeasuresGroup". These measures are stopped by default.

Table 13 Optional Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
ipCanEmergencyActiveSessionsPerApn	The number of simultaneous active emergency IP-CAN sessions established per APN.	<APN Id>	-	Gauge
ipCanUnknownEmergencyActiveSessions	The total number of simultaneous authenticated emergency IP-CAN sessions for subscribers not found in the SAPC.	Sessions	-	Gauge

To activate these measures, follow the procedure [Start Measurement Collection Job](#), using their respective PmJobs:

- policyControlFunctionIpCanEmergencyActiveSessionsPerApnJob.
- policyControlFunctionIpCanUnknownEmergencyActiveSessionsJob.

**Note:** The ipCanUnknownEmergencyActiveSessions measure will be fully operational after activation when previous emergency sessions are terminated. In the meantime, these values might be imprecise.



## 2.13 REST Provisioning Measures

The following table describes measures provided by the SAPC belonging to the measure group: "policyControlFunctionRestProvMeasuresGroup".

Table 14 REST Provisioning Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
restProvServiceUnavailable	The number of REST provisioning messages indicating too busy (HTTP status code set to 503).	<REST Client IP>	-	Cumulative Counter

## 2.14 Other Measures

The following table describes measures provided by the SAPC belonging to the measure group: "policyControlFunctionOtherMeasuresGroup".

Table 15 Other Measures

Measure Name	Measure Meaning	Measured Object Instance	Alarm Id	Measurement Type
reauthsOnToDTooBusy	The number of Time of Day reauthorizations not processed due to overload protection.	TimeTrigger	-	Cumulative Counter
unknownSubscribers	The number of requests received from a traffic gateway with unknown subscriber identifier. These requests are only counted when there is not Unknown subscriber profile defined in the SAPC.	<PCEF Peer>	Major Type: 193 Minor Type: 7077892	Cumulative Counter

### 3 Measurements Configuration

COM PM Service provides an information model to allow configuration of performance management to specify the behavior of the related measures (for example, enabled measurements, granularity period).

A Performance Measurement Job is the process executed in the Network Element (NE) to either accumulate data or generate alarms:

- A Measurement Job is the process to accumulate measurement result data and assemble it for collection, inspection, or both. It can be defined either to collect the values for a Group of Measurement Types or to collect the value of a specific Measurement Type.
- A Threshold Job is the process to monitor for surpassed thresholds. When a threshold is surpassed, a notification (alarm or alert) is issued. A Threshold Job does not generate any measurement data.

For more information related to managing operations, refer to **Configuration Management** chapter in *Performance Management*.

To ease the operation, the SAPC provides (at installation time) the jobs needed to collect all the SAPC performance management measures and raise threshold-related alarms. The following figure shows a summary of the SAPC performance default configuration.

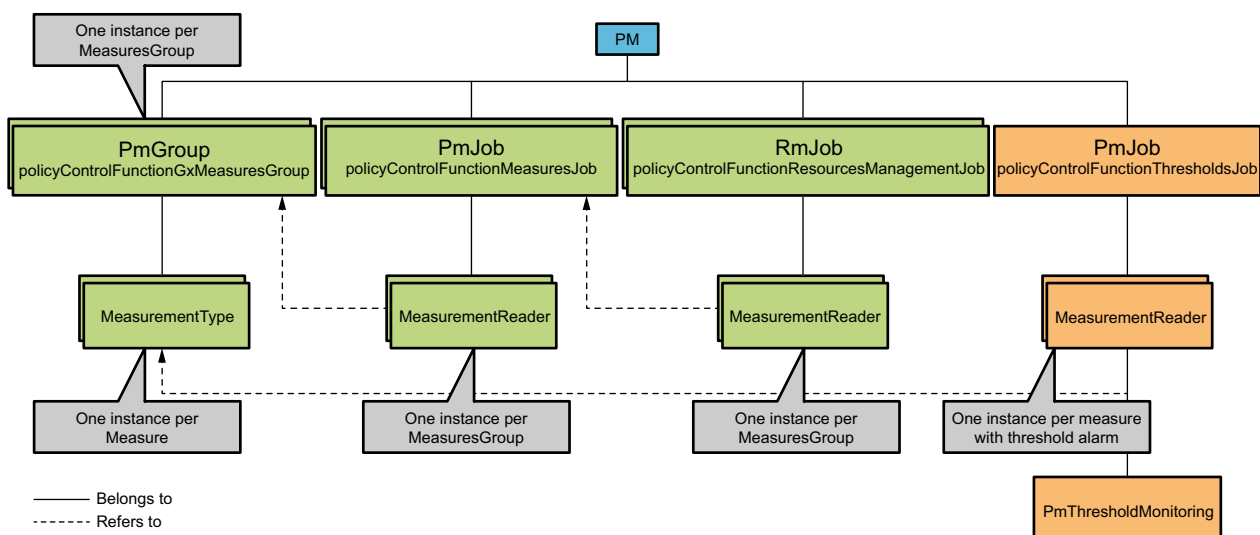


Figure 1 The SAPC Performance Management Instances

For details, look for SapcInstancesCounters inside Managed Object Model (MOM).



## 3.1 Managing Measurement Collection

At deployment time, to be easier to use, the SAPC provides all measurement collection jobs active, except the ones related to Section 2.12 Optional Measures on page 22

To stop the collection of the SAPC measures, follow the procedure in [Stop Measurement Collection Job](#).

## 3.2 Managing Threshold Monitoring

PM generates alarm notifications when threshold monitoring is activated.

The following cases can happen:

- A new alarm is raised when an alarm criteria is fulfilled and no alarm is active for the measured instance.
- A changed alarm notification is sent (for example, change the alarm severity), at the end of the GP, when a new alarm criteria is fulfilled while an alarm is active
- A cleared alarm notification is sent, at the end of the GP, when all alarms clear criteria is fulfilled

`PmThresholdMonitoring` defines two threshold values, low and high. This can be used to define a hysteresis for the corresponding alarm. If the threshold direction (refer to `MeasurementType`) is `INCREASING` and the measurement value at the end of the granularity period is higher than the high threshold, the alarm is newly raised or changed. If the value is lower than the low threshold, the alarm is cleared or changed. For threshold direction `DECREASING`, the opposite applies.

Threshold monitoring can be used with both Cumulative Counters (CC) and Gauges. However, the measurement value in the threshold parameters (`thresholdHigh`, `thresholdLow` of `PmThresholdMonitoring`) is defined in different ways:

- Gauge: an absolute value.
- Cumulative counter: rate of variation per granularity period.

An example describing 3 consecutive granularity periods with the following values:

```
thresholdHigh=600
thresholdLow=300
granularity period = 5 minutes (300 seconds)
```

- 1 Granularity Period 1: The counter value is 601 (or higher value): the alarm is raised



- 2 Granularity Period 2: The counter value is 450: the alarm is kept
- 3 Granularity Period 3: The counter value is 299 (or lower value): the alarm is cleared

To ease the operation, the SAPC provides (at installation time) the threshold monitors ACTIVE, configured with thresholdHigh=600, thresholdLow=300 (and granularity period set to 5 minutes).

To stop the collection of the SAPC threshold monitors, follow the procedure in Stop Threshold Monitoring Job.





## 4 Performance Measurement Reports

To collect the Performance Measurement Report files from an external system, use SFTP as explained in [System Administrator Guide](#).

Once the measurement jobs are set up, CoreMW is responsible for collecting the measurement results for every job. Once the results are ready, at the end of the granularity period of every measurement job, the COM PM functionality writes results into Result Output Period (ROP) report files.

The ROP files are XML files compliant with the 3GPP TS 32.432. The file format for XSD-based XML PM report files generated is A.2 in 3GPP TS 32.435, refer to [Performance Management Report File Format](#), which means that it uses the optional positioning attributes on measurement types and results.

To ease the tracking between the column titles of the tables stated in Section 2 on page 2 and the corresponding XML elements within reported files where the SAPC measures are produced, see following table for the most significant elements:

Table 16 The SAPC Measure Table Contents vs Reported Data XML Elements

SAPC Measure Table Contents	XML Element	Examples
Measure Group	measInfoId	<measInfo measInfoId="policyControlFunctionGxMeasuresGroup">
Measure Name	measType	<measType p="1">gxCcasInitSuccess</measType>
Measure Value	measValue	<measValue measObjLdn="PolicyControlFunction=1,Network=1,DiameterNodes=1,DiameterNode=ggsn2NodeHostname.ggsn2NodeHostRealm.com"> <r p="1">546</r></measValue>

**Note:** If the job is active, the report files are always generated. But, if the measure is not increased, it does not appear in the report file.