

SAPC 16B to SAPC 1 Network Impact Report

Ericsson Service-Aware Policy Controller

Network Impact Report

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Contents

1	SAPC 16B to SAPC 1 Network Impact Report Introduction	1
2	General Impact	2
2.1	Capacity and Performance	2
2.2	Implementation	5
2.3	Platform	6
2.4	PNF Architecture	6
2.5	VNF Architecture	7
2.6	Upgrade	7
2.7	Interface	8
2.8	Operation	14
2.9	IP Network Design	31
2.10	Other Network Elements	32
3	Additional Information	33
3.1	Subscription Management	33
3.2	Fair Usage Management	33
3.3	QoS Profile Management	33
3.4	Database Access Management	33
3.5	Policy Management	33
3.6	Time Management	38
4	Impact on Value Packages	40
4.1	Base Package	40
4.2	Business Intelligence	44
4.3	Convergence	45
4.4	High Availability and Pooling	45
4.5	Monetize OTT	46
4.6	Money Aware	47
4.7	Network Assurance	47
4.8	Network Efficiency	47
4.9	Smart Personalized Broadband	49
4.10	Voice Optimization	51
4.11	5G EPC	53





1 SAPC 16B to SAPC 1 Network Impact Report Introduction

This Network Impact Report describes how the current release of the SAPC 1 affects the previous release of the SAPC 16B CP04 and the operators overall network, including all affected functions.

Unless it is stated, this NIR covers both SAPC 16B CP04 to SAPC 1 (PNF), and SAPC 16B CP04 to SAPC 1 (VNF).

Note: The adoption of Ericsson SW Model is a requirement before upgrading to SAPC 1.

The purpose of this document is to provide information at an early stage to Ericsson system operators to help them plan the introduction of the SAPC 1 and upgrade their networks.

This document is a living document and is subject to change during the development of the new release. Therefore, part of the information may be incomplete or unavailable until General Availability (GA) of the SAPC 1 release.



2 General Impact

Next sections give information about the SAPC characteristics and describes the differences between SAPC 1 deployed as PNF and SAPC 16B CP04 in terms of subscriber capacity, network performance, and memory consumption. Figures given along this document are based on preliminary characteristics measurements on SAPC 1.

Information is provided for the network scenarios, traffic models, and configurations detailed in *SAPC 1 Network Impact Report*.

2.1 Capacity and Performance

2.1.1 PNF Subscriber Capacity and Network Performance

The following tables show the maximum Subscriber Capacity and the maximum Transactions Per Second of SAPC 1 per each network scenario. The number of TPS supported for all releases of the Gx interface when executing similar functions is about the same.

The concept of Transaction in this document means a service request and the corresponding reply. The related capacity term is Transactions Per Second (TPS).

PNF BSP 8100 HW

Table 1 Scenario A: Gx, QoS

Scenario A	2 TP	10 TP	20 TP	45 TP
Millions of Subscribers	8.1	81.5	159.1	327.9
Transactions Per Second	1600	16168	31564	65038
PDP Sessions (thousands)	2823	28531	55700	114772

Table 2 Scenario B1: Gx, QoS, Usage Reporting

Scenario B1	2 TP	10 TP	20 TP	45 TP
Millions of Subscribers	5.7	57.5	115.3	237.5
Transactions Per Second	1240	12534	25109	51738



Scenario B1	2 TP	10 TP	20 TP	45 TP
PDP Sessions (thousands)	1993	20145	40354	83150

Table 3 Scenario F: LTE/EPC Solution

Scenario F	2 TP	10 TP	20 TP	45 TP
Millions of Subscribers	5.2	52.6	111.8	259.9
Transactions Per Second	890	9000	19136	44477
Number of Gx sessions (thousands)	3643	36816	78283	181951

Table 4 Scenario F1: IMS VoLTE Solution

Scenario F1	2 TP	10 TP	20 TP	45 TP
Millions of Subscribers	1.5	10.9	20.7	42.6
Transactions Per Second	1497	10946	20798	42855
Number of Gx sessions (thousands)	1043	7622	14482	29841
AF Sessions (thousands)	37	272	517	1067

PNF NSP 6.1 HW

Table 5 Scenario A: Gx, QoS

Scenario A	2 TP	10 TP	20 TP	45 TP
Millions of Subscribers	1.6	29.1	56.5	119.7
Transactions Per Second	323	5769	11215	23741
PDP Sessions (thousands)	571	10181	19792	41896

Table 6 Scenario B1: Gx, QoS, Usage Reporting

Scenario B1	2 TP	10 TP	20 TP	45 TP
Millions of Subscribers	1.1	16.6	36.1	84.5
Transactions Per Second	251	3628	7850	18406
PDP Sessions (thousands)	403	5831	12617	29581

Table 7 Scenario F: LTE/EPC Solution

Scenario F	2 TP	10 TP	20 TP	45 TP
Millions of Subscribers	1.1	15.2	32.9	77.2
Transactions Per Second	180	2605	5637	13215
Number of Gx sessions (thousands)	736	10657	23059	54062

Table 8 Scenario F1: IMS VoLTE Solution

Scenario F1	2 TP	10 TP	20 TP	45 TP
Millions of Subscribers	0.7	5.4	10.3	21.3
Transactions Per Second	745	5457	10368	21363
Number of Gx sessions (thousands)	519	3800	7219	14875
AF Sessions (thousands)	18	135	258	531

External Database Access

The impact of storing subscriber profiles in an external database is determined by the performance of the external database, the parts of the subscriber profile externally stored and the operator data model. According to estimations, the impact in performance using LDAP interface is as follows:

- 15% reduction in the number of TPS supported, when both subscriber profile and usage accumulators are stored in external database, which needs a write operation to external database.



- 10% reduction in the number of TPS supported, when no accumulators are stored in the external database.

Mobility Based Policy for Overlay Deployments

Smp is a new interface that requires dimensioning. This feature has no impact in the performance for those scenarios where the Smp interface is not used. The performance of the Smp operations is better than the performance of Gx operations as the functionality provided is lighter.

The impact on the performance of the feature mostly depends on:

- Subscribers that are using the Smp interface.
- Traffic model: the frequencies of some operations can become high depending on especially those related to location change.

2.1.2 PNF Memory

No information is available for this document release.

2.1.3 VNF Subscriber Capacity, Network Performance, and Memory

For performance information of the SAPC 1 deployed as VNF, refer to *SAPC 1 Network Impact Report*.

2.2 Implementation

2.2.1 PNF Implementation

The SAPC 1 introduces new provisioning and configuration databases available through new interfaces. As a consequence, it is not possible to provide a direct upgrade from SAPC 16B CP04 to SAPC 1 PNF. The SAPC 16B to SAPC 1 upgrade implies a SW reinstallation. The procedure also includes data migration.

The overall reinstallation time and out-of-service impact depends on the execution time of the project.

2.2.2 VNF Implementation

The SAPC 1 VNF deployments are considered new network deployments. No upgrade alternative is available in such case.



2.3 Platform

The SAPC 1 platform capabilities are provided by a set of Ericsson Component Based Architecture (CBA) common components. This CBA-based platform replaces Telecom Server Platform (TSP) functions offered under SAPC 16B CP04.

To review the list of the common components provided with SAPC 1 refer to the [Technical Product Description](#).

SAPC 1 provides a merged SW upgrade, meaning that application and common components can be upgraded at the same time.

2.4 PNF Architecture

The SAPC PNF architecture is based on the following function elements:

- System Controllers (SCs): Virtual Machines (VMs) executed on top of a virtualized environment based on KVM providing the SAPC OAM and provisioning services.
- Traffic Payloads (PLs): Native Physical processors providing the SAPC traffic interface and traffic processing capabilities. Diameter traffic processing is distributed among all Traffic Payloads in the cluster based on the session-id AVP, not based on the UE IP address.

For more information, refer to [Availability and Scalability](#).

2.4.1 PNF Supported HW

2.4.1.1 Supported HW When Upgrading from SAPC 16B CP04

To facilitate SAPC 1 adoption by current SAPC 16B CP04 customers, existing installed base HW is supported:

- NSP 6.1
- BSP 8100

2.4.1.2 Additional PNF Supported HW

The SAPC 1 can be deployed in any COTS HW fulfilling at least the minimum HW requirements listed in [Technical Product Description](#).

2.4.1.3 PNF HW Not Supported

- NSP 6.0



2.5 VNF Architecture

The SAPC 1 VNF architecture consists of several Virtual Machines (VMs) taking different function roles:

- System Controllers (SCs): Virtual Machines (VMs) executed on top of a virtualized environment based on KVM providing the SAPC OAM and provisioning services.
- Traffic Payloads (PLs): VMs providing the SAPC traffic interface and traffic processing capabilities. Diameter traffic processing is distributed among all Traffic Payloads in the cluster based on the session-id AVP, not based on the UE IP address.
- Virtual Router (VR): VMs providing the Virtual Routing Service.

For more information, refer to [SAPC VNF Network Configuration Guide and Availability and Scalability](#).

2.5.1 VNF Infrastructure

The SAPC 1 can be deployed as VNF on top of either OpenStack or VMware based NFVI.

2.6 Upgrade

Upgrade procedure in SAPC 1 improved providing:

- Merged SW upgrade, meaning that application and common components are upgraded at the same time and for all scenarios.
- Automatic update of configuration files.
- Automatic update of Diameter dictionary files.
- Automatic update of PM (counters and threshold alarms).
- Automatic update of preconfigured entities.
- Upgrade traces for troubleshooting purposes.

For the SAPC PNF upgrade, if the hardware used is NSP 6.1 with GEP3 blades, the validated and mandatory GEP3 firmware version to ensure a successful upgrade is R11A or later.

The GEP3 firmware version must be updated as a pre-upgrade step.



2.7 Interface

This section describes interface changes between SAPC 16B CP04 and SAPC 1 common functions. Specific impacts on functions detailed as not available or phased-out in [Impact on Value Packages](#) on page 40, are not covered in this section.

2.7.1 Traffic Interfaces

The impacts on traffic interfaces are summarized for in [Table 9](#) and [Table 10](#).

Table 9 Impacts on Traffic Interfaces

Interface	Nodes	Impact
EBM	SAPC<-->EBM server	Major: Impacts detailed below.
ESy	SAPC<-->Ericsson Charging System	No impact
Gx	SAPC<-->PCEF	Major: Impacts detailed below.
Gx+	SAPC<-->Ericsson PCEF	Major: —Gx+ Rel7 and Gx+ Rel8 support is phased-out.
LDAP	SAPC<-->External Database	Minor: —If the External Database reports LDAP Error Code 51 as response to an LDAP query, DIAMETER_TOO_BUSY (3004) is returned over the Gx interface. The SAPC can use the especial unknown subscriber, and then returns DIAMETER_SUCCESS (2001). The unknown subscriber must be provisioned in the SAPC as explained in Database Access
Rx	SAPC<-->AF	Major: Impacts detailed below.
SMPP	SAPC<-->SMS Center	No impact
SOAP Incoming Notification Web Services	SAPC<-->External Database	Minor —When the SAPC is overloaded, it rejects the incoming SOAP notification messages to reduce its



Interface	Nodes	Impact
		load answering with an HTTP Server Error.
SOAP	SAPC<->SOAP Notification Server SAPC<->BBSC	No impact
Sy	SAPC<->OCS	No impact
Sx	SAPC<-> SGSN-MME	Major: This interface has been renamed to Smp. See Smp impacts detailed below.
Sd	SAPC<->TDF	Major: New interface in SAPC 1.

Diameter Base Protocol Impacts

- SAPC Diameter Base Protocol Errors not supported:
DIAMETER_LIMITED_SUCCESS (2002),
DIAMETER_UNABLE_TO_DELIVER (3002),
DIAMETER_REALM_NOT_SERVED (3003).

SCTP Impacts

SCTP bundling is disabled (default value at installation time). So, the SAPC sends Diameter outgoing messages over SCTP faster.

EBM Impacts

The Event-Based Monitoring (EBM) interface has the following impact on SAPC 1:

- BEARER_MBR_UL, BEARER_MBR_DL, BEARER_GBR_UL, and BEARER_GBR_DL change the Type and Value Range from UINT: 24 bits to UINT: 32 bits.

Gx Impacts

The 3GPP Gx interface has the following impacts on SAPC 1:

- SAPC supports Gx Rel9 version 9.7.0 or higher versions.
- Gx Rel7 and Gx Rel8 support is phased-out. If the PCEF requests session establishment with Gx interface Release 8 or previous, the SAPC returns the error code DIAMETER_INVALID_AVP_VALUE (5004).
- Gx Diameter Redirection Agent (DRA) functionality is not available.

- Credit-Control-Request (CCR):
 - Event-Trigger value not supported: CHARGING_CORRELATION_EXCHANGE.
 - 3GPP2-BSID AVP is not supported.
 - IP-CAN-Type AVP adds support for FBA value.
 - Access-Network-Charging-Identifier-Gx AVP is not supported.
 - The TWAN-Identifier, UE-Local-IP-Address, TCP-Source-Port, UDP-Source-Port AVPs are added.
 - Support added for bit 30 (Netloc-Untrusted-WLAN) in the Supported-Features AVP.
 - The TDF-Information AVP is added in CCR-Initial for the support of Sd for Application Detection and Control.
- Charging-Rule-Install AVP
 - Charging-Correlation-Indicator AVP is not supported.
- Charging-Rule-Definition AVP
 - Monitoring-Key AVP is not supported.
 - Flow-Description AVP uplink (direction 'in') inside Flow-Information AVP is not supported in Gx Rel9 versions 9.7.0 and higher. It is supported in Gx Rel9 versions 9.0.0 and 9.1.0.
 - Flow-Direction AVP is not supported in Gx Rel9 versions 9.0.0 and 9.1.0. It is supported in Gx Rel9 versions 9.7.0 and higher.

The support of Gx Rel9 versions 9.0.0 and 9.1.0 can be configured for each PCEF (see Configuration Guide for Access and Charging Control (Gx))
- Charging-Rule-Report AVP
 - Rule-Failure-Code AVP adds support of the following values: RATING_GROUP_ERROR (2), SERVICE_IDENTIFIER_ERROR (3), GWPCEF_MALFUNCTION (4), RESOURCES_LIMITATION (5), MAX_NR_BEARERS_REACHED (6), UNKNOWN_BEARER_ID (7), MISSING_BEARER_ID (8), MISSING_FLOW_INFORMATION (9), UNSUCCESSFUL_QOS_VALIDATION (11), INCORRECT_FLOW_INFORMATION (12), and NO_BEARER_BOUND (15).
- Application Detection and Control (ADC) error handling:



- When a CCR-U is received with APPLICATION_START or APPLICATION_STOP event trigger, but not Application-Detection-Information AVP or with Application-Detection-Information AVP but not TDF-Application-Identifier AVP inside, the SAPC returns a CCA with error code DIAMETER_MISSING_AVP (5005).
- When a CCR-U is received with APPLICATION_START or APPLICATION_STOP event trigger, with Application-Detection-Information AVP including a Flow-Information AVP, but no corresponding TDF-Application-Instance-Identifier AVP, the SAPC returns a CCA with error code DIAMETER_MISSING_AVP (5005).
- Emergency services error handling:
 - When the SAPC receives an initial CCR for an emergency session and the emergency subscriber is not provisioned, the SAPC processes the request (does not return DIAMETER_USER_UNKNOWN 5030).
- Re-Auth-Answer (RAA):
 - The IP-CAN-Type, RAT-Type, AN-Trusted, and AN-GW-Address AVPs add support for IP-CAN Type Change Notification.
- Re-Auth-Request (RAR):
 - The AF-Signalling-Protocol AVP is added.
 - Support added for bit 2 (ProvAFsignalFlow) in the Supported-Features AVP.

Rx Impacts

The Rx interface has the following impacts on SAPC 1:

- Rx Rel7 and Rx Rel8 support is phased-out.
 - If the AF only supports Rx Rel7 standard, and therefore the Supported-Features AVP is absent from the AAR command, the SAPC returns DIAMETER_MISSING_AVP (5005).
 - If the AF requests session establishment with Rx interface Rel 8 standard, the SAPC returns DIAMETER_INVALID_AVP_VALUE (5004).
- AA-Request (AAR):
 - If there are no policies defined in the SAPC to match the information received in the AA-Request command and classify the relevant dynamic services, then the SAPC responds to the AF with an AA-Answer command including the Experimental-Result-Code AVP set to the value REQUESTED_SERVICE_NOT_AUTHORIZED (5063).
 - Specific-Action AVP values CHARGING_CORRELATION_EXCHANGE (1) not supported.

- If an IMS emergency call binds to a non-emergency IP-CAN session, the SAPC does not ignore the value of Service-URN AVP.
 - Support added for bit 16 (Netloc-Untrusted-WLAN) in the Supported-Features AVP.
 - The AF-Signalling-Protocol AVP is added.
 - Support added for bit 2 (ProvAFsignalFlow) in the Supported-Features AVP.
 - Support added for the AF_SIGNALLING(2) value in the Flow-Usage AVP.
- Re-Auth-Request (RAR):
- Access-Network-Charging-Identifier AVP not supported.
 - The TWAN-Identifier, UE-Local-IP-Address, TCP-Source-Port, UDP-Source-Port AVPs are added.
 - AN-GW-Address AVP is supported.
- Session-Termination-Answer (STA):
- The TWAN-Identifier, UE-Local-IP-Address, TCP-Source-Port, UDP-Source-Port AVPs are added.

Smp Impacts

The Smp interface has the following impacts on SAPC 1:

- CCR not supported AVPs:
- Event-Trigger
 - Presence-Reporting-Area-Information
 - Session-Linking-Indicator
- CCA not supported AVPs:
- Event-Trigger
 - Presence-Reporting-Area-Information
- CCA modified AVPs
- MIP6-Agent-Info: multiple AVPs are supported
- RARs are not supported



- When a CCR-U or CCR-T is received, the SAPC does not perform any control. In case there is no error in the request it returns a CCA with result code DIAMETER_SUCCESS (2001)
- Unsupported result codes:
 - DIAMETER_LIMITED_SUCCESS (2002)
 - DIAMETER_UNABLE_TO_DELIVER (3002)
 - DIAMETER_REALM_NOT_SERVED (3003)
 - DIAMETER_AUTHORIZATION_REJECTED (5003)
- New result codes:
 - DIAMETER_CREDIT_CONTROL_NOT_APPLICABLE (4011)

Sd Impacts

The Sd interface is a new interface in SAPC 1 between the TDF and the SAPC to provide Application Detection and Control.

Table 10 Phased-out Traffic Interfaces

Interface	Nodes	Comments
Cisco SCE	SAPC<->Cisco SCE	
E4-HTTP	SAPC<->NASS	
Ericsson MASC	SAPC<->UE	
RADIUS	SAPC<->BNG	Fixed and convergence policy control is provided through Gx interface.
SMTP	SAPC<->SMTP server	
SQL	SAPC<->External Database	Integration with SQL External Database is not supported.

2.7.2 Operation and Maintenance Interfaces

The impacts on operation and maintenance interfaces are detailed in [Table 11](#) and [Table 12](#):

Table 11 Impacts on Operation and Maintenance Interfaces

Interface	Nodes	Impact
Ericsson Command-Line Interface (ECLI)	SAPC<->CLI Client	Major: The SAPC 1 uses ECLI to monitor the node and configure application data.

Interface	Nodes	Impact
NETCONF	SAPC<-->Management System	Major: The NETCONF interface is used for node configuration, offering a Managed Object Model (MOM).
REST API	SAPC<-->Provisioning System	Major: This is a new provisioning interface. The Ericsson Multi Activation (EMA) 16.2 CP1 supports the SAPC REST API. When the SAPC is overloaded, it rejects the incoming REST API messages to reduce its load answering with an HTTP Service Unavailable Error. The SAPC 1 uses REST API to query subscriber state, subscriber information and IMSI list.
SFTP	SAPC<-->Management System	No Impact.
SNMP	SAPC<-->SNMP Manager	Major: SNMPv1, SNMPv2c, SNMPv3, and the ERICSSON-ALARM-MIB – SNMP is used to report failures.

Table 12 Phased-out Configuration and Provisioning Interfaces

Interface	Nodes	Impact
LDAP LDAPs	SAPC<-->Node Configuration System / Operator	Configuration LDAP interface is replaced by a NETCONF interface.
LDAP LDAPs	SAPC<-->Provisioning System	Provisioning LDAP interface is replaced by a provisioning REST API.
SOAP Provisioning Web Service	SAPC<-->External application	Replaced by the provisioning REST API

2.8 Operation

2.8.1 Provisioning and Node Configuration

The SAPC 16B CP04 LDAP provisioning and configuration interface is deprecated. As a consequence, all LDAP-based operator provisioning configurations and node configurations must be adapted to support the SAPC 1 available provisioning and configuration data models through the new available interfaces.



2.8.1.1 Provisioning Impacts

The SAPC 1 provisioning (subscribers, groups, services, profiles, and policy-related data) is managed by a provisioning REST API. This document does not provide the mapping between the SAPC 16B CP04 provisioning LDAP objects and parameters and the SAPC 1 REST resources and JSON objects.

The SAPC 1 does not provide different levels of administrator profiles to handle provisioning data.

2.8.1.2 Node Configuration Impacts

The SAPC 1 node configuration is managed by the COM component which implements a manager-agent architecture. A detailed description for object and attributes can be found in [Managed Object Model \(MOM\)](#). The SAPC 1 node configuration data is accessed through the NETCONF interface or the ECLI.

This document does not provide the mapping between the SAPC 16B CP04 LDAP node configuration objects and parameters and the SAPC 1 MOM.

2.8.2 Performance Management

The SAPC 1 measures report file is based on 3GPP TS 32.435 v10.0.0, XSD type XML file format definition.

The main differences with SAPC 16B CP04 TSP nPMF XSD type XML (3GPP TS 32.435 v6.0.0) are the following:

- Newly supported XML elements and attributes: elementType, userLabel, swVersion, job, jobId, repPeriod, suspect, p, r, and measInfoId.
- XML element not supported: measResults.

DTD type XML file format support is phased-out in SAPC 1. XSD type XML must be used instead.

SAPC 1 does not push to an external system, the PM files. OSS/BSS has to pull the PM files, For more information refer to [SAPC Measurements](#).

2.8.2.1 Gx Protocol Measures

The SAPC 1 Gx protocol measure impacts are listed below. Compatible measures are listed in [Table 13](#) and new measures are listed in [Table 14](#)

For PCEF configured as clustered Diameter systems, the PCEF peer identifier reported as Measured Object Instance is the Origin-Host received from the PCEF, not the cluster pattern.

Table 13 SAPC 1 and SAPC 16B CP04 Gx Protocol Compatible Measures

SAPC 1 Name	SAPC 16B CP04 Name
gxAdcStartEvents	GxAdcStartEvents
gxAdcStopEvents	GxAdcStopEvents
gxCcasInitFailed	GxPdpActivatesFailed
gxCcasInitInvalidAvp	GxPdpActivatesInvalidAvpValue
gxCcasInitMissingAvp	GxPdpActivatesMissingAvpValue
gxCcasInitSuccess	GxPdpActivatesSuccess
gxCcasInitTooBusy	GxTooBusy
gxCcasInitUnableToComply	GxPdpActivatesUnableToComply
gxCcasInvalidInfo	GxInvalidInfo
gxCcasRejected	GxResponsesRejected
gxCcasSuccess	GxResponsesSent
gxCcasTerminateSuccess	GxPdpTerminatesSuccess
gxCcasUnableToComply	GxUnableToComply
gxCcasUnknownSession	GxUnknownSessions
gxCcasUpdateSuccess	GxPdpModifiesSuccess
gxCcrsInit	GxPdpActivates
gxCcrsTerminate	GxPdpTerminates
gxCcrsUpdate	GxPdpModifies
gxChargingCharsRequested	GxChargingCharsRequested
gxPushQosChange	GxPushQosChange
gxPushRulesInstallation	GxPushRulesInstallation
gxQosAccepted	GxQosAccepted
gxQosChanged	GxQosChanged
gxQosDowngraded	GxQosDowngraded
gxQosRequests	GxQosRequests
gxQosUpgraded	GxQosUpgraded
gxRaas	GxPdpReauthResponses
gxRaasFailed	GxPdpReauthFailed
gxRaasOutOfSpace	GxRaasOutOfSpace
gxRaasPendingTransaction	GxRaasPendingTransaction
gxRaasSuccess	GxPdpReauthSuccess
gxRaasUnableToDeliver	GxPdpReauthUnableToDeliver
gxRars	GxPdpReauthRequests



SAPC 1 Name	SAPC 16B CP04 Name
gxRarsTimeout	GxPdpReauthTimeout
gxRuleSpaceChanged	GxRuleSpaceChanged
gxRuleSpaceSuggestedRequests	GxRuleSpaceSuggestedRequests

Table 14 SAPC 1 Gx Protocol New Measures

SAPC 1 Name
gxCcasErrorInitialParameters
gxCcasInitEmergencyFailed
gxCcasInitEmergencySuccess
gxCcasInitEmergencyTooBusy
gxCcasInitMultimediaPriorityTooBusy
gxCcasTerminateTooBusy
gxCcasUpdateEmergencyTooBusy
gxCcasUpdateMultimediaPriorityTooBusy
gxCcasUpdateTooBusy
gxRaasUnknownSessionId

2.8.2.2

Rx Protocol Measures

The SAPC 1 Rx protocol measures impacts are listed below. Compatible measures are listed in [Table 15](#), new measures are listed in [Table 16](#) and measures not available in [Table 17](#).

Table 15 SAPC 1 and SAPC 16B CP04 Rx Protocol Compatible Measures

SAPC 1 Name	SAPC 16B CP04 Name
rxAaasInvalidInfo	RxAuthReqInvalidInfo
rxAaasServiceNotAuthorized	RxAuthReqServiceNotAuthorized
rxAaasSuccess	RxAuthResponses
rxAaasUnableToComply	RxAuthReqUnableToComply
rxAarsInit	RxAuthReqCreates
rxAarsUpdate	RxAuthReqModifies
rxAsrs	RxAbortRequests
rxRars	RxReauthRequests
rxStasSuccess	RxTerminateResponses
rxStasUnknownSessionId	RxTerminateUnknownSessions



SAPC 1 Name	SAPC 16B CP04 Name
rxStrs	RxTerminates

Table 16 SAPC 1 Rx Protocol New Measures

SAPC 1 Name
rxAaasAfSignallingSuccess
rxAaasFailed
rxAaasInitEmergencyFailed
rxAaasInitEmergencySuccess
rxAaasInitEmergencyTooBusy
rxAaasInitMultimediaPriorityFailed
rxAaasInitMultimediaPriorityTooBusy
rxAaasInitSuccess
rxAaasInitTooBusy
rxAaasIpSessionNotAvailable
rxAaasMultimediaPrioritySuccess
rxAaasUnauthorizedNonEmergency
rxAaasUpdateEmergencyTooBusy
rxAaasUpdateMultimediaPriorityTooBusy
rxAaasUpdateTooBusy
rxAarsAfSignalling
rxAarsMultimediaPriority
rxAsasAfSignallingSuccess
rxAsasFailed
rxAsasSuccess
rxAsrsAfSignalling
rxAsrsTimeout
rxRaasFailed
rxRaasSuccess
rxRarsTimeout
rxStasAfSignallingSuccess
rxStasTooBusy
rxStrsAfSignalling



Table 17 SAPC 16B CP04 Rx Protocol Measures Not Available in SAPC 1

SAPC 16B CP04 Name	Observation
RxAbortResponses	Equivalent to (rxAsasSuccess+ rxAsasFailed)
RxAuthIpCanNotAvailable	Not available
RxAuthReqTooBusy	Not available
RxAuthReqUnknownSessions	Not available
RxReauthResponses	Equivalent to (rxRaasSuccess+ rxRaasFailed)

2.8.2.3

Sy Protocol Measures

The SAPC 1 Sy protocol measures impacts are listed below. Compatible measures are listed in [Table 18](#), new measures are listed in [Table 19](#) and measures not available in [Table 20](#).

Table 18 SAPC 1 and SAPC 16B CP04 Sy Protocol Compatible Measures

SAPC 1 Name	SAPC 16B CP04 Name
sySlrs	SySubsChargingCreateRequests
sySnasFailed	SySubsChargingUpdateResponsesFailed
sySnasSuccess	SySubsChargingUpdateResponsesSuccess
sySnrs	SySubsChargingUpdateRequests
syStrs	SySubsChargingTerminateRequests

Table 19 SAPC 1 Sy Protocol New Measures

SAPC 1 Name
sySlasFailed
sySlasSuccess
sySlrsTimeout
sySnasTooBusy
syStasFailed
syStasSuccess
syStrsTimeout



Table 20 SAPC 16B CP04 Sy Protocol Measures Not Available in SAPC 1

SAPC 16B CP04 Name	Observation
SySubsChargingResponsesFailed	Equivalent to (sySlasFailed + syStasFailed)
SySubsChargingResponsesSuccess	Equivalent to (sySlasSuccess + syStasSuccess)

2.8.2.4 Smp Protocol Measures

Most of Smp measures of SAPC 16B CP04 are kept (exact name) in SAPC 1. The SAPC 1 Smp protocol measures impacts are listed below. New measures are listed in [Table 21](#) and measures not available in [Table 22](#).

Table 21 SAPC 1 Smp Protocol New Measures

SAPC 1 Name
sxCcasInitDropSxSession
sxCcasInitTooBusy
sxCcasInitUnableToComply

Table 22 SAPC 16B CP04 Smp Protocol Measures Not Available in SAPC 1

SAPC 16B CP04 Name	Observation
sxCcasRejected	Smp authorization not supported
sxCcasTooBusy	It can be derived from other measures
sxCcasUnableToComply	It can be derived from other measures
sxRaas	Smp RAR messages not supported
sxRaasFailed	Smp RAR messages not supported
sxRaasSuccess	Smp RAR messages not supported
sxRaasUnableToDeliver	Smp RAR messages not supported
sxRars	Smp RAR messages not supported
sxRarsTimeout	Smp RAR messages not supported

2.8.2.5 Sd Protocol Measures

The SAPC 1 Sd protocol measures impacts are listed below.



Table 23 SAPC 1 Sd Protocol New Measures

SAPC 1 Name
sdAdcStartEvents
sdAdcStopEvents
sdCcasInvalidInfo
sdCcasSuccess
sdCcasTerminateSuccess
sdCcasUnableToComply
sdCcasUnknownSession
sdCcasUpdateSuccess
sdCcasUpdateTooBusy
sdCcrsUpdate
sdCcrsTerminate
sdRaasFailed
sdRaasSuccess
sdRaasUnknownSessionId
sdRars
sdRarsTimeout
sdTsasFailed
sdTsasSuccess
sdTsrs
sdTsrsTimeout

2.8.2.6 REST Protocol Measures

The SAPC 1 REST protocol measure impact is listed below. A new measure is listed in [Table 24](#).

Table 24 SAPC 1 REST New Measure

SAPC 1 Name
restProvServiceUnavailable

2.8.2.7 Fair Usage Control Measures

The SAPC 1 fair usage control measures impacts are listed below. Compatible measures are listed in [Table 25](#).



Table 25 SAPC 1 and SAPC 16B CP04 Fair Usage Control Compatible Measures

SAPC 1 Name	SAPC 16B CP04 Name
usageLimitSurpassed	GxUsageLimitSurpassed

2.8.2.8

User Notification Measures

The SAPC 1 notification measures impacts are listed below. New notification measures are listed in [Table 26](#) and notification measures not available in [Table 27](#).

Table 26 SAPC 1 Notification New Measures

SAPC 1 Name
smsNotificationsFailed
smsNotificationsSent
soapNotificationsFailed
soapNotificationsReceivedTooBusy
soapNotificationsSent

Table 27 SAPC 16B CP04 Notification Measures Not Available in SAPC 1

SAPC 16B CP04 Name	Observation
EndUserNotificationsSent	Equivalent to (smsNotificationsSent + soapNotificationsSent)
EndUserNotificationsFailed	Equivalent to (smsNotificationsFailed + soapNotificationsFailed)

2.8.2.9

Capacity Measures

The SAPC 1 capacity measures impacts are listed below. Compatible capacity measures are listed in [Table 28](#), new capacity measures on [Table 29](#) and capacity measures not available in [Table 30](#).

Table 28 SAPC 1 and SAPC 16B CP04 Capacity Compatible Measures

SAPC 1 Name	SAPC 16B CP04 Name
afActiveSessions	ActiveAfSessions
mobileActiveSessions	ActiveMobileIpSessions



Table 29 SAPC 1 New Capacity Measures

SAPC 1 Name
afEmergencyActiveSessions
afSignallingActiveSessions
fixedActiveSessions
ipCanAuthenticatedEmergencyActiveSessions
ipCanEmergencyActiveSessionsPerApn
ipCanUnauthenticatedEmergencyActiveSessions
ipCanUnknownEmergencyActiveSessions
sdActiveSessions

Table 30 SAPC 16B CP04 Capacity Measures Not Available in SAPC 1

SAPC 16B CP04 Name
ActiveGxSessions

2.8.2.10 External Database Measures

The SAPC 1 external database measures impacts are listed below. New measures in [Table 31](#).

Table 31 External Database Measures

SAPC 1 Name
ldapModifyRequests
ldapModifyResponsesFailed
ldapSearchRequests
ldapSearchResponsesFailed
soapExtDbNotificationResponsesFailed
soapExtDbNotificationsReceived

2.8.2.11 EBM Protocol Measures

The SAPC 1 EBM measures impacts are listed in [Table 32](#).

Table 32 SAPC 1 and SAPC 16B CP04 EBM Protocol Compatible Measures

SAPC 1 Name	SAPC 16B CP04 Name
ebmBusinessEvents	EbmBusinessEvents



SAPC 1 Name	SAPC 16B CP04 Name
ebmBusinessEventsNotSent	EbmBusinessEventsNotSent

2.8.2.12

Other SAPC Measures

The SAPC 1 other SAPC measures impacts are listed below. Compatible measures are listed in [Table 33](#), new measures in [Table 34](#), and phased-out measures in [Table 35](#).

Table 33 SAPC 1 and SAPC 16B CP04 Other SAPC Compatible Measures

SAPC 1 Name	SAPC 16B CP04 Name
subscribers	Subscribers
unknownSubscribers	UnknownSubscribers

Table 34 SAPC 1 Other New Measures

SAPC 1 Name
reauthOnToDTooBusy

Table 35 SAPC 16B CP04 Other Measures Phased-Out in SAPC 1

SAPC 1 Name	Observation
ReauthsOnToDMissing	Phased-out: The ToD mechanism is enhanced so that reauthorizations are not lost.

2.8.2.13

Resources Measures

The SAPC 1 resource measures are listed in [Table 36](#). The SAPC 16B CP04 TSP per processor platform and OAM measures are not available.

Table 36 SAPC 1 Cluster Measures

SAPC 1 Name
CPUload.Total
Mem.PercentUsed

2.8.3

Alarms

The SAPC 1 alarm information model, configuration, and operation are described in [Fault Management](#). The SAPC 1 alarms follow the *Ericsson Alarm MIB*. This section compares both SAPC 16B CP04 and SAPC 1 based on the common *Specific Problem* Object type.



The SAPC 1 and the SAPC 16B CP04 equivalent alarms are listed in [Table 37](#), the SAPC 1 new alarms are listed in [Table 38](#), and the SAPC 16B CP04 alarms not available in SAPC 1 are listed in [Table 39](#).

The SAPC 16B CP04 TSP-related alarms are not available. To check additional SAPC 1 alarms introduced with the platform components, refer to the *Fault Management* folder in library.

Table 37 SAPC 1 and SAPC 16B CP04 Equivalent Alarms

SAPC 1 Alarm Specific Problem	SAPC 16B CP04 Alarm Specific Problem
License Management, Capacity Usage Threshold Reached ⁽¹⁾	Capacity License Exceeds Soft Limit
License Management, Capacity Usage Threshold Reached ⁽²⁾	Capacity License Reaches Hard Limit
Policy Control, Connection to Notification Server Failed	Communication Failure to Notification Server
Policy Control, EBM Buffer Overflow	EBM Buffer Overflow
Policy Control, EBM Communication Failure	EBM Communication Failure
Policy Control, External Repository Connection Failure	External Repository Connection Failure
Policy Control, Number of Gx Session Rejections Reached	Number of Gx Session Rejections Reached
Policy Control, Number of Rx Failed Sessions Reached	Number of Dynamic Service Rejections Reached
Policy Control, Number of Unknown Subscribers Reached	Number of Unknown Subscribers Reached
Policy Control, Number of Usage Limits Surpassed Reached	Number of Usage Limits Surpassed Reached

(1) Warning Severity

(2) Major Severity

Table 38 SAPC 1 New Alarms

SAPC 1 Alarm Specific Problem
Policy Control, Number of Gx CCAs Initial Sent Indicating Too Busy Reached
Policy Control, Number of AAAs Initial Sent Indicating Too Busy Reached
Policy Control, Geographical Redundancy Unable To Reach Peer
Policy Control, Number of Sx CCAs Initial Sent Indicating Too Busy Reached



Table 39 SAPC 16B CP04 Alarms Not Available in SAPC 1

SAPC 16B CP04 Alarm Specific Problem	Comments
Number of Missing Reauthorizations on ToD Reached	Phased-out: The ToD mechanism is enhanced so that reauthorizations are not lost.

2.8.4 Fault Management Notifications

The SAPC 1 notifications (stateless alarms compliant with *Ericsson Alarm MIB*) defined by the platform components, are described in the **Notifications** folder in CPI library.

The SAPC 16B CP04 notifications not available in SAPC 1 are listed in [Table 40](#).

The SAPC 16B CP04 TSP-related notifications are not available.

Table 40 SAPC 16B CP04 Notifications Not Available in SAPC 1

SAPC 16B CP04 Notifications
Diameter Peer Restarts, Deletion of Old Sessions Started ⁽¹⁾
Diameter Peer Restarts, Deletion of Old Sessions Finished ⁽²⁾

(1) Replaced by "Start deleting old sessions" log.

(2) Replaced by "End deleting old sessions" log.

2.8.5 Logging Events

The SAPC 1 logging events impacts are listed below. Compatible logging events are listed in [Table 41](#), new logging events are listed in [Table 42](#), and logging events available both in SAPC 1 and SAPC 16B CP04 are listed in [Table 43](#). The logging events not available in SAPC 1 are listed in [Table 44](#). For additional information, refer to [Logging Events](#).

Table 41 SAPC 1 and SAPC 16B CP04 Compatible Logging Events

SAPC 1 Event Name	SAPC 16B CP04 Event Name
AF Emergency Session established	AF Emergency Session
IP-CAN session exists	General PDP session exists
License error	License not active
SOAP Ext DB Notif not matching object for DN	SOAP external DB notification not matching object for DN



Table 42 SAPC 1 New Logging Events

SAPC 1 Event Name
AF Emergency Session terminated
Diameter incoming message discarded
Diameter peer node restarted
Discarded received usage
End deleting inactive sessions
End User Notification discarded
Error sending TSR
IMS Multimedia Priority Service
Geographical redundancy state changed
NetLoc information not received during AF session termination
Non-Persistent data storage empty
Notification Server Communication Error
SOAP external DB notification event not supported
Start deleting inactive sessions
Timeout receiving RAA
Timeout receiving SLA
Timeout receiving STA
Timeout receiving TSA
Unsuccessful RAA received
Unsuccessful SNA sent
Unsuccessful SLA received
Unsuccessful STA received
Unsuccessful TSA received
Unable to deliver End User Notification

Table 43 Logging Events Available Both in SAPC 16B CP04 and SAPC 1

SAPC 16B CP04 and SAPC 1 Event Name
Autoprovisioned subscriber
Configuration error
EBM mandatory parameter missed
End deleting old sessions



SAPC 16B CP04 and SAPC 1 Event Name
Error fetching data from external DB
Error sending ASR
Error sending CCA
Error sending RAR
Error sending SLR
Error sending SNA
Error sending STR
Error storing data into external DB
Existing IP Session removed
Internal error
Protocol error
Reset of accumulated usage data
Rule Installation Failure
Start deleting old sessions
STA sent ⁽¹⁾
Usage Limit Surpassed

(1) Warning log: If the SAPC does not receive Network Location Information. The Informational log is not available.

Table 44 SAPC 16B CP04 Logging Events Not Available in SAPC 1

SAPC 16B CP04 Event Name
AAA sent
AAR received
Active Subscriber Groups for Subscriber
AF Gating Change request
ASA received
ASR sent
Capacity license checked
CCA sent
CCR received
Charging Profile id obtained
Configuration and Provisioning data model installed
DBN error
Diameter Redirect Indication



SAPC 16B CP04 Event Name
Diameter stack installed successfully
EBM internal communication error
EBM internal overload
EBM invalid XML file
EBM XML file not found
Error installing Diameter stack
Error sending STA
Error sending subscriber notification
Incoming bearer QoS
Invalid license
License server cannot be contacted
Outgoing bearer QoS
Outgoing QoS per Rule
PCEF belongs to non-existing PCEF group
Policy data model installed
PRA status change
QoS Profile id obtained
RAA received
RAR sent
Received balance
Received usage
REST Operation Req failed
REST Operation Req received
REST Operation Resp sent
Rule to Install
Rule to Remove
SLA received
SLR sent
SNA sent
SNR received
SOAP Ext DB Notif for object not supported
SOAP Ext DB Notif received
SOAP Ext DB Notif received Event Type not supported
SOAP GetSubscribedGroups received



SAPC 16B CP04 Event Name
SOAP GetUsageInfo received
SOAP SetUsageLimits received
SOAP SubscribeToGroup received
STA received
STA sent
STR received
STR received
STR sent
Subscriber notification sent
Suggested RuleSpace changed
Unable to classify dynamic Service
Unsupported Bearer Type
Update Accumulated Usage Failed

2.8.6 Security Management

SAPC 1 does not support LDAP authentication.

2.8.7 Backup and Restore

The SAPC 1 backup and restore functions are provided by the Backup and Restore Management (BRM) Component. For details on the backup and restore operation procedures, refer to [Backup and Restore](#).

The SAPC 1 backup has been improved to remove dynamic information that is considered obsolete if restored. The database backup does not store the following information:

- IP-CAN sessions.
- Time Trigger events.

Only one URI is possible to be used by backup scheduler when automatically exporting a scheduled backup.

2.8.8 License Management

The SAPC 1 controls the activation of the purchased functionality by license keys using License Manager (LM) Common Component.



2.8.9 Geographical Redundancy

The SAPC 1 geographical redundancy function is based on the replication capability provided by the Database Service (DBS). Any data not stored in the DBS is not replicated. The following data is not stored in DBS and not replicated:

- The node configuration data that is provided through COM. Therefore, the configuration data must be provided to each SAPC node individually.
- The licensing information. Therefore license information must be managed in each SAPC individually.

The geographical redundancy function is managed using NETCONF or the ECLI. For additional details on the operation of geographical redundancy function, refer to [Geographical Redundancy](#) folder.

2.8.10 Graphical User Interface

The SAPC 1 introduces the following impacts on the graphical user interface:

- The Policy Studio replaces the Business Studio and SAPC GUI. For information, see [Policy Studio](#).
- The Ericsson NETCONF browser (ENB) presents configuration data graphically, allowing users to navigate the configuration structure and perform add, modify, and delete operations on configuration elements. The ENB is an Ericsson separate product not directly provided with the SAPC. For more information, refer to [Ericsson NETCONF Browser](#) documentation.
- The [Provisioning Tools](#) document provides an introduction to the Postman Chrome plug-in to interact graphically with the REST API.
- TSP-based Node Management Toolbox (and all its associated services including TelORB Manager, Alarm Viewer, Notification Viewer, Redundancy GUI, License Manager, and so on), Load Viewer tool, and Signaling Manager are not available.

2.9 IP Network Design

The SAPC 1 supports IPv6-only configuration in the external networks for OAM and signalling traffic that permits the communication with SAPC neighbors such as PCEFs, External Databases or Provisioning Systems for both VNF and PNF deployments.

For PNF, this does not include the hypervisor management network and the BSP Northbound OAM network for PNF deployments, that are supported only with IPv4.

For VNF, the IPv6-only configuration is supported only for deployments without Virtual Routers.



2.10 Other Network Elements

The SAPC 1 introduces the following impact in external database:

- The schema is updated with new attributes `OngoingSession` and `ClosedSession`

For information on SAPC 1 compatibility with other Ericsson products, refer to [Compatible Network Elements](#).



3 Additional Information

3.1 Subscription Management

The SAPC 1 impacts affecting Subscription management are the following:

- "Unknown" subscriber changed to "unknown".
- Special "Global" and "Autoprovisioned" dataplans (groups) changed to "global" and "auto" respectively.

3.2 Fair Usage Management

The SAPC 1 impacts affecting Fair Usage Management are the following:

- Special predefined value "_ReportingGroup_" is renamed "reporting-group".

3.3 QoS Profile Management

The QoS profile has been subdivided in SAPC 1 to differentiate bearer QoS profile (ip-can-session-qos) and service QoS profile (content-qos).

The 3GPP standard QoS Class Identifiers (QCI) defined for Vehicle-to-Everything (V2X) and low latency services are supported. A new optional parameter `resourceType` is added to the content-qos profile, to allow configuration of the QCI values as GBR or non-GBR.

3.4 Database Access Management

The Entity Data Sources are configured inside the SAPC 1 internal database, using COM class `EDSource` MOC. The list of preconfigured Entity Data Sources and its values are simplified in the SAPC 1 compared to the SAPC 16B CP04. The SAPC 16B CP04 Entity Data Sources extended by the operator, if any, have to be mapped to the SAPC 1 Entity Data Sources definition in the data migration service of the upgrade.

3.5 Policy Management

3.5.1 Policy Types

The SAPC 1 impacts affecting Policy Types are the following:



- The Policy Locator 'Action' concept is removed.
- Policy Locator 'Contexts', Policy Locator 'Resources' and Policy Locator 'Output Attributes' are modeled differently in REST provisioning API. The Policy Locator naming equivalences between SAPC 16B CP04 and SAPC 1 are summarized in [Table 45](#), [Table 47](#), and [Table 49](#). Refer to Configuration Guide for Subscription and Policies.
- Rule combining algorithms equivalences are summarized in [Table 51](#).

Table 45 SAPC 1 and SAPC 16B CP04 Policy Locator Context Equivalences

SAPC 1 Context	SAPC 16B CP04 Context
access	Access
adc-mute-notification	AdcMuteNotification
adc-redirect	AdcRedirect
autoprovisioning	Autoprovisioning
accumulation	Accumulation
charging	Charging
content-filtering	ContentFiltering
charging-system	ChargingSystem
event-triggers	EventTriggers
location	Location
notification	Notification
pdn-gw	PdnGw
qos	adcQoS
static-access	StaticAccess
service-classification	ServiceClassification
spid	Spid
subscription	Subscription
flexible-output	_ANY_

Table 46 SAPC 1 New Policy Locator Context

SAPC 1 Context
sx-session



Table 47 SAPC 1 and SAPC 16B CP04 Policy Locator Resource Equivalences

SAPC 1 Resource	SAPC 16B CP04 Resource
any	_ANY_
application	_Application_
ip-can-session	_Bearer_
service-domain	_ServiceDomain_
reporting-group	_ReportingGroup_

Table 48 SAPC 1 New Policy Locator Resource

SAPC 1 Resource
tdf-detected-application

Table 49 SAPC 1 and SAPC 16B CP04 Policy Locator Output Attributes Equivalences

SAPC 1 Output Attributes	SAPC 16B CP04 Output Attributes
adc-redirect	AdcRedirect
adc-mute-notification	AdcMuteNotification
BearerQosProfile ServiceQosProfile	QosProfile
charging	Charging
charging-system	ChargingSystem
content-filtering-id	ContentFilteringId
dataplan	Group
event-triggers	EventTriggers
deny	Deny
max-qos	max
min-qos	min
muted	Muted
notification	Notification
notification	NotifyMessage
pcc-rule-id	PccRuleId
pdn-gw-list	PdnGw
permit	Permit



SAPC 1 Output Attributes	SAPC 16B CP04 Output Attributes
presence-area	PresenceArea
qos	QoS
rule-space	RuleSpace
service	Service
spid	Spid
subs-charging	SubsCharging
unmuted	Unmuted

Table 50 SAPC 1 Policy Locator Output Attributes

SAPC 1 Output Attributes
adc-rule-id

Table 51 SAPC 1 and SAPC 16B CP04 Rule Combining Algorithms Equivalences

SAPC 1 Combining Algorithm	SAPC 16B CP04 Combining Algorithm
all-permit	AllPermit
deny-overrides	DenyOverrides
multiple-match	AllClassified_AllMatchedMultiple
permit-overrides	PermitOverrides
single-match	AllClassified_AllMatchedOnce

Table 52 SAPC 1 New Rule Combining Algorithm

SAPC 1 Combining Algorithm
any-match

3.5.2 Policy Tags

3.5.2.1 Tags Related to Access and Charging

- `AccessData.bearer.accessType` possible values changed to align them with RAT-Type AVP values.
- `AccessData.bearer.eventTriggers` return type changed to Multivalued Integer.



- `AccessData.bearer.ipCanType` adds support to FBA as possible value.
- `AccessData.bearer.usage` not supported.
- `AccessData.host.group` not supported.
- `AccessData.subscriber.locationInfo.presenceReportingArea["presenceAreaName"].status` replaced by `AccessData.subscriber.locationInfo.presenceReportingArea["presenceAreaName"].isInArea`, and defined as a boolean.
- `AccessData.subscriber.service["serviceName"].isOutOfCredit` tag not supported.

3.5.2.2 Tags Related to Dynamic Services

- `AfData.media.type` possible value "other" added. Support to possible values "model", "multipart" and "image" is deprecated.
- `AfData.media.typeAsInt` possible value '7' refers to "other" instead of 'model'. Support to possible values '8' (multipart) and '9' (image) is deprecated.
- `AfData.media.isAfSignalling` is supported
- `AfData.media.flowUsage` is supported
- `AfData.specificActions` tag is not supported
- `AfData.requestType` is supported

3.5.2.3 Tags Related to Mobility Based Policy for Overlay Deployments

- `AccessData.bearer.controlMode` tag not supported.
- `AccessData.bearer.eventTriggers` tag not supported.
- `AccessData.host.group` tag not supported.
- `AccessData.subscriber.ueIpAddress` tag not supported.
- `AccessData.subscriber.ueIpAddressType` tag not supported.
- `AccessData.subscriber.ueIpv6Prefix` tag not supported.
- `AccessData.subscriber.locationInfo.countryCode` tag obtained from the 3GPP-SGSN-MCC-MNC AVP.
- `AccessData.subscriber.locationInfo.networkCode` tag not supported.



- `AccessData.subscriber.locationInfo.presenceReportingArea["presenceAreaName"].status` tag not supported.
- `AccessData.subscriber.locationInfo.routingAreaIdentity` tag not supported.
- `AccessData.subscriber.locationInfo.timezone` tag not supported.

3.5.2.4 Tags Related to QoS

- `AccessData.requestedQos.priorityLevel` adds support for Flexible ARP Mapping.

3.5.2.5 Tags Related to Quota Rollover

- `AccessData.subscriber.accumulatedUsage.reportingGroup["total"/"reportingGroupName"].currentRolloverPercentage["type"]` is supported
- `AccessData.subscriber.accumulatedUsage.reportingGroup["total"/"reportingGroupName"].counter["counterName"].currentRolloverPercentage["type"]` is supported
- `AccessData.subscriber.accumulatedUsage.reportingGroup["total"/"reportingGroupName"].group["groupName"].currentRolloverPercentage["type"]` is supported
- `AccessData.subscriber.accumulatedUsage.reportingGroup["total"/"reportingGroupName"].group["groupName"].counter["counterName"].currentRolloverPercentage["type"]` is supported

3.5.2.6 Tags Related to Sd for Application Detection and Control

- SAPC 1 new qualification tag:
 - `TdfData.tdfApp["id"].isStarted`
- SAPC 1 new Sd dynamic classification tags:
 - `TdfData.tdfAppId`
 - `TdfData.tdfAppInstanceId`
 - `TdfData.serverIp`
 - `TdfData.serverPort`

3.6 Time Management

The SAPC 1 impact that affects Time Zone is the following:



- A new configuration parameter was introduced to control whether the 3GPP-MS-TimeZone AVP (received from the mobile access network) is considered for the time correction or not.

4 Impact on Value Packages

4.1 Base Package

4.1.1 3GPP Gx

The 3GPP Gx function has the following impacts on SAPC 1:

- Dispersion on reauthorization: The dispersion range mechanism for reauthorization owing to time of day conditions and related configuration variables, are no longer applicable. The reauthorizations are sent as soon as possible limited by a throttling mechanism that can be configured based on network traffic model, and the SAPC capacity.
- Subscriber basic session clean up mechanism: When the SAPC receives an IP-CAN session activation request for a subscriber including an APN and an IPv4 or IPv6 prefix address, the SAPC does not check if an IP-CAN session exists for the same subscriber identifier, the same APN, different IP address value of the same type (IPv4 or IPv6 prefix) and same traffic identifier as the received in the activation request. In such a case, both sessions coexist.

For 3GPP Gx interface impacts, refer to [Gx Impacts](#).

4.1.2 Basic Policy Control

The Basic Policy Control function has the following impacts on SAPC 1:

- Clustered diameter systems are defined based on a common pattern associated to the received origin host, not a logical node identifier.
- Temporarily inactive PCC rule status not available.

4.1.3 Dedicated Bearer QoS Control

The 3GPP standard QCI values defined for Vehicle-to-Everything (V2X) services are supported.

The SAPC supports operator-specific QCI values in the range from 128 to 254 that can be configured as either GBR or non-GBR.

4.1.4 Default QoS Control

The 3GPP standard QCI values defined for Vehicle-to-Everything (V2X) services are supported.



The SAPC supports operator-specific QCI values in the range from 128 to 254 that can be configured as either GBR or non-GBR.

4.1.5 Multiple PCEF Support

No impacts.

4.1.6 Policy Studio

The SAPC Policy Studio replaces SAPC 16B CP04 Business Studio. The SAPC Policy Studio is deployed in an external Linux server. For additional details, refer to [Policy Studio](#).

4.1.7 Restful API for Provisioning

This is a new provisioning interface. The SAPC provisioning is executed through REST operations, defined in the [Provisioning REST API](#). For additional information on the description of the configuration and provisioning data model, refer to [Managed Object Model \(MOM\)](#).

4.1.8 Usage Reporting for Gx

The Usage Reporting function has the following impacts on SAPC 1:

- Association between preconfigured or dynamic services and their monitoring key is not supported. As a consequence, the monitoring key policy type is not available.
- Interaction with external database: Collisions Detection Counter (CDC) mechanism, based on a CDC attribute, not available.
- The fair usage validity time dispersion logic is reworked. The configuration variable to add a random number of seconds to the calculated validity time is no longer applicable.
- Accumulated usage information is now accessed through REST API.

4.1.9 Flexible Output Protocol

The Flexible Output Protocol function has the following impacts on SAPC 1:

- Transformations are applied at command level and at service level.
- Flexible Output Protocol language syntax has been modified.
- Transformations are now provided by Entity Data Targets.

- Only Gx protocol is supported.
- Only AVPs not part of Gx dictionary are configured in Flexible Output Protocol specific dictionary.

4.1.10 Session Release Due to Subscription Removal

This function has the following impacts on SAPC 1:

- On Diameter Gx race condition, after the SAPC sends a RAR command to request the IP-CAN session termination, any incoming CCR-U request for the same Gx session from the PCEF is answered with a CCA-U Result-Code AVP set to DIAMETER_SUCCESS value, instead of DIAMETER_USER_UNKNOWN. No IP-CAN session reauthorization is done.
- On Rx race condition, after the SAPC sends a Gx RAR command to request the IP-CAN session termination due to subscription removal, any incoming AAR-U for an Rx session bound with this Gx session is answered with an AAA Result-Code AVP set to DIAMETER_SUCCESS value instead of DIAMETER_UNABLE_TO_COMPLY. No IP-CAN session reauthorization is done.
- On Sy race condition, after the SAPC sends a Gx RAR command to request the IP-CAN session termination due to subscription removal, any incoming SNR for an Sy session bound with this IP-CAN session is answered with an SNA Result-Code AVP set to DIAMETER_SUCCESS value instead of DIAMETER_UNABLE_TO_COMPLY. No IP-CAN session reauthorization is done.
- On massive subscription removal, when the sending of RAR commands is disabled by the SAPC configuration, any incoming CCR-U from the removed subscribers is answered with a CCA-U Result-Code AVP set to DIAMETER_AUTHORIZATION_REJECTED value, instead of DIAMETER_USER_UNKNOWN, to force the IP-CAN session termination on the PCEF.

4.1.11 Session Cleanup Mechanism Due to Inactivity

This is a new function added to SAPC 1:

- The SAPC provides an automatic cleanup mechanism to remove all the Gx sessions that have been inactive (no request has been received or sent for them in a period of time).

4.1.12 CNOM

The Core Network Operations Manager (CNOM) is an Ericsson separate product, not directly provided with the SAPC. The SAPC 1 provides support to integrate the following applications of CNOM:



- Network monitor
- Alarm monitor
- Health check
- UE Trace
- Traffic Analysis

4.1.13 Session Context Exposure

Session context published and session removal mechanisms in SAPC 1 and cSAPC are different, the details are the following:

- Newly supported session context elements in SAPC 1: PCC rule list, QoS information of the default bearer, RAT type, PRA, MCC and MNC.
- Session context elements not supported in SAPC 1 but supported in cSAPC: IMEI and SGSN addresses.
- Newly supported the closed session context retrieval from both external and internal database in SAPC 1.
- Newly supported the ongoing session context retrieval from external database in SAPC 1.
- Removing subscriber sessions manually not supported in SAPC 1 but supported in cSAPC.

4.1.14 REST API to Translate Session IP Address to IMSI

This is a new function added to SAPC 1:

- The REST API to translate session IP address to IMSI function enables the operator to query an IMSI list of ongoing sessions by IP address, APN (if available) and PCEF (if available).

4.1.15 Session Handler Tool

This is a new function added to SAPC 1:

- The Session Handler tool enables the operator to access relevant information regarding the sessions of a specific subscriber, for all the applicable protocols. The tool also allows the termination of retrieved sessions for the Gx and Rx protocols.

For a detailed description of the tool, refer to SAPC Troubleshooting Guide.



4.1.16 Phased-out Functions

- Cisco SCE
- E4 Interface
- OAM via WEB Services
- Multivendor BNG Support
- RADIUS / RADIUS COA
- Usage Reporting for RADIUS

4.1.17 Unavailable Functions

- 3GPP Gxa
- Subordinated PCEFs

4.2 Business Intelligence

The Business Intelligence and Network Assurance Value Packages are joined in the Analytics and Assurance Value Package from SAPC 1.

4.2.1 SOAP Notifications

- HTTPS support for SOAP notifications is not available.
- A load balancing mechanism is introduced to distribute the delivery of notifications among the set of configured Notification Addresses, belonging to a Notification Server, using round robin algorithm. When the SAPC detects one of the configured Notification Addresses is not available, it stops sending further notifications towards that Notification Address. When the connection towards a Notification Address is restored, the SAPC starts again sending notifications towards this Notification Address.
- Connection handling changes:
 - The default maximum number of connections per process, between the SAPC and the SOAP notification server are doubled (50).
 - The default maximum size of the SOAP notifications queue is doubled (2000).
 - The default time period to check the SOAP connection status has doubled to (6000 ms)



- If a connection is not established after the connection reattempts, or the connection is established but the notification delivery fails (an error is received at protocol level), the SAPC inserts this notification in the notification queue at the last position if there is room for one more notification. For the list of specific HTTP supported errors refer to [User Notifications](#).

4.2.2 EBM

- EBM events are not logged.
- Detected mistakes are corrected in the `sapc_ebm.xml` file:
 - Typo fixed in the name of the `FAMILY_ID` parameter.
 - Typo fixed in the `SUBSCRIPTION_TYPE` parameter inside the `ACCUMULATED_USAGE_RESET` and `ACCUM_USAGE_LIMIT_SURPASSED` events.
- Support for N-EBM Servers is available in SAPC 1.
- In SAPC 1, more than one `Specific-Action` can be sent in an Rx RAR message. In SAPC 16B CP04, `SPECIFIC_ACTION` inside `RX_RAR_RAA_TRANSACTION` was not defined as an array. Because of this, a new array, `SPECIFIC_ACTIONS`, is added at the end of the `RX_RAR_RAA_TRANSACTION` event.
- The `RAT_TYPE` parameter has two new values:
 - `VIRTUAL` (value 11)
 - `EUTRAN-NB-IOT` (value 12)

4.3 Convergence

4.3.1 Fixed Mobile Policy Control

Fixed and convergence policy control is provided through Gx interface. The SAPC supports all Subscription-Id-Type values, so it is possible to use `END_USER_NAI` or `END-USER_PRIVATE` traffic identity (for example with a MAC address) for fixed PCC. Radius interface support is phased-out.

4.4 High Availability and Pooling

4.4.1 Hot-Standby Geographical Redundancy

The SAPC 1 provides a new geographical redundancy solution, following the "Primary / Standby" (1+1 redundancy) replication model available in SAPC 16B



CP04. For additional details on the geographical redundancy function refer to the Geographical Redundancy Facility Description.

4.4.2 Active-Active Geographical Redundancy

This is a new function added to SAPC 1:

- A new, full geographical redundancy deployment in active-active mode has been added where both active SAPC nodes are able to handle traffic simultaneously.
- Node states are managed in the GeoRedManager MO and have different values than TelORB states.
- The Redundancy Control Mechanism is not based on the NetRed software of TSP.
- The Diameter Redirection Agent (DRA) or Diameter clients shall distribute traffic homogeneously between the two mated pairs of SAPC nodes. The distribution must ensure subscriber and session stickiness.

4.4.3 Unavailable Function

- Upgrade with active replication

4.5 Monetize OTT

4.5.1 Dynamic Policy Control

Refer to [Dynamic Policy Control](#) on page 51.

4.5.2 SOAP Notifications

Refer to [SOAP Notifications](#) on page 44.

4.5.3 Multimedia Priority Services - Rx (On-Demand)

No impact.

4.5.4 Phased-out Functions

- MASC



4.6 Money Aware

4.6.1 3GPP Sy

The 3GPP Sy function has the following impacts on SAPC 1:

- The SAPC 1 expects to receive SNR messages according to 3GPP, including only the Policy Counters that change their status. The existing Sy session Policy Counters not received in an SNR message, are not changed.

4.6.2 Advanced Sy Capabilities

No Impacts.

4.6.3 Enhanced Subscription Handling

No Impacts.

4.7 Network Assurance

The Business Intelligence and Network Assurance Value Packages are joined in the Analytics and Assurance Value Package from SAPC 1.

4.7.1 EBM

See impacts in [EBM](#) on page 45.

4.8 Network Efficiency

4.8.1 External Database Access

The function managing External Database access has the following impacts on SAPC 1:

- The Uniform Resource Locator (URL)-path of the SOAP server managing the notifications request is "/sapc/v1/notifications".
- LDAPS support for LDAP operations is not available.
- Connection handling changes:
 - Single pool of connections for read and write operations.
 - An IP address is considered unreachable if SAPC detects consecutive time-outs in at least 30% of the LDAP sessions.

- Maximum of 64 LDAP sessions towards the External Database (IP address) per PL.
- Maximum of 20 outstanding LDAP requests per LDAP session.
- SQL External Repositories not supported.
- Collision Detection mechanism is not available.

4.8.2 Mobility-Based Policy for Overlay Deployments

The function managing Mobility-Based Policy has the following impacts on SAPC 1:

- No controls are executed on session modification, subscriber profile update or ToD session reauthorization. This means:
 - Smp RARs are not supported
 - Smp CCR-Us are always answered with DIAMETER_SUCCESS (2001)
- No Smp session is maintained on the SAPC.
- Smp Session Access Control supports a new scenario, where SAPC 1 allows returning DIAMETER_CREDIT_CONTROL_NOT_APPLICABLE (4011) to notify the SGSN-MME to continue the IP-CAN session but drop the Smp session. Other Smp Session Access Control scenarios not supported.
- PDN-GW selection allows to define lists of PDN-GWs.
- Smp-presence Reporting Area not supported.
- Integration with Online Charging System not supported.
- Event Triggers not supported.
- User Notifications not supported.
- Flexible Output Protocol not supported.
- Session-Linking-Indicator AVP ignored.

4.8.3 Unavailable Functions

- Flexible Smp Protocol
- Mobility-Based Policy for PCRF



4.9 Smart Personalized Broadband

4.9.1 Application Detection and Control (ADC) over Gx

No impacts.

4.9.2 Enhanced Policy Control

The Enhanced Policy Control function has the following impacts on SAPC 1:

- Gx Diameter Redirection Agent (DRA) functionality is not available.
- Ericsson Gx+: [Dispersion on reauthorization](#) and [Subscriber basic session clean up mechanism](#) impacts affect this interface just as it affects regular 3GPP Gx interface.

4.9.3 Enhanced Subscription Handling

Refer to [Enhanced Subscription Handling](#) on page 47.

4.9.4 Policy Control for Mobile SDN

No impacts.

4.9.5 Shared Data Plans

The Shared Data Plans function has the following impacts on SAPC 1:

- Quota Reservation functionality not available.
- External Database support is not available.

4.9.6 SOAP Notifications

Refer to [SOAP Notifications](#) on page 44.

4.9.7 User Notifications

The User Notifications function has the following impacts on SAPC 1:

- Email message notifications are phased-out.
- Connection handling changes:

- The default maximum number of connections per process, between the SAPC and the SMS notification server are doubled (50).
- The default maximum size of the SMS notifications queue is doubled (2000).
- If a connection is not established after the connection reattempts, or the connection is established but the notification delivery fails (an error is received at protocol level), the SAPC inserts this notification in the notification queue at the last position if there is room for one more notification. For the list of specific SMPP supported errors refer to [User Notifications](#).
- The maximum waiting time for the acknowledgment of the SMPP connection attempt is not configurable.

4.9.8 Presence Reporting Area

The Presence Reporting Area function has the following impacts on SAPC 1:

- During the establishment of the session the presence status of the UE in the presence reporting area is by default outside the area until the first CCR-U is received with the actual presence.

4.9.9 Aggregable Dataplan for Fair Usage Policies

This is a new function added to SAPC 1:

- The SAPC supports aggregation of a subscriber's absolute usage limits from different subscriber groups and performs fair usage control for the aggregated limits. The SAPC combines respectively the uplink, downlink, bidirectional volume limits and time limits from aggregable Reporting Groups of the subscriber groups associated with the subscriber.

4.9.10 Multimedia Priority Services - Gx (Subscription-Based)

The subscription-based Multimedia Priority Services (MPS) have the following impact on SAPC 1:

- To prioritize Gx MPS events, it is mandatory to configure the APNs corresponding to MPS types defined in the MPS profiles.

4.9.11 Support of Sd for Application Detection and Control

This is a new function added to SAPC 1:

- The support of Sd for Application Detection and Control (ADC) introduces the Sd interface between the SAPC and the Traffic Detection Function (TDF) that



enables PCC decisions based on the reporting of detected applications from the TDF.

4.9.12 Quota Rollover

The Quota Rollover function has the following impact on SAPC 1:

- The `currentRolloverPercentage` tag is added to access the value of the current rollover usage accumulator expressed as percentage of the corresponding rollover quota from the previous period limit.

4.9.13 Stackable Dataplan

This is a new function added to SAPC 1:

The SAPC enables the operator to activate automatically multiple vouchers with the same absolute volume or time limits for prepaid subscriptions. This is enabled by defining multiple sets of start date and end date in the association of subscriber and subscriber group. Therefore, the subscriber can use multiple times the same usage limits from the prepaid subscriptions associated with multiple instances.

4.10 Voice Optimization

4.10.1 Dynamic Policy Control

The Dynamic Policy Control function has the following impacts on SAPC 1:

- The access network charging identifier per service data flow is not available.
- On reception of SIP Forking, the SAPC updates the existing PCC rules with additional IP flows and bandwidth, as required. However if a forking leg contains additional media components, then new PCC rules are generated.
- The support of `ServiceId.MediaComponentId` has been deprecated. The output of the Dynamic Service Classification is simply a `ServiceId`, a string that can have any characters such as ".", "_", and so on. Similarly, the input for the Dynamic Service Qualification (Resource) is simply a `ServiceId` (a string, not an entity).
- The dynamic PCC rule random name generation is improved. It follows a specific format of four elements, delimited by the "@" character, with a maximum size of 63 characters. The PCC rule name begins with the service identifier that results from the dynamic service classification process, then continues with the Media-Component-Number and the Flow-Number, and finally includes a pseudo-random portion derived from the Rx diameter Session-Id.

- If an IMS emergency call binds to a non-emergency IP-CAN session, the SAPC does not ignore the value of Service-URN AVP.
- A new `provision_rules_on_preliminary_info` configuration parameter has been added. It supports the installation of PCC rules for preliminary service information, or delaying the installation until the status of the service information is final.

4.10.2 Network Location (NetLoc)

No impacts.

4.10.3 Smart Policy Control for Wi-Fi Calling

The Smart Policy Control for Wi-Fi Calling function has the following impacts on SAPC 1:

- Fair Usage based Wi-Fi calling functionality is not available, as association between dynamic services and their monitoring key is not supported.

4.10.4 Notification of Signalling Path Status

This function has the following impacts on SAPC 1:

- The SAPC reports the release of signalling path from the PCEF to the AF through a RAR message. The RAR does not contain the Abort-Cause AVP.
- The default AF signalling service must be configured in the AF signalling path profile. It is possible to configure a different AF signalling service per APN.

4.10.5 IP-CAN Type Change Notification

This function has the following impacts on SAPC 1:

- The SAPC automatically subscribes to the IP-CAN_CHANGE and RAT_CHANGE event triggers when the Specific-Action AVP with IP-CAN_CHANGE value is received in an Rx AAR-I message. It is not needed to configure event trigger selection policy for IP-CAN type change notification.
- If the AF does not subscribe to IP-CAN type notification, the SAPC reports IP-CAN Type, RAT Type and AN-Trusted to the AF in an Rx AAA-I/U message only when the SAPC subscribed to the IP-CAN_CHANGE event trigger before.



4.10.6 Network Location Information for Untrusted WLAN

This is a new function added to SAPC 1:

- The Network Location Information (NetLoc) for Untrusted WLAN function enables the SAPC to report the network provided location for Untrusted WLAN information to the AF during session establishment, modification and termination, and IP-CAN session termination and bearer release.

The network provided WLAN location information includes:

- WLAN location information and location information age
- UE local IP address, User Datagram Protocol (UDP) source port, Transmission Control Protocol (TCP) source port
- UE time zone

4.10.7 IMS Restoration

This is a new function added to SAPC 1

The Provisioning of AF Signalling Flow Information is a supported feature, it is part of the IMS Restoration Procedures, specified in 3GPP TS 23.380, to handle a Proxy Call Session Control Function (P-CSCF) service interruption scenario with minimum impact to the service to the end user.

After UE registration to IMS, the AF (P-CSCF) sends information to the SAPC about the AF signalling flows between the UE and the AF. The SAPC installs the corresponding dynamic PCC rules (if not installed before) by triggering a RAR message in order to convey the AF address the UE is using to the PCEF. The PCEF monitors all P-CSCF nodes being used by the UEs and if a P-CSCF becomes unresponsive, the PCEF requests all UEs using this P-CSCF to do a new registration against another P-CSCF.

4.10.8 SRVCC

No impacts.

4.10.9 Multimedia Priority Services - Rx (On-Demand)

Refer to [Multimedia Priority Services - Rx \(On-Demand\)](#) on page 46.

4.11 5G EPC

This is a new value package added to SAPC 1.



4.11.1 Extended Bit Rates over Gx/Rx

Extended bandwidth AVPs representing bit rates in kbps are introduced to manage bandwidth values higher than $2^{32}-1$ bps (4,3 Gbps), to support EPC Dual Connectivity (E-UTRAN and 5G NR).