

# Gx Interface Description

Ericsson Service-Aware Policy Controller

## INTERWORK DESCRIPTION

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# 1 Gx Interface Overview

This document describes the standard 3GPP Gx interface used between a Policy and Charging Enforcement Function (PCEF) client and the SAPC.

This document also describes the Ericsson Gx+ interface used between an Ericsson PCEF (for example EPG) and the SAPC.

3GPP Gx is built over the Diameter Base Protocol RFC. The SAPC supports 3GPP Gx Rel9 onwards.

For detailed support about 3GPP Release versions of 3GPP TS 29.212, refer to the corresponding Statement of Compliance documents.

It also describes the Ericsson proprietary AVP extensions (Ericsson Gx+ interface) that can be used between an Ericsson PCEF and the SAPC.

## 1.1 Document Content Conventions

This document contains the specific details supported by the SAPC implementation.

This document does not repeat information that can be found in 3GPP Technical Specifications or Diameter Base Protocol RFC.

For detailed information about Statement of Compliance towards different 3GPP Release versions (for example Rel13, Rel14 and so on), see the corresponding SoCs documents.

Each message is described with the list of parameters (AVPs) exchanged between the Diameter peers.

- For **incoming** messages received in the SAPC, this document only indicates the AVPs that the SAPC reads to perform the corresponding business logic or evaluation inside policy conditions.

The SAPC can receive other AVPs (but does not use them) that can be found in 3GPP Technical Specifications, but are not stated in this document. This is possible because the SAPC uses a dictionary that specifies the format of messages and AVPs. The SAPC behaves in the following way (standard Diameter Base Protocol behavior):

- a If the SAPC receives in a message an AVP with M bit set to 1, and that AVP is not included in the dictionary, the SAPC rejects the message indicating DIAMETER\_AVP\_UNSUPPORTED.
- b If the SAPC receives in a message an AVP defined in the dictionary, but with different values in the flag bits, the SAPC rejects the message indicating DIAMETER\_INVALID\_AVP\_BITS.



- c If the SAPC receives in a message an AVP with M bit set to 0, and that AVP is not defined in the dictionary, the SAPC does not reject the message, but ignores the AVP value.
  - For **outgoing** messages (and AVPs) sent by the SAPC, this document indicates only the AVPs that the SAPC fills.
- Note:** When the SAPC does not support a message or AVP for all 3GPP Release versions (for example Rel9, Rel10 and so on), it is explicitly indicated in this document.



## 2 Gx Interface Message Exchange

For an example of the Gx Diameter message exchange in the communication between a PCEF and the SAPC, see Figure 1:

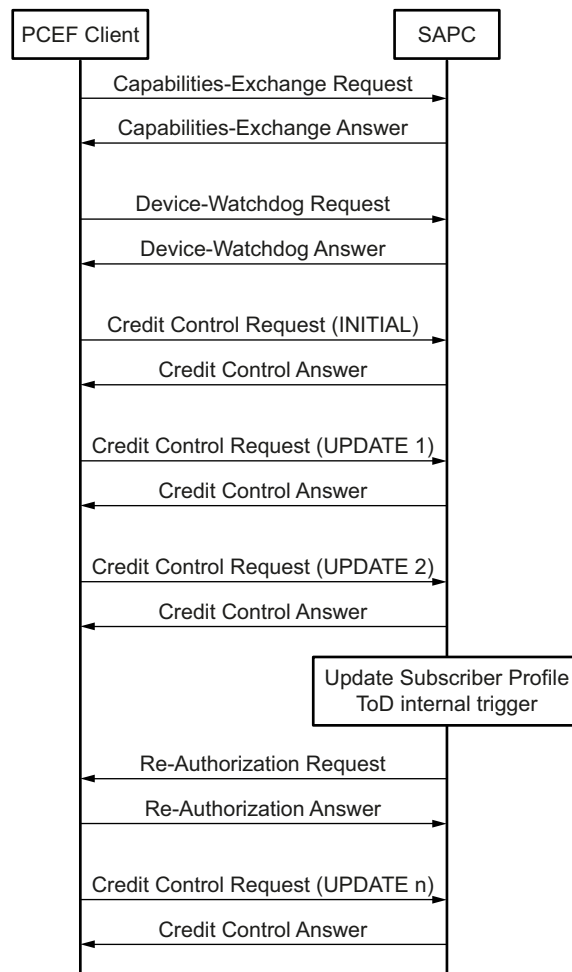


Figure 1 Gx Diameter Message Flow







## 3 Diameter Base Protocol Messages

### 3.1 Gx Capability Negotiation

The following table lists the AVPs that the SAPC supports in a CER message.

Table 1 CER AVPs

AVP Name	AVP Code	Comment	Reference
* [ Acct-Application-Id ]	259	-	RFC 6733
* [ Auth-Application-Id ]	258	-	RFC 6733
[ Firmware-Revision ]	367	-	RFC 6733
1* { Host-IP-Address }	257	-	RFC 6733
{ Origin-Host }	264	-	RFC 6733
{ Origin-Realm }	296	-	RFC 6733
{ Product-Name }	269	-	RFC 6733
* [ Supported-Vendor-Id ]	265	-	RFC 6733
{ Vendor-Id }	266	-	RFC 6733
*[ Vendor-Specific-Application-Id ]	260	-	RFC 6733

Table 2 lists the AVPs that the SAPC sends in a CEA message.

Table 2 CEA AVPs

AVP Name	AVP Code	Comment	Reference
*[ Auth-Application-Id ]	258		RFC 6733
[ Error-Message ]	281	-	RFC 6733
[ Failed-AVP ]	279		RFC 6733
[ Firmware-Revision ]	267	-	RFC 6733
1* { Host-IP-Address }	257	-	RFC 6733
{ Origin-Host }	264	-	RFC 6733
{ Origin-Realm }	296	-	RFC 6733
{ Product-Name }	269	-	RFC 6733



Table 2 CEA AVPs

AVP Name	AVP Code	Comment	Reference
{ Result-Code }	268	-	RFC 6733
*[ Supported-Vendor-Id ]	265	The SAPC sends the values assigned to other supported vendors, different from the vendor device (Ericsson): <ul style="list-style-type: none"><li>• 10415 (3GPP)</li><li>• 5535 (3GPP2)</li></ul>	RFC 6733
{ Vendor-Id }	266	The SAPC sets it to value 193 (Ericsson).	RFC 6733
*[ Vendor-Specific-Application-Id ]	260	The SAPC sends the following AVP values: <ul style="list-style-type: none"><li>• Vendor-Id= 10415 (3GPP)</li><li>• Auth-Application-Id= 16777238 (3GPP Gx)</li></ul>	RFC 6733

**Note:** The SAPC does not send an Origin-State-Id AVP in a CEA message.

## 3.2 Device Watchdog

Table 3 lists the AVPs that the SAPC can receive or send in a DWR message.

Table 3 DWR AVPs

AVP Name	AVP Code	Comment	Reference
{ Origin-Host }	264	-	RFC 6733
{ Origin-Realm }	296	-	RFC 6733
[ Origin-State-Id ]	278	-	RFC 6733

**Note:** The SAPC does not include Origin-State-Id AVP when it sends an outgoing DWR message.

Table 4 lists the AVPs that the SAPC can receive or send in a DWA message.

Table 4 DWA AVPs

AVP Name	AVP Code	Comment	Reference
[ Error-Message ]	281	-	RFC 6733



Table 4 DWA AVPs

AVP Name	AVP Code	Comment	Reference
[ Failed-AVP ]	279	-	RFC 6733
{ Origin-Host }	264	-	RFC 6733
{ Origin-Realm }	296	-	RFC 6733
[ Origin-State-Id ]	278	-	RFC 6733

**Note:** The SAPC does not include Origin-State-Id AVP when it sends an outgoing DWA message.

### 3.3 Disconnect Peer

Table 5 lists the AVPs that the SAPC supports in a DPR message.

Table 5 DPR AVPs

AVP Name	AVP Code	Comment	Reference
{ Origin-Host }	264	-	RFC 6733
{ Origin-Realm }	296	-	RFC 6733
{ Disconnect-Cause }	273	-	RFC 6733

Table 6 lists the AVPs that the SAPC supports in a DPA message.

Table 6 DPA AVPs

AVP Name	AVP Code	Comment	Reference
[ Error-Message ]	281	-	RFC 6733
[ Failed-AVP ]	279	-	RFC 6733
{ Origin-Host }	264	-	RFC 6733
{ Origin-Realm }	296	-	RFC 6733
[ Result-Code ]	268	-	RFC 6733





## 4 Gx Interface Controls and AVP Relations

The SAPC supports several policy control functions. The SAPC can execute such policy control functions based on:

- Configuration of the corresponding control (enabled or not) in the SAPC
- The values received in the Supported-Features AVP
- For Ericsson Gx+, the value received in the Gx-Capability-List AVP (Section 8.2 on page 35) for the control

The SAPC sends such control related information through the Gx interface that is applicable to the requesting PCEF only when the SAPC gets values to return. For more information on the AVPs, see Table 7.

Table 7 summarizes the AVPs that are included in the SAPC Gx interface messages for every control function.

Table 7 AVPs Applicable to Each Control Function

Control	Related AVPs
IP-CAN Session Access Control	<p>If the trigger is the reception of a CCR:</p> <ul style="list-style-type: none"> <li>• To accept the request, the SAPC answers with a CCA with the Result-Code AVP indicating success.</li> <li>• To reject the request, the SAPC answers with the Result-Code AVP indicating DIAMETER_AUTHORIZATION_REJECTED (5003).</li> </ul> <p>If the trigger is an internal reauthorization, and the session terminates, the SAPC sends a RAR containing Session-Release-Cause = UE_SUBSCRIPTION_REASON.</p>



Service Access Control	<p>Charging-Rule-Authorization AVP</p> <p>Charging-Rule-Install AVP, including:</p> <ul style="list-style-type: none"><li>• Charging-Rule-Name AVP</li><li>• Charging-Rule-Base-Name AVP</li></ul> <p>Charging-Rule-Definition AVP (for preconfigured or dynamic services). The charging information is included depending on the Service Charging Control.</p> <p>Bearer-Identifier AVP</p> <p>Charging-Rule-Remove AVP, including:</p> <ul style="list-style-type: none"><li>• Charging-Rule-Name AVP</li><li>• Charging-Rule-Base-Name AVP</li></ul> <p>Related to ToD, and when the PCEF is the time controller:</p> <ul style="list-style-type: none"><li>• Revalidation-Time</li><li>• Rule-Activation-Time and Rule-Deactivation-Time AVPs included within the Charging-Rule-Definition AVP</li><li>• REVALIDATION_TIMEOUT value for Event-Trigger AVP</li></ul>
Bearer QoS Control (1)	<p>QoS-Information AVP</p> <p>Default-EPS-Bearer-QoS AVP</p>
Subscriber Charging Control	<p>Online AVP at CCA level</p> <p>Offline AVP at CCA level</p> <p>3GPP-Charging-Characteristics AVP</p> <p>Charging-Information AVP</p>



Service Charging Control	Charging-Rule-Install AVP, including: <ul style="list-style-type: none"> <li>• Service-Identifier AVP</li> <li>• Rating-Group AVP</li> <li>• Reporting-Level AVP</li> <li>• Online AVP</li> <li>• Offline AVP</li> <li>• Metering-Method AVP</li> <li>• AF-Charging-Identifier AVP</li> </ul>
Usage Reporting	Usage-Monitoring-Information AVP
Content Filtering Control	Content-Filtering-Profile-Id AVP

(1) In the SAPC, in 3GPP accesses, it is mandatory to receive a QoS-Information or Default-EPS-Bearer-QoS AVP in the CCR Initial message.







## 5 Gx Interface Message Format

### 5.1 Gx Credit-Control-Request (CCR)

Table 8 lists the AVPs that the SAPC supports in a CCR message.

Table 8 CCR AVPs

AVP Name	AVP Code	Comment	Reference
< Session-Id >	263	-	RFC 6733
[ 3GPP-Charging-Characteristics ]	13	3GPP-Charging-Characteristics AVP is of type UTF8String and is defined according to 3GPP TS 29 061 (Reference [1]) and transformed into a Diameter AVP.	3GPP TS 29 061
[ 3GPP-MS-TimeZone ]	23	If received, the SAPC local time used in any calculation is corrected with the offset value.	3GPP TS 29 061
[ 3GPP-SGSN-MCC-MNC ]	18	-	3GPP TS 29 061
[ 3GPP-SGSN-Address ]	6	-	3GPP TS 29 061
[ 3GPP-SGSN-IPv6-Address ]	15	-	3GPP TS 29 061
[ 3GPP-User-Location-Info ]	22	-	3GPP TS 29 061
0*2[ AN-GW-Address ]	1050	-	3GPP TS 29.212
[ AN-Trusted ]	1503	-	3GPP TS 29.273
*[ Application-Detection-Information ] <sub>(1)</sub>	1098	The SAPC supports the following AVPs: <ul style="list-style-type: none"> <li>• {TDF-Application-Identifier}</li> <li>• [TDF-Application-Instance-Identifier]</li> <li>• *[Flow-Information]</li> </ul>	3GPP TS 29.212
{ Auth-Application-Id }	258	-	3GPP TS 29.212
[ Bearer-Identifier ]	1020	-	3GPP TS 29.212
[ Bearer-Operation ]	1021	-	3GPP TS 29.212
[ Bearer-Usage ]	1000	-	3GPP TS 29.212
[ Called-Station-Id ]	30	-	See RFC 4005
{ CC-Request-Number }	415	-	RFC 4006
{ CC-Request-Type }	416	-	RFC 4006



Table 8 CCR AVPs

AVP Name	AVP Code	Comment	Reference
*[ Charging-Rule-Report ]	1018	See Section 6.3 on page 26	3GPP TS 29.212
[ Default-EPS-Bearer-QoS ]	1049	See Section 6.5 on page 27	3GPP TS 29.212
{ Destination-Realm }	283	-	RFC 6733
[ Destination-Host ]	293	-	RFC 6733
*[ Event-Trigger ]	1006	<p>The SAPC supports the following values:</p> <ul style="list-style-type: none"><li>• SGSN_CHANGE (0)</li><li>• QoS_CHANGE(1)</li><li>• RAT_CHANGE (2)</li><li>• PLMN_CHANGE (4)</li><li>• IP-CAN_CHANGE (7).</li><li>• RAI_CHANGE (12)</li><li>• USER_LOCATION_CHANGE (13)</li><li>• OUT_OF_CREDIT (15)</li><li>• REALLOCATION_OF_CREDIT (16)</li><li>• REVALIDATION_TIMEOUT (17)</li><li>• DEFAULT_EPS_BEARER_QOS_CHANGE (20)</li><li>• AN_GW_CHANGE (21)</li><li>• SUCCESSFUL_RESOURCE_ALLOCATION (22)</li><li>• UE_TIME_ZONE_CHANGE (25)</li><li>• TAI_CHANGE (26)</li><li>• ECGI_CHANGE (27)</li><li>• APN-AMBR_MODIFICATION_FAILURE (29)</li><li>• USAGE_REPORT (33)</li><li>• DEFAULT-EPS-BEARER-QOS_MODIFICATION_FAILURE (34)</li><li>• APPLICATION_START (39).</li><li>• APPLICATION_STOP (40).</li><li>• ACCESS_NETWORK_INFO_REPORT (45).</li><li>• CHANGE_OF_UE_PRESENCE_IN_PRESENCE_REPORTING_AREA_REPORT (48).</li></ul>	3GPP TS 29.212
[ Framed-IP-Address ] <sup>(2)</sup> (3)	8	The SAPC identifies the subscriber IP-CAN session using Framed-IP-Address AVP together with Called-Station-Id AVP and Subscription-Id AVP.	RFC 4005



Table 8 CCR AVPs

AVP Name	AVP Code	Comment	Reference
[ Framed-IPv6-Prefix ] (2) (3)	97	The SAPC identifies the subscriber IP-CAN session using Framed-IPv6-Prefix AVP together with Called-Station-Id AVP and Subscription-Id AVP.	RFC 4005
[ IP-CAN-Type ]	1027	The SAPC supports the following values: <ul style="list-style-type: none"> <li>• 3GPP-GPRS (0)</li> <li>• DOCSIS (1)</li> <li>• xDSL (2)</li> <li>• WiMAX (3)</li> <li>• 3GPP2 (4)</li> <li>• 3GPP-EPS (5)</li> <li>• Non-3GPP-EPS (6)</li> <li>• FBA (7)</li> </ul>	3GPP TS 29.212
[ Network-Request-Support ]	1024	-	3GPP TS 29.212
{ Origin-Host }	264	-	RFC 6733
{ Origin-Realm }	296	-	RFC 6733
[ Origin-State-Id ]	278	-	RFC 6733
[ Presence-Reporting-Area-Information ]	2822	See Section 6.7 on page 28	3GPP TS 29.212
[ QoS-Information ]	1016	See Section 6.4 on page 26.	3GPP TS 29.212
[ QoS-Negotiation ]	1029	-	3GPP TS 29.212
[ QoS-Upgrade ]	1030	-	3GPP TS 29.212
[ RAI ]	909	-	3GPP TS 29 061
[ RAT-Type ]	1032	-	3GPP TS 29.212
*[ Subscription-Id ]	443	<p>If the SAPC receives several instances of this AVP, it uses:</p> <ul style="list-style-type: none"> <li>• The value contained in Subscription-Id-Data of the first Subscription-Id AVP received</li> <li>• Or the value contained in Subscription-Id-Data corresponding to the Subscription-Id-Type set in a configurable parameter in the SAPC.</li> </ul> <p>For IP-CAN sessions restricted to IMS emergency services, Subscription-Id AVP is optional in the CCR INITIAL message. If Subscription-Id AVP is not received, the CCR INITIAL message must include the IMEISV within the User-Equipment-Info AVP.</p>	RFC 4006
*[ Supported-Features ]	628	See Section 6.1 on page 21.	TS 29.229



Table 8 CCR AVPs

AVP Name	AVP Code	Comment	Reference
[ TWAN-Identifier ]	29	-	3GPP TS 29.061
[ TDF-Information ]	1087	See Section 6.8 on page 29.	3GPP TS 29.212
[ TCP-Source-Port ]	2843	-	3GPP TS 29.212
	2806	-	3GPP TS 29.212
[ UE-Local-IP-Address ]	2805	-	3GPP TS 29.212
*[ Usage-Monitoring-Information ]	1067	-	3GPP TS 29.212
[ User-Equipment-Info ]	458	-	RFC 4006
[ User-Location-Info-Time ]	2812		3GPP TS 29.212

(1) If the CCR-U includes the Flow-Information AVPs, then it should also include the TDF-Application-Instance-Identifier AVP. If that situation happens, no error is returned, because the SAPC does not use the contents of the Flow-Information AVPs.

(2) Framed-IP-Address (or Framed-IPv6-Prefix) and Subscription-Id AVPs are mandatory to be received for the SAPC in CCR INITIAL message. Otherwise, the SAPC returns Result-Code AVP set to DIAMETER\_MISSING\_AVP.

(3) When both Framed-IP-Address and Framed-IPv6-Prefix AVPs are received, an IPv4v6 dual stack IP-CAN session is created.

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## Warning!

Once there are ongoing Gx sessions in the SAPC, and the first CCR is received, **do not** change the value sent in the Origin-Host AVP for the subsequent CCR messages. Otherwise, the SAPC can answer these CCR messages with an UNABLE\_TO\_COMPLY (5012) error that can lead to service outage.

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## 5.2 Gx Credit-Control-Answer (CCA)

Table 9 lists the AVPs that the SAPC sends in a CCA message.

Table 9 CCA AVPs

AVP Name	AVP Code	Comment	Reference
< Session-Id >	263	-	RFC 6733
{ Auth-Application-Id }	258	-	3GPP TS 29.212



Table 9 CCA AVPs

AVP Name	AVP Code	Comment	Reference
[ Bearer-Control-Mode ]	1023	<p>For CCA Initial, the SAPC sets its value to:</p> <ul style="list-style-type: none"> <li>• UE_ONLY (0) if Network-Request-Support AVP received with value Network Request Not Supported, or if the Network-Request-Support AVP was not received.</li> <li>• UE_NW (2) if Network-Request-Support AVP was received in CCR with value Network Request Supported</li> </ul> <p>For CCA updates, the SAPC include this AVP only if Network-Request-Support AVP was received in the CCR, and sets its value to:</p> <ul style="list-style-type: none"> <li>• UE_ONLY (0) if Network-Request-Support AVP received with value Network Request Not Supported.</li> <li>• UE_NW (2) if Network-Request-Support AVP was received in CCR with value Network Request Supported.</li> </ul>	3GPP TS 29.212
{ CC-Request-Number }	415	The SAPC includes the same value as received in the CCR.	3GPP TS 29.212
{ CC-Request-Type }	416	The SAPC includes the same value as received in the CCR.	3GPP TS 29.212
[ Charging-Information ]	618	-	TS 29.229
*[ Charging-Rule-Install ]	1001	See Section 6.2 on page 23.	3GPP TS 29.212
*[ Charging-Rule-Remove ]	1002	-	3GPP TS 29.212
[ Default-EPS-Bearer-QoS ]	1049	See Section 6.5 on page 27.	3GPP TS 29.212
*[ Event-Trigger ]	1006	<p>The SAPC includes this AVP in the CCA Initial and CCA Update messages.</p> <p>The SAPC provides a new complete list of applicable event triggers for adding new event triggers or removing provisioned event triggers. If the SAPC does not include the Event-Trigger AVP in the CCA message, the previously provisioned event triggers are still applicable. If the SAPC includes the value NO_EVENT_TRIGGERS (14) in the CCA message, the previously provisioned event triggers are removed.</p> <p>See Page 14.</p>	3GPP TS 29.212
[ Experimental-Result ]	297	-	RFC 6733
*[ Failed-AVP ]	279	-	RFC 6733
[ Offline ]	1008	-	3GPP TS 29.212
[ Online ]	1009	-	3GPP TS 29.212
{ Origin-Host }	264	-	RFC 6733
{ Origin-Realm }	296	-	RFC 6733
[ Presence-Reporting-Area-Information ]	2822	See Section 6.7 on page 28	3GPP TS 29.212



Table 9 CCA AVPs

AVP Name	AVP Code	Comment	Reference
[ Origin-State-Id ]	278	The SAPC increments its value in standalone mode after restart.  In geographical redundancy, the SAPC does not increment its value unless both peers are down. This MUST never happen, as the SAPC does a transparent switch-over (the Diameter peer always sees an operative SAPC, the one in active state).	RFC 6733
[ QoS-Information ]	1016	See Section 6.4 on page 26.	3GPP TS 29.212
[ Result-Code ]	268	-	RFC 6733
[ Revalidation-Time ]	1042	-	3GPP TS 29.212
*[ Supported-Features ]	628	-	TS 29.229
*[ Usage-Monitoring-Information ]	1067	See Section 6.6 on page 28.	3GPP TS 29.212

## 5.3 Gx Re-Authorization-Request (RAR)

Table 10 lists the AVPs that the SAPC sends in a RAR message.

Table 10 RAR AVPs

AVP Name	AVP Code	Comment	Reference
< Session-Id >	263	-	RFC 6733
{ Auth-Application-Id }	258	-	3GPP TS 29.212
*[ Charging-Rule-Install ]	1001	See Section 6.2 on page 23.	3GPP TS 29.212
*[ Charging-Rule-Remove ]	1002	-	3GPP TS 29.212
[ Default-EPS-Bearer-QoS ]	1049	See Section 6.5 on page 27.	3GPP TS 29.212
*[ Event-Trigger ]	1006	The SAPC provides a new complete list of applicable event triggers for adding new event triggers or removing provisioned event triggers. If the SAPC does not include the <b>Event-Trigger</b> AVP in the RAR message, the previously provisioned event triggers are still applicable. If the SAPC includes the value NO_EVENT_TRIGGERS (14) in the RAR message, the previously provisioned event triggers are removed.  See Page 14.	3GPP TS 29.212
{ Destination-Host }	293	-	RFC 6733
{ Destination-Realm }	283	-	RFC 6733
{ Origin-Host }	264	-	RFC 6733



Table 10 RAR AVPs

AVP Name	AVP Code	Comment	Reference
{ Origin-Realm }	296	-	RFC 6733
[ Origin-State-Id ]	278	The SAPC increments its value in standalone mode after restart. In geographical redundancy, the SAPC does not increment its value unless both peers are down. This MUST never happen, as the SAPC does a transparent switch-over (the Diameter peer always sees an operative SAPC, the one in active state).	RFC 6733
[ QoS-Information ]	1016	See Section 6.4 on page 26.	3GPP TS 29.212
{ Re-Auth-Request-Type }	285	The SAPC supports the following values: • AUTHORIZE_ONLY (0)	RFC 6733
[ Revalidation-Time ]	1042	-	3GPP TS 29.212
[ Session-Release-Cause ]	1045	The SAPC supports the following values: • UE_SUBSCRIPTION_REASON (1)	3GPP TS 29.212
*[ Usage-Monitoring-Information ]	1067	See Section 6.6 on page 28.	3GPP TS 29.212

## 5.4 Gx Re-Authorization-Answer (RAA)

The SAPC does not read any AVPs received in RAA answers, except the AVPs shown in Table 11:

Table 11 RAA AVPs

AVP Name	AVP Code	Comment	Reference
0*2[ AN-GW-Address ]	1050	-	3GPP TS 29.212
[ AN-Trusted ]	1503	-	3GPP TS 29.273
[ Experimental-Result ]	297	The SAPC supports the following value within Experimental-Result-Code AVP: • DIAMETER_PENDING_TRANSACTION (4144)	3GPP TS 29.212
[ IP-CAN-Type ]	1027	See Table 8.	3GPP TS 29.212
[ NetLoc-Access-Support ]	2824	It is present when NetLoc is requested by the AF, but the IP-CAN session does not support NetLoc.	3GPP TS 29.212
[ RAT-Type ]	1032	-	3GPP TS 29.212
[ Result-Code ]	268	The SAPC supports the following values: • DIAMETER_SUCCESS (2001) • DIAMETER_OUT_OF_SPACE (4002) • DIAMETER_UNKNOWN_SESSION_ID (5002) • DIAMETER_USER_UNKNOWN (5030)	RFC 6733







## 6 Gx Interface AVPs

The following subsections contain information about AVPs, that owing to space reasons, cannot be explained in the message tables of Section 5 on page 13.

### 6.1 Gx Supported-Features

Depending on the information received from the PCEF in the Feature-List AVP within the Supported-Features AVP, the SAPC decides the release feature used in Gx, according to Table 12.

**Note:** The SAPC includes the Supported-Features AVP only when the Result-Code AVP value is 2001 (SUCCESS). The SAPC does not send a Supported-Features AVP if the Result-Code AVP value is different from 2001 (SUCCESS).

Table 12 Supported-Features

Feature	Received and Sent Features-List AVP bit Values, inside Supported-Features AVP
PRA	If the SAPC receives bit 23 = 1 in CCR command and the PRA function is enabled, the SAPC answers CCA including bit 23 = 1.
Pending Transaction	If the SAPC receives bit 16 = 1 in CCR command, it answers CCA including bit 16 = 1.
NetLoc-Untrusted-WLAN	If the SAPC receives bit 30 = 1 in CCR command and the NetLoc function is enabled, the SAPC answers CCA including bit 30 = 1. It requires that the SAPC also receives bit 10 = 1.
NetLoc	If the SAPC receives bit 10 = 1 in CCR command and the NetLoc function is enabled, the SAPC answers CCA including bit 10 = 1.
ADC	If the SAPC receives bit 6 = 1 in CCR command and the ADC Rule function is enabled, the SAPC answers CCA including bit 6 = 1.
ProvAFsignal Flow	If the SAPC receives bit 2 = 1 in CCR command and the dynamic policy control function is enabled, the SAPC answers CCA including bit 2 = 1.



Table 12 Supported-Features

Feature	Received and Sent Features-List AVP bit Values, inside Supported-Features AVP
Gx Rel10 onwards	<p>If the SAPC receives from the PCEF in CCR command:</p> <p>Supported-Features</p> <pre>{ Vendor-Id = 10415 } { Feature-List-ID = 1 } { Feature-List   bit 0 = x (any value)   bit 1 = x (any value)   bit 3 = 1   rest of bits = x (any value)}</pre> <p>the SAPC answers CCA including:</p> <p>Supported-Features</p> <pre>{ Vendor-Id = 10415 } { Feature-List-ID = 1 } { Feature-List   bit 0 = x (same value than received in CCR)   bit 1 = x (same value than received in CCR)   bit 3 = 1   rest of bits = 0 }</pre>
Gx Rel9	<p>If the SAPC receives from the PCEF in CCR command:</p> <p>Supported-Features</p> <pre>{ Vendor-Id = 10415 } { Feature-List-ID = 1 } { Feature-List   bit 0 = x (any value)   bit 1 = 1   bit 3 = 0   rest of bits = x (any value)}</pre> <p>the SAPC answers CCA including:</p> <p>Supported-Features</p> <pre>{ Vendor-Id = 10415 } { Feature-List-ID = 1 } { Feature-List   bit 0 = x (same value than received in CCR)   bit 1 = 1   bit 3 = 0   rest of bits = 0 }</pre>



Table 12 Supported-Features

Feature	Received and Sent Features-List AVP bit Values, inside Supported-Features AVP
Gx Rel8	<p>If the SAPC receives from the PCEF in CCR command:</p> <p>Supported-Features</p> <pre>{ Vendor-Id = 10415 } { Feature-List-ID = 1 } { Feature-List   bit 0 = 1   bit 1 = 0   bit 3 = 0   rest of bits = x (any value)}</pre> <p>the SAPC answers CCA with Result-Code AVP set to DIAMETER_INVALID_AV P_VALUE, and including Supported-Features AVP inside Failed-AVP AVP.</p>
Gx Rel7	<p>If the SAPC receives from a PCEF a Gx message without Supported-Features AVP, the SAPC responds with Result-Code AVP set to DIAMETER_MISSING_A VP, including Supported-Features AVP inside Failed-AVP AVP.</p>

## 6.2 Charging-Rule-Install AVP

Table 13 Charging-Rule-Install AVPs

AVP Name	AVP Code	Comment	Reference
[ Bearer-Identifier ]	1020	The SAPC includes <b>Bearer-Identifier</b> AVP only for UE_ONLY bearer control mode, and if it was received from the PCEF.	3GPP TS 29.212
*[ Charging-Rule-Base-Name ]	1004	-	3GPP TS 29.212
*[ Charging-Rule-Definition ]	1003	<p>The <b>Charging-Rule-Install</b> AVP can contain several <b>Charging-Rule-Definition</b> AVPs that define PCC rules for service data flows that use IPv4, IPv6 or both.</p> <p>The flows for a PCC rule are sent in one or several <b>Flow-Information</b> AVPs inside the same <b>Charging-Rule-Definition</b> AVP, according to the PCC rule information configured in the SAPC.</p> <p>For PCC rules derived from AF, the SAPC includes several <b>Charging-Rule-Definition</b> AVPs (one per media subcomponent) inside a <b>Charging-Rule-Install</b> AVP.</p> <p>See Section 6.2.1 on page 24.</p>	3GPP TS 29.212
*[ Charging-Rule-Name ]	1005	-	3GPP TS 29.212
[ Resource-Allocation-Notification ]	1063	<p>The SAPC supports the following values:</p> <ul style="list-style-type: none"> <li>ENABLE_NOTIFICATION (0)</li> </ul>	3GPP TS 29.212



Table 13 Charging-Rule-Install AVPs

AVP Name	AVP Code	Comment	Reference
[ Rule-Activation-Time ]	1043	-	3GPP TS 29.212
[ Rule-Deactivation-Time ]	1044	-	3GPP TS 29.212

## 6.2.1 Charging-Rule-Definition AVP

Table 14 Charging-Rule-Definition AVPs

AVP Name	AVP Code	Comment	Reference
[ AF-Charging-Identifier ]	505	-	3GPP TS 29.214
[ AF-Signalling-Protocol ]	529	-	3GPP TS 29.214
{ Charging-Rule-Name }	1005	-	3GPP TS 29.212
*[ Flow-Information ]	1058	The SAPC sends the following AVPs: <ul style="list-style-type: none"><li>• [Flow-Description]</li><li>• [Flow-Direction]</li></ul>	3GPP TS 29.212
[ Flow-Status ]	511	The SAPC sets it to ENABLED for preconfigured PCC rules. The SAPC sends the value received from Rx interface for dynamic PCC rules.	3GPP TS 29.214
*[ Flows ]	510	-	3GPP TS 29.214
[ Metering-Method ]	1007	It is configured in the SAPC at service level.	3GPP TS 29.212
[ <sup>(1)</sup> Mute-Notification]	2809	-	3GPP TS 29.212
[ Offline ]	1008	It is set in the SAPC at service level.	3GPP TS 29.212
[ Online ]	1009	It is set in the SAPC at service level.	3GPP TS 29.212
[ Precedence ]	1010	See Section 6.2.1.2 on page 25.	3GPP TS 29.212
[ QoS-Information ]	1016	It can be set in the SAPC at service level or derived from AF information.	3GPP TS 29.212
[ Rating-Group ]	432	It is set in the SAPC at service level.	RFC 4006
[ Redirect-Information ]	1085	The SAPC sends the following AVPs: [Redirect-Support] [Redirect-Address-Type] [Redirect-Server-Address]	3GPP TS 29.212
*[ Required-Access-Info ]	536	The SAPC sets this AVP only when the AF requests the SAPC to report Access Network Information.	3GPP TS 29.214



Table 14 Charging-Rule-Definition AVPs

AVP Name	AVP Code	Comment	Reference
[ Reporting-Level ]	1011	The SAPC supports the following values: <ul style="list-style-type: none"> <li>SERVICE_IDENTIFIER_LEVEL (0)</li> <li>RATING_GROUP_LEVEL (1)</li> </ul> It is configured in the SAPC at service level.	3GPP TS 29.212
[ Service-Identifier ]	439	It is configured in the SAPC at service level.	RFC 4006
[ TDF-Application-Identifier ] <sup>(2)</sup>	1088	-	3GPP TS 29.212

(1) The reported value in the Mute-Notification AVP towards the PCEF does not change during the life time of the PCC rule.

(2) The SAPC sends either Flow-Information AVPs or TDF-Application-Identifier AVP in the same Charging-Rule-Definition AVP.

### 6.2.1.1 Flow-Description AVP

The Flow-Description AVP is used to describe a single IP flow.

The values returned by the SAPC in this AVP depend on a combination of what is configured in the SAPC at service level and what it is received in the incoming CCR.

— The values returned by the SAPC in the Flow-Description AVP are:

- Direction: 'out'.
- Source address taken from the configured address.
- Source port taken from the configured ports.
- Destination address is completed with the IP address of the UE (Framed-IP-Address AVP for IPv4 scenarios, or from Framed-IPv6-Prefix AVP for IPv6 scenarios). However, this does not happen for IP flows received in the Flow-Description AVP through the Rx interface that is downloaded transparently over the Gx interface.
- Destination port taken from the configured ports.

### 6.2.1.2 Precedence AVP

The SAPC uses the following mechanism to calculate the value of this AVP:

Table 15 Precedence Scoring

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Configurable for preconfigured PCC rules					Dynamic part		



The dynamic part is calculated for preconfigured and dynamic PCC rules depending on the completeness of downlink filters.

## 6.3 Charging-Rule-Report AVP

Table 16 Charging-Rule-Report AVPs

AVP Name	AVP Code	Comment	Reference
[ Bearer-Identifier ]	1020	-	3GPP TS 29.212
*[ Charging-Rule-Base-Name ]	1004	-	3GPP TS 29.212
*[ Charging-Rule-Name ]	1005	-	3GPP TS 29.212
[ PCC-Rule-Status ]	1019	The SAPC supports the following values: <ul style="list-style-type: none"><li>• ACTIVE (0)</li><li>• INACTIVE (1)</li></ul>	3GPP TS 29.212
[ Rule-Failure-Code ]	1031	The SAPC supports the following values: <ul style="list-style-type: none"><li>• UNKNOWN_RULE_NAME (1)</li><li>• RATING_GROUP_ERROR (2)</li><li>• SERVICE_IDENTIFIER_ERROR (3)</li><li>• GWPCEF_MALFUNCTION (4)</li><li>• RESOURCES_LIMITATION (5)</li><li>• MAX_NR_BEARERS_REACHED (6)</li><li>• UNKNOWN_BEARER_ID (7)</li><li>• MISSING_BEARER_ID (8)</li><li>• MISSING_FLOW_INFORMATION (9)</li><li>• RESOURCE_ALLOCATION_FAILURE (10)</li><li>• UNSUCCESSFUL_QOS_VALIDATION (11)</li><li>• INCORRECT_FLOW_INFORMATION (12)</li><li>• PS_TO_CS_HANDOVER (13) <sup>(1)</sup></li><li>• TDF_APPLICATION_IDENTIFIER_ERROR (14)</li><li>• NO_BEARER_BOUND (15)</li><li>• MISSING_REDIRECT_SERVER_ADDRESS (18)</li></ul>	3GPP TS 29.212

(1) On reception of a service data flow deactivation due to PS to CS handover, the SAPC informs the AF with Abort-Cause=PS\_TO\_CS\_HANDOVER. For any other rule code value, SAPC sends to AF Abort-Cause=BEARER\_RELEASE

## 6.4 QoS-Information AVP

The SAPC can receive the requested (negotiated) QoS in the network from the PCEF, included in the QoS-Information AVP in a CCR message.



Whenever the SAPC calculates an authorized QoS, its value is always included in the QoS-Information AVP in CCA or RAR commands.

Table 17 QoS-Information AVPs

AVP Name	AVP Code	Comment	Reference
[ Allocation-Retention-Priority ]	1034	-	3GPP TS 29.212
[ APN-Aggregate-Max-Bitrate-DL ]	1040	-	3GPP TS 29.212
[ APN-Aggregate-Max-Bitrate-UL ]	1041	-	3GPP TS 29.212
[ Bearer-Identifier ]	1020	The SAPC includes Bearer-Identifier AVP, if it was received from the PCEF in the CCR messages.	3GPP TS 29.212
[ Guaranteed-Bitrate-DL ]	1025	-	3GPP TS 29.212
[ Guaranteed-Bitrate-UL ]	1026	-	3GPP TS 29.212
[ Max-Requested-Bandwidth-DL ]	515	-	3GPP TS 29.214
[ Max-Requested-Bandwidth-UL ]	516	-	3GPP TS 29.214
{ QoS-Class-Identifier }	1028	-	3GPP TS 29.212

**Note:** The SAPC includes Max-Requested-Bandwidth-DL and Max-Requested-Bandwidth-UL AVPs in the QoS-Information AVP, if these AVPs are received from the PCEF in the CCR messages.

The SAPC includes APN-Aggregate-Max-Bitrate-DL and APN-Aggregate-Max-Bitrate-UL AVPs in the QoS-Information AVP, if these AVPs are received from the PCEF in the CCR messages.

## 6.5 Default-EPS-Bearer-QoS AVP

Whenever the SAPC calculates an authorized QoS, its value is always included in the Default-EPS-Bearer-QoS AVP in CCA commands.

Table 18 Default-EPS-Bearer-QoS AVPs

AVP Name	AVP Code	Comment	Reference
[ Allocation-Retention-Priority ]	1034	The SAPC supports the following AVPs: <ul style="list-style-type: none"> <li>• {Priority-Level}</li> <li>• [Pre-emption-Capability]</li> <li>• [Pre-emption-Vulnerability]</li> </ul>	3GPP TS 29.212
[ QoS-Class-Identifier ]	1028	-	3GPP TS 29.212



## 6.6 Usage-Monitoring-Information AVP

Table 19 Usage-Monitoring-Information AVPs in CCR Messages

AVP Name	AVP Code	Comment	Reference
[ Monitoring-Key ]	1066	-	3GPP TS 29.212
[ Used-Service-Unit ]	446	The SAPC supports the following AVPs: <ul style="list-style-type: none"><li>• [CC-Input-Octets]</li><li>• [CC-Output-Octets]</li><li>• [CC-Total-Octets]</li></ul>	RFC 4006

Table 20 Usage-Monitoring-Information AVPs in CCA or RAR Messages

AVP Name	AVP Code	Comment	Reference
[ Granted-Service-Unit ]	431	The SAPC supports the following AVPs: <ul style="list-style-type: none"><li>• [CC-Input-Octets]</li><li>• [CC-Output-Octets]</li><li>• [CC-Total-Octets]</li></ul>	RFC 4006
[ Monitoring-Key ]	1066	-	3GPP TS 29.212
[ Usage-Monitoring-Level ]	1068	The SAPC supports the following values: <ul style="list-style-type: none"><li>• SESSION_LEVEL (0)</li><li>• PCC_RULE_LEVEL (1)</li></ul>	3GPP TS 29.212
[ Usage-Monitoring-Report ]	1069	The SAPC supports the following values: <ul style="list-style-type: none"><li>• USAGE_MONITORING_REPORT_REQUIRED (0)</li></ul>	3GPP TS 29.212
[ Usage-Monitoring-Support ]	1070	The SAPC supports the following values: <ul style="list-style-type: none"><li>• USAGE_MONITORING_DISABLED (0)</li></ul>	3GPP TS 29.212

## 6.7 Presence-Reporting-Area-Information AVP

The Presence-Reporting-Area-Information AVP is only valid for the CCR-Update and CCA-Initial messages. The Presence-Reporting-Area-Information AVP includes the following AVPs as shown in Table 21.

Table 21 Presence-Reporting-Area-Information AVPs

AVP Name	AVP Code	Comment	Reference
[ Presence-Reporting-Area-Identifier ]	2821	Only valid for CCR-Update and CCA-Initial message.	3GPP TS 29.212





Table 21 Presence-Reporting-Area-Information AVPs

AVP Name	AVP Code	Comment	Reference
[ Presence-Reporting-Area-Status ]	2823	Only valid for CCR-Update message. The SAPC supports the following values: <ul style="list-style-type: none"> <li>• In Area (0)</li> <li>• Out of Area (1)</li> </ul>	3GPP TS 29.212
[ Presence-Reporting-Area-Elements-List ]	2820	Only valid for CCA-Initial message.	3GPP TS 29.212

## 6.8 TDF-Information AVP

The TDF-Information AVP is only valid for the CCR-Initial messages. This AVP contains information about the TDF that handles application detection and reports for that IP-CAN session.

The TDF-Information AVP includes the following AVPs as shown in Table 22:

Table 22 TDF-Information AVPs

AVP Name	AVP Code	Comment	Reference
[ TDF-Destination-Host ] <sup>(1)</sup>	1089	Only valid with the TDF-Destination-Realm AVP.	3GPP TS 29.212
[ TDF-Destination-Realm ] <sup>(2)</sup>	1090	Only valid with the TDF-Destination-Host AVP.	3GPP TS 29.212
[ TDF-IP-Address ]	1091	The address type can be IPv4 or IPv6.	3GPP TS 29.212

(1) If the TDF-Destination-Host AVP is received in a CCR-Initial message, the TDF-Destination-Realm AVP is mandatory to be received. Otherwise, the SAPC returns a Result-Code AVP set to DIAMETER\_INVALID\_AVP\_VALUE.

(2) If the TDF-Destination-Realm AVP is received in a CCR-Initial message, the TDF-Destination-Host AVP is mandatory to be received. Otherwise, the SAPC returns a Result-Code AVP set to DIAMETER\_INVALID\_AVP\_VALUE.





## 7 Ericsson Gx+ Message Format

This section contains the Ericsson added value AVPs that can be used in the Ericsson Gx+ interface, in addition to the standard information covered in Section 5 on page 13.

### 7.1 Ericsson Gx+ Credit-Control-Request (CCR)

Table 23 lists the Ericsson added AVPs that the SAPC supports in a CCR.

Table 23 CCR Ericsson Added AVPs

AVP Name	AVP Code	Description	Reference
[ 3GPP-Charging-Characteristics ]	13	3GPP-Charging-Characteristics AVP is of type UTF8String and is defined according to 3GPP TS 29 061 (Reference [1]) and transformed into a Diameter AVP.	3GPP TS 29 061
[ Gx-Capability-List ]	1060	Gx-Capability-List AVP is of type Unsigned32. It can be included in the CCR initial for the IP-CAN session by the PCEF indicating the Ericsson offered proprietary capabilities.  This negotiated Gx capability list is applicable for the lifetime of the IP-CAN session (and it is ignored if received again).  If this negotiation is not present, the SAPC works in standard 3GPP Gx mode.  Each bit, numbered 0-31 starting from the least significant bit, is used to indicate a separate function. The least significant bit is designated as bit 0.	See Section 8.2 on page 35
[ Rule-Space-Suggestion ]	290	Rule-Space-Suggestion AVP is of type OctetString. It can be included in the initial CCR.	
[ Rule-Space-Decision ]	291	Rule-Space-Decision AVP is of type OctetString and can be included in initial CCR/CCA.  If the Rule-Space-Decision AVP is received in the CCR, the SAPC does not change it, and does not include Rule-Space-Decision AVP in the CCA.	

### 7.2 Ericsson Gx+ Credit-Control-Answer (CCA)

Table 24 lists the Ericsson added AVPs that the SAPC can send in a CCA.

Table 24 CCA Ericsson Added AVPs

AVP Name	AVP Code	Description	Reference
[ 3GPP-Charging-Characteristics ]	13	The SAPC returns this AVP in CCA (2 octets value), if configured in the SAPC at subscriber level and the capability Charging characteristics retrieval is negotiated.	3GPP TS 29 061
[ Charging-Rule-Authorization ]	1055	The SAPC can add this AVP inside Charging-Rule-Install AVP.	See Section 8.1 on page 33.



Table 24 CCA Ericsson Added AVPs

AVP Name	AVP Code	Description	Reference
[ Content-Filtering-Profile-Id ]	1138	<p>The <b>Content-Filtering-Profile-Id</b> AVP is of type Unsigned 32. It is used to select a local content filtering profile identifier in the Ericsson PCEF. The SAPC uses the special value 0xFFFFFFFF to indicate to the PCEF to remove the previously downloaded value.</p> <p>The SAPC includes it in CCA Initial message, if provisioned in the SAPC at subscriber level and the capability Content Filtering is negotiated.</p> <p>The SAPC includes it in CCA Update, only if its value is different than the value previously sent.</p>	
[ Customer-Id ]	1146	<p>It contains the customer identifier of the PDP context (used for HTTP Header Enrichment) and is primarily intended to replace the MSISDN as the user identity sent out to applications on the Internet. This AVP is an Ericsson proprietary addition, but it is not negotiated in the <b>Gx-Capability-List</b>. It is only sent in CCA initial, if configured in the SAPC at subscriber level. It contains an ASCII value of variable length, between 1-25 octets, and cannot include special characters.</p>	
[ Gx-Capability-List ]	1060	-	See Section 8.2 on page 35.
[ Rule-Space-Decision ]	291	<p>If the <b>Rule-Space-Suggestion</b> AVP is included in the CCR, this indicates to the SAPC can override this suggestion by including the <b>Rule-Space-Decision</b> AVP in the CCA initial.</p>	

## 7.3 Ericsson Gx+ Re-Auth-Request (RAR)

Table 25 lists the Ericsson added AVPs that the SAPC can send in a RAR.

Table 25 RAR Ericsson Added AVPs

AVP Name	AVP Code	Description	Reference
[ Charging-Rule-Authorization ]	1055	The SAPC can add this AVP inside <b>Charging-Rule-Install</b> AVP.	See Section 8.1 on page 33.
[ Content-Filtering-Profile-Id ]	1138	<p>See Page 32.</p> <p>The SAPC only includes it in RAR message, if there is a change compared to the value that sent to the PCEF in a previous CCA or RAR message.</p>	



## 8 Ericsson Gx+ AVPs

The following subsections contain information for AVPs, that owing to space reasons, cannot be explained in the message tables of Section 7 on page 31.

### 8.1 Charging-Rule-Authorization

The Charging-Rule-Authorization AVP is of type Grouped. It groups the AVPs that are required to define the authorization state for the current and next time period for the associated Charging-Rule-Names and Charging-Rule-Base-Names.

It is only applicable for static PCC rules.

The Charging-Rule-Authorization AVP is shared in the same Charging-Rule-Install for those Charging-Rule-Names or Charging-Rule-Base-Names that have the same Authorization-State.

The Charging-Rule-Authorization AVP has the following ABNF grammar:

AVP Format:

```
Charging-Rule-Authorization ::= < AVP Header: 1055, Vendor Id:193 >
                                { Authorization-State }
                                [ Authorization-State-Change-Time ]
                                [ Next-Authorization-State ]
                                [ One-Time-Redirect-Control ]
```

**Note:** The SAPC does not send Authorization-State-Change-Time and Next-Authorization-State AVPs.

#### 8.1.1 Authorization-State AVP

The authorization state for current and next periods of time is included in Charging-Rule-Install AVP by inserting the Charging-Rule-Authorization AVP (only for static PCC rules).

The Authorization-State AVP (AVP code 1056) is of type Enumerated and specifies the authorization state and reason for non-authorization for the Charging-Rule-Names and Charging-Rule-Base-Names provided in the Charging-Rule-Install AVP.

It is only used for static PCC rules if capabilities enabling enhanced service authorization control or One Time Redirect are negotiated.

The SAPC supports the following values:



AUTHORIZED	0
DENIED_CALENDAR_TIME	1
DENIED_ROAMING	2
DENIED_QUALITY_OF_SERVICE	3
DENIED_BLACKLISTED	4
DENIED_TERMINAL	5
DENIED_OPERATOR_REASON_ONE	6
DENIED_OPERATOR_REASON_TWO	7
DENIED_OPERATOR_REASON_THREE	8
DENIED_OPERATOR_REASON_FOUR	9
DENIED_OPERATOR_REASON_FIVE	10
DENIED_UNKNOWN_REASON	11
DENIED_USAGE_CONTROL	12

### 8.1.2 One-Time-Redirect-Control AVP

The One-Time-Redirect-Control AVP (AVP code 1193) is of type enumerated. It specifies if the one-time redirect is active or not for the charging rules and charging rule base names provided in the Charging-Rule-Install AVP.

It is only used for static PCC rules if One-Time-Redirect capability is enabled.

The SAPC includes this AVP in the Charging-Rule-Authorization AVP only in case that the Authorization-State is Authorized (0) and One Time Redirect capability is negotiated.

The SAPC provides the One-Time-Redirect-Control AVP only when there is a change regarding the previously provided information for the IP-CAN session (previous CCA).

The One-Time Redirect is deactivated by providing the One-Time-Redirect-Control AVP with the value One-Time Redirect Inactive.

The following values are defined:

One-Time-Redirect inactive	0
One-Time-Redirect active	1



## 8.2 Gx-Capability-List AVP

The Gx-Capability-List AVP is of type Unsigned32. It can be included in the initial CCR for the IP-CAN session by the PCEF indicating the Ericsson offered proprietary capabilities.

This negotiated Gx capability list is applicable for the lifetime of the IP-CAN session (and it is ignored if received again).

If this negotiation is not present, the SAPC works in standard 3GPP Gx mode.

Each bit, numbered 0-31 starting from the least significant bit, is used to indicate a separate function. The least significant bit is designated as bit 0.

Table 26 indicates the possible values for the supported capabilities:

Table 26 Gx+ Capabilities

Feature bit	Feature	Description
0	Enhanced service authorization control	If set, use of non-authorization codes is possible
1	Not used	-
2	Not used	-
3	Rule Space negotiation	Rule Space negotiation is possible.
4	Charging Characteristics retrieval	If set, the SAPC is able to retrieve the Charging Characteristics specified for the subscriber and return it to the PCEF.
5	Not used	Set to 0
6	Not used	Set to 0
7	Not used	Set to 0
8	Not used	Set to 0
9	Not used	Set to 0
10-11	Reserved for future use	Set to 0.
12	Support of Content Filtering Profile Id	Set to 1 if Content Filtering Profile Id is supported.
13	Reserved for future use	Set to 0.
14	-	Not used for backward compatibility reasons
15	Reserved for future use	Reserved bits are set to zero for forward compatibility reasons



Feature bit	Feature	Description
16	One-Time-Redirect	If set, One-Time-Redirect is enabled.
17-31	Reserved for future use	Reserved bits are set to zero for forward compatibility reasons

The SAPC includes this AVP in the Ericsson Gx+ initial CCA messages. The bit for each capability is set to 1 whenever that capability was set to 1 by the Ericsson PCEF. The corresponding control is configured in the SAPC for that PCEF (only for capabilities linked to a control).





## 9 Gx Error Handling

When the SAPC detects an error at protocol or application level, it returns a response including the Result-Code AVP with an error code specifying the error.

### 9.1 Gx Protocol Errors

The SAPC handles the following Diameter Base Protocol error types:

Table 27 SAPC Diameter Base Protocol Errors

Diameter Result Code	Value	Description
DIAMETER_SUCCESS	2001	A request is successfully completed.
DIAMETER_COMMAND_UNSUPPORTED	3001	A request contains a Command-Code that the SAPC does not recognize or support.
DIAMETER_TOO_BUSY	3004	A request is received when the SAPC is overloaded.
DIAMETER_APPLICATION_UNSUPPORTED	3007	A request is received for an unsupported application.
DIAMETER_INVALID_HDR_BITS	3008	A request is received with a Diameter header whose bits are set to an invalid combination or to a value that is inconsistent with the Command-Code definition.
DIAMETER_INVALID_AVP_BITS	3009	A request is received with an AVP whose flag bits are set to an unrecognized value or are inconsistent with the AVPs definition.
DIAMETER_UNKNOWN_PEER	3010	A CER message is received from an unknown peer.

### 9.2 Gx Application Errors

The SAPC handles the following Gx Interface Application errors:

Table 28 SAPC Application Errors

Diameter Result Code	Value	Description
DIAMETER_OUT_OF_SPACE	4002	A Diameter node received the request but was unable to commit it to stable storage due to a temporary lack of space.



Table 28 SAPC Application Errors

Diameter Result Code	Value	Description
ELECTION_LOST	4003	The peer has determined that it has lost the election process and has therefore disconnected the transport connection.
DIAMETER_AVP_UNSUPPORTED	5001	<p>A request is received with an AVP that is not recognized or supported (not included in the SAPC Diameter dictionary) and was marked with the Mandatory bit.</p> <p>A Diameter message with this error must contain one or more Failed-AVP AVP containing the AVPs that caused the failure.</p>
DIAMETER_UNKNOWN_SESSION_ID	5002	Returned if the session does not exist for the UE IP address at session modification/termination.
DIAMETER_INVALID_AVP_VALUE	5004	<p>A request is received with an AVP with an invalid value in its data portion.</p> <p>A Diameter message with this error must contain one or more Failed-AVP AVP containing the AVPs that caused the failure.</p>
DIAMETER_MISSING_AVP	5005	When a request is received including an AVP that is not required to process that request, that AVP is ignored and the request is processed as usual. On the contrary, when a request does not include an AVP that is required to process such request, the SAPC returns a response including Result-Code DIAMETER_MISSING_AVP and the Failed-AVP AVP.
DIAMETER_CONTRADICTING_AVPS	5007	<p>A request is received with AVPs that are contradicted each other.</p> <p>A Diameter message with this error must contain one or more Failed-AVP AVP containing the AVPs that caused the failure.</p>
DIAMETER_AVP_NOT_ALLOWED	5008	<p>A request is received with an AVP that must not be present.</p> <p>A Diameter message with this error must contain a Failed-AVP AVP with a copy of the offending AVP.</p>



Table 28 SAPC Application Errors

Diameter Result Code	Value	Description
DIAMETER_AVP_OCCURS_TOO_MANY_TIMES	5009	<p>A request is received with an AVP that appears more often than permitted in the message definition.</p> <p>A Diameter message with this error must contain a Failed-AVP AVP with a copy of the first instance of the offending AVP that exceeded the maximum number of occurrences.</p>
DIAMETER_NO_COMMON_APPLICATION	5010	A CER message is received and there are no common applications supported between the SAPC and the peer.
DIAMETER_UNSUPPORTED_VERSION	5011	A request is received with an unsupported version number.
DIAMETER_UNABLE_TO_COMPLY	5012	This error is returned when the SAPC receives a request and detects an internal error which does not allow to continue processing a request.
DIAMETER_INVALID_BIT_IN_HEADER	5013	A request is received with an unrecognized bit in the Diameter header is set to one.
DIAMETER_INVALID_AVP_LENGTH	5014	<p>A request is received containing an AVP with an invalid length.</p> <p>A Diameter message with this error must contain a Failed-AVP AVP containing the offending AVP.</p>
DIAMETER_INVALID_MESSAGE_LENGTH	5015	A request is received with an invalid message length.
DIAMETER_INVALID_AVP_BIT_COMBO	5016	<p>A request is received with an AVP which is not allowed to have the received value in the AVP Flags field.</p> <p>A Diameter message with this error must contain a Failed-AVP AVP containing the offending AVP.</p>
DIAMETER_NO_COMMON_SECURITY	5017	<p>This error is returned when a CER message is received, and there are no common security mechanisms supported between the peers.</p> <p>A CEA MUST be returned with the Result-Code AVP set to DIAMETER_NO_COMMON_SECURITY.</p>



Table 29 The SAPC Application Errors (II)

Result Code	Value	Description
DIAMETER_AUTHORIZATION_REJECTED	5003	A request is received for which the subscriber could not be authorized, owing to IP-CAN Session Access Control.
DIAMETER_USER_UNKNOWN	5030	This error is returned when the subscriber specified in the Subscription-Id AVP is not known in the SAPC at session activation or modification

Table 30 The SAPC Application Errors, Experimental Results

Result Code	Value	Description
DIAMETER_PENDING_TRANSACTION	4144	Received if the PCEF cannot determine that Gx RAR message can be safely handled without creating a state mismatch.
DIAMETER_ERROR_INITIAL_PARAMETERS	5140	<p>This error is returned when the SAPC receives a CCR INITIAL for an emergency IP-CAN session establishment where:</p> <ul style="list-style-type: none"><li>• The Subscription-Id AVP is missing and unauthenticated emergency services are not allowed</li><li>• Unauthenticated emergency services are allowed, but both Subscription-Id and User-Equipment-Info AVPs are missing</li></ul>



# Reference List

## Standards References

- [1] [Interworking between the Public Land Mobile Network \(PLMN\) Supporting Packet Based Services and Packet Data Networks \(PDN\)](#), 3GPP TS 29.061 V6.7.0
- [2] [Policy and Charging Control Reference Points](#), 3GPP TS 29.212
- [3] [E-UTRAN – eHRPD Connectivity and Interworking: Core Network Aspects](#), 3GPP2 X.S0057

## Online References

- [4] [Diameter Base Protocol](#)
- [5] [Diameter Credit-Control Application](#)
- [6] [Diameter Network Access Server Application](#)