

Statement of Compliance towards 3GPP Technical Specification 29.214 Release 12

Ericsson Service-Aware Policy Controller

STATEMENT OF COMPLIANCE

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Introduction

This document describes to what extent Ericsson Service-Aware Policy Controller (SAPC) implementation of Policy and Charging Rules Function (PCRF) role conforms with the 3GPP Technical Specification (TS) 29.214 V12.12.0 (2016-06) standard Reference [2] with the exemptions or additions stated in this document.

General Considerations

This document is structured following the chapters of the 3GPP Technical Specification 29.214 V12.12.0 (2016-06) .

The following terms explain the columns in the fill-in tables in the document:

Qualifier	Defines whether the implementation of a certain entity is mandatory (M), optional (Op) or conditional (C).
Compliance	Defines whether the implementation of a certain entity is Compliant by the system.
Comment	It may contain more information.
No requirement (NR)	The TS statement contains general information for the understanding of other statements not applicable to the SAPC (the statements may be applicable for other nodes).

One of the following statements (with the associated interpretation) is given to each of the requirements of the Technical Specification:

Not compliant (NC)	The TS statement is not fulfilled.
Compliant (C)	All of the TS statements are fulfilled
Partially compliant (PC)	Not completely all of the TS statements are fulfilled, the exceptions are described.

One of the following statements (with the associated interpretation) is given to each of the AVPs of the Technical Specification:

Not compliant (NC)	The AVP is not supported.
Compliant (C)	The AVP is supported and handled by SAPC
Partially compliant (PC)	The AVP is supported but not handled (or not fully handled) by SAPC.

In this context, 'is/shall/will' statements are considered as mandatory, 'may and should' statements are considered as optional, and 'can' statements are considered as conditional.

Some sentences (rows in the tables of this document) stating requirements are not completely independent, as they explain a behavior that shall be understood in the context of the corresponding chapter where they appear.



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1 Scope

NR

2 References

NR

3 Definitions, symbols and abbreviations

NR

4 Rx reference point

4.1 Overview

NR

4.2 Rx reference model

Partially compliant. Scenarios with TDF and BBERF are not supported for Rx interactions.



4.3 Functional elements

4.3.1 AF

NR

4.3.2 PCRF

Table 1 PCRF

Text	Qualifier	Compliance	Comment
The PCRF provides network control regarding the service data flow detection, gating, QoS and flow based charging (except credit management) towards the PCEF.	M	C	
The PCRF receives session and media related information from the AF and informs AF of traffic plane events.	M	C	
The PCRF may check that the service information provided by the AF is consistent with the operator defined policy rules before storing the service information	Op	C	
The service information shall be used to derive the QoS for the service	M	C	
The PCRF may reject the request received from the AF	Op	C	
If the PCRF rejects a request received from the AF the PCRF shall indicate, in the response to the AF, the service information that can be accepted by the PCRF.	M	PC	The SAPC may reject a request owing to service not authorized, but in the response, the SAPC does not indicate the service information that can be accepted
The PCRF may use the subscription information as basis for the policy and charging control decisions.	Op	C	



Text	Qualifier	Compliance	Comment
The subscription information may apply for both session based and non-session based services. The subscription specific information for each service may contain e.g. max QoS class and max bit rate.	Op	C	
If the AF requests it, the PCRF shall report IP-CAN session events (including bearer events and events on AF signalling transport) to the AF via the Rx reference point.	M	PC	See Rx Interface Description for supported events (Specific-Action AVP)
The PCRF PCC/QoS Rule decisions may be based on one or more of the following:	Op	C	
- the session and media related information obtained from the AF via the Rx reference point;			
- the bearer and subscriber related information obtained from the PCEF over the Gx reference point	Op	C	
- the bearer and subscriber related information obtained from the BBERF over the Gxx reference point	Op	NC	The Gxx reference point is not supported.
- subscriber and service related data the PCRF may be aware of by configuration or through the Sp reference point	Op	C	
- pre-configured information in the PCRF	Op	C	
The PCRF shall provision PCC/QoS Rules to the PCEF via the Gx/Gxx reference point.	M	PC	The Gxx reference point is not supported.



4.4 PCC procedures over Rx reference point

4.4.1 Initial Provisioning of Session Information

Table 2 Initial Provisioning of Session Information

Text	Qualifier	Compliance	Comment
AF-Application-Identifier AVP can be provided at both AF session level, and Media-Component-Description level. When provided at both levels, the AF-Application Identifier provided within the Media-Component-Description AVP will have precedence	M	C	
If the PCRF receives the Service-URN AVP indicating an emergency session, the PCRF may apply special policies, for instance prioritizing service flows relating to the new AF session or allowing these service flows free of charge.	Op	C	
If the PCRF receives the MPS-Identifier AVP indicating an MPS session, the PCRF may take specific actions on the corresponding IP-CAN to ensure that the MPS session is prioritized as specified in 3GPP TS 29.212	Op	NC	Multimedia Priority Services are not supported



Text	Qualifier	Compliance	Comment
When the AF is a GCS AS, it may include the GCS-Identifier AVP at command level and Reservation-Priority AVP at command level or media component level in order to indicate that the new AF session relates to a prioritized Group Communication session. Based on this information, the PCRF may take specific actions on the corresponding IP-CAN to ensure that the Group Communication session is prioritized as specified in 3GPP TS 29.212.	Op	NC	
If the AF provides service information that has been fully negotiated (e.g. based on the SDP answer), the AF may include the Service-Info-Status AVP set to FINAL_SERVICE_INFORMATION. In this case the PCRF shall authorize the session and provision the corresponding PCC/QoS rules to the PCEF/BBERF.	M	PC	The Gxx reference point is not supported.



Text	Qualifier	Compliance	Comment
The AF may additionally provide preliminary service information not fully negotiated yet (e.g. based on the SDP offer) at an earlier stage. To do so, the AF shall include the Service-Info-Status AVP with the value set to PRELIMINARY SERVICE INFORMATION. Upon receipt of such preliminary service information, the PCRF shall perform an early authorization check of the service information. For GPRS, the PCRF shall not provision PCC rules towards the PCEF unsolicitedly. However, the PCRF may authorize a PCC/QoS rule request received from the PCEF/BBERF as per 3GPP TS 29.212.	M	PC	The SAPC may provision PCC rules for GPRS regardless of the Service-Info-Status. The Gxx reference point is not supported.
Further, if the AF requests the PCRF to report the access network information together with preliminary service information, the PCRF shall immediately configure the PCEF (or BBERF) to provide the access network information.	M	PC	The SAPC does not support to configure BBERF to provide the access network information.
If the UE is roaming with the visited access case and the AF is located in the HPLMN or roaming with the home routed case and operator policies do not allow accessing the sponsored data connectivity with this roaming case, the H-PCRF shall reject the service request indicating UNAUTHORIZED_SPONSORED_DATA_CONNECTIVITY to the AF	M	NC	



Text	Qualifier	Compliance	Comment
If the UE is roaming with the visited access case and the AF is located in the VPLMN, the V-PCRF shall reject the service request indicating UNAUTHORIZED_SPONSORED_DATA_CONNECTIVITY to the AF.	M	NC	
<p>If the UE is in the non-roaming case or roaming with the home routed case and the operator policies allow accessing the sponsored data connectivity with this roaming case, the following procedures apply:</p> <ul style="list-style-type: none"> - If the PCEF does not support sponsored connectivity and the required reporting level for that service indicates a sponsored connectivity level according to 3GPP TS 29.212, clause 4.5.20, then the PCRF shall reject the request indicating REQUESTED_SERVICE_NOT_AUTHORIZED 	M	NC	



Text	Qualifier	Compliance	Comment
If the PCRF supports sponsored data connectivity feature or the required reporting level is different from sponsored connectivity level as described in 3GPP TS 29.212, then the PCRF, based on operator policies, shall check whether it is required to validate the sponsored connectivity data. If it is required, it shall perform the authorizations based on sponsored data connectivity profiles. If the authorization fails, the PCRF responds to the AF with an AA-Answer including the Experimental-Result-Code AVP set to the value UNAUTHORIZED_SPONSORED_DATA_CONNECTIVITY. The profile may include a list of Application Service Providers and their applications per sponsor.	M	NC	
When the PCRF receives an initial AA-Request from the AF, the PCRF shall perform session binding as described in 3GPP TS 29.213	M	C	
To allow the PCRF to identify the IP-CAN session for which the session applies, the AF shall provide either the Framed-IP-Address or the Framed-IPv6-Prefix containing the full IP address applicable to an IP flow or IP flows towards the UE.	M	C	
If the PCRF fails in executing session binding, the PCRF responds to the AF with an AA-Answer including the Experimental-Result-Code AVP set to the value IP-CAN_SESSION_NOT_AVAILABLE.	M	C	



Text	Qualifier	Compliance	Comment
If the request contains Media-Component-Description Attribute-Value Pair(s) (AVP(s)) the PCRF shall store the received Service Information. The PCRF shall process the received Service Information according to the operator policy and may decide whether the request is accepted or not.	M	C	
The PCRF may take the priority information within the Reservation-Priority AVP into account when making this decision.	Op	C	
If the service information provided in the AA-Request command is rejected (e.g. the subscribed guaranteed bandwidth for a particular user is exceeded), the PCRF shall indicate in the AA-Answer the cause for the rejection with the Experimental-Result-Code AVP set to the value REQUESTED_SERVICE_NOT_AUTHORIZED.	M	C	
The PCRF may additionally provide the acceptable bandwidth within the Acceptable-Service-Info AVP.	Op	NC	
If the Reservation-Priority AVP is not specified the requested priority is DEFAULT (0).	M	C	



Text	Qualifier	Compliance	Comment
The AF may request notifications of specific IP-CAN session events through the usage of the Specific-Action AVP in the AA-Request command. The PCRF shall make sure to inform the AF of the requested notifications in the event that they take place.	M	PC	See Rx Interface Description document for supported values of Specific-Action AVP. If a given specific action is not supported by the SAPC, the SAPC accepts the request anyway, but no associated notifications are sent to AF in that case.
The PCRF shall check whether the received Service Information requires PCC/QoS Rules to be created and provisioned and/or authorized QoS to be provisioned.	M	C	
Provisioning of PCC/QoS Rules and Authorized QoS to the PCEF/BBERF shall be carried out as specified at 3GPP TS 29.212	M	PC	The Gxx reference point is not supported.
The PCRF shall reply with an AA-Answer to the AF. The acknowledgement towards the AF should take place before or in parallel with any required PCC Rule provisioning towards the PCEF and shall include the Access Network-Charging-Identifier(s) and may include the Access-Network-Charging-Address AVP, if they are available.	M	PC	The SAPC always sends the AA-Answer before the PCC rule provisioning. Access Network-Charging-Identifier(s) and Access-Network-Charging-Address AVP, are not returned in AAA.



Text	Qualifier	Compliance	Comment
The AA-Answer message shall also include the IP-CAN-Type AVP, if such information is available. In that case, the AA-Answer message shall also include the RAT-Type AVP when applicable for the specific IP-CAN Type (e.g. 3GPP IP-CAN Type).	M	NC	
The PCRF shall also include IP-CAN-type and RAT-type information (if applicable) to IP flow mobility related flows, if such information is available. The IP flow mobility affected service data flows are included within the Flows AVP at command level	M	NC	
If the PCRF needs to terminate the Rx session before it has sent the AA Answer, the PCRF shall send the AA Answer immediately and before the AS Request.	M	C	
If the PCRF fails in installing PCC/QoS rules based on the provided service information due to resource allocation failure as specified in 3GPP TS 29.212 and if requested by the AF, the PCRF shall send an RAR command to the AF with the Specific-Action AVP set to the value INDICATION_OF_FAILURE_RESOURCES_ALLOCATION to report the resource allocation failure.	M	PC	The Gxx reference point is not supported.



4.4.2 Modification of Session Information

Table 3 Modification of Session Information

Text	Qualifier	Compliance	Comment
For the normal case where the AF provides service information that has been fully negotiated (e.g. based on the SDP answer), the AF may include the Service-Info-Status AVP set to FINAL_SERVICE_INFORMATION. In this case the PCRF shall authorize the session and provision the corresponding PCC rules to the PCEF.	M	C	
Upon reception of an AA-Request command with the Service-Info-Status AVP set to PRELIMINARY SERVICE INFORMATION, the PCRF shall perform an early authorization check of the service information. For GPRS, the PCRF shall not provision PCC rules towards the PCEF unsolicitedly. However, the PCRF may authorize a PCC/QoS rule request received from the PCEF/BBERF as per 3GPP TS 29.212.	M	PC	The Gxx reference point is not supported.
Further, if the AF requests the PCRF to report the access network information together with preliminary service information, the PCRF shall immediately configure the PCEF (or BBERF) to provide the access network information.	M	PC	The SAPC does not support to configure BBERF to provide the access network information.



Text	Qualifier	Compliance	Comment
The AF may include the MPS-Identifier AVP in order to indicate that the modified AF session relates to an MPS session. If the PCRF receives the MPS-Identifier AVP, it may take specific actions on the corresponding IP-CAN to ensure that the MPS session is prioritized as defined in 3GPP TS 29.212.	Op	NC	
When the AF is a GCS AS, it may include the GCS-Identifier AVP at command level and Reservation-Priority AVP at command level or media component level in order to modify the priority of an AF session that relates to a prioritized Group Communication session. Based on this information, the PCRF may take specific actions on the corresponding IP-CAN to ensure that the Group Communication session is prioritized as specified in 3GPP TS 29.212.	Op	NC	
The PCRF shall process the received Service Information according the operator policy	M	C	
The PCRF may decide whether the request is accepted or not.	Op	C	
If the updated Service Information is not acceptable (e.g. subscribed guaranteed bandwidth for a particular user is exceeded), the PCRF shall indicate in the AA-Answer the cause for the rejection with the Experimental-Result-Code AVP set to the value REQUESTED_SERVICE_NOT_AUTHORIZED.	M	C	

Text	Qualifier	Compliance	Comment
The PCRF may additionally provide the acceptable bandwidth within the Acceptable-Service-Info AVP.	Op	NC	
If accepted, the PCRF shall update the Service Information with the new information received.	M	C	
Due to the updated Service Information, the PCRF may need to create, modify or delete the related PCC rules and provide the updated information towards the PCEF following the corresponding procedures specified at 3GPP TS 29.212	Op	C	
The procedures to update the Authorized QoS for the affected IP-CAN bearer are also specified at 3GPP TS 29.212	Op	C	
The PCRF shall reply with an AA-Answer to the AF.	M	C	
The acknowledgement towards the AF should take place before or in parallel with any required PCC Rule provisioning towards the PCEF	Op	C	The SAPC always sends the AA-Answer before the PCC rule provisioning
The AA-Answer sent towards the AF shall include the Access Network-Charging-Identifier(s), if they are available at this moment and have not been yet supplied earlier to the AF.	M	NC	
The AA-Answer sent towards the AF may include the Access-Network-Charging-Address AVP, if it is available at this moment and have not been yet supplied earlier to the AF.	Op	NC	



Text	Qualifier	Compliance	Comment
The AA-Answer message shall include the IP-CAN-Type AVP if such information is available and has not yet been supplied earlier to the AF. In that case, the AA-Answer message shall also include the RAT-Type AVP when applicable for the specific IP-CAN Type (e.g. 3GPP IP-CAN Type).	M	NC	
The PCRF shall also include IP-CAN-type and RAT-type information (if applicable) to IP flow mobility related flows, if such information is available and has not yet been supplied earlier to the AF. The IP flow mobility affected service data flows are included within the Flows AVP at command level.	M	NC	
If the PCRF needs to terminate the Rx session before it has sent the AA-Answer, the PCRF shall send the AA Answer immediately and before the AS-Request.	M	C	



Text	Qualifier	Compliance	Comment
If the PCRF does not have an existing session for the Rx session being modified (such as after a PCRF failure), the PCRF may reject the request with an AA-Answer with the result code set to DIAMETER_UNKNOWN_SESSION_ID	Op	C	
If the PCRF modifies existing PCC/QoS rules based on the updated service information and the modification fails due to resource allocation failure as specified in 3GPP TS 29.212 and if requested by the AF, the PCRF shall send an RAR command to the AF with the Specific-Action AVP set to the value INDICATION_OF_FAILED_RESOURCES_ALLOCATION to report the modification failure	M	C	

4.4.3 Gate Related Procedures

Table 4 Gate Related Procedures

Text	Qualifier	Compliance	Comment
The PCRF shall set the appropriate gate status for the corresponding active PCC rule(s) in response to an AA-Request message containing the Media-Component-Description AVP(s) that contains the flow status information (in the Flow-Status AVP) for the flows to be enabled or disabled.	M	C	



Text	Qualifier	Compliance	Comment
If a Media-Sub-Component AVP under a Media-Component-Description AVP contains a Flow-Usage AVP with the value RTCP, then the corresponding RTCP IP Flows in both directions shall be enabled even if the Flow-Status AVP under the Media-Sub-Component AVP is set to ENABLED-UPLINK, ENABLED-DOWNLINK, ENABLED, or DISABLED.	M	C	
The PCRF shall reply with an AA-Answer and shall include the Access-Network-Charging-Identifier(s) available at this moment.	M	NC	
The PCRF forwards the AF decision to enable or disable the authorized IP flows.	M	C	

4.4.4

AF Session Termination

Table 5 AF Session Termination

Text	Qualifier	Compliance	Comment
When the PCRF receives a ST-Request from the AF, indicating an AF session termination, it shall acknowledge that request by sending a ST-Answer to the AF.	M	C	
Afterwards, it shall free the resources allocated for the corresponding Service Data Flow(s).	M	C	



Text	Qualifier	Compliance	Comment
The PCRF shall initiate the request for the removal of any related PCC/QoS rules from the PCEF/BBERF and for the update of the Authorized QoS for the affected IP-CAN bearer following the corresponding procedures specified at 3GPP TS 29.212	M	PC	The Gxx reference point is not supported.
However, if the AF requests the reporting of access network information within the ST-Request or if the AF provided a threshold for the sponsored data connectivity, the PCRF shall defer sending the ST-Answer.	M	PC	Sponsored data connectivity is not supported.
If the AF session being terminated corresponds to an MPS session, the PCRF may revoke the actions related to the prioritization of the MPS session in the corresponding IP-CAN as defined in 3GPP TS 29.212	M	NC	
If the AF session being terminated corresponds to the last Group Communication session for the IP-CAN session, the PCRF may revoke the actions related to the prioritization of the Group Communication session as specified in 3GPP TS 29.212.	M	NC	
For sponsored data connectivity, and if a volume threshold was provided for the sponsored data connection at initial provisioning of session information (clause 4.4.1) or modification of session information (clause 4.4.2) procedures, the PCRF shall provide the volume consumed to the AF.	M	NC	



Text	Qualifier	Compliance	Comment
For such purpose, the PCRF shall initiate the IP-CAN session modification procedure according 3GPP TS 29.212 in order to obtain the consumed volume. The PCRF shall send then the ST-Answer to the AF including the Used-Service-Unit AVP for reporting accumulated usage within the Sponsored-Connectivity-Data AVP.	M	NC	
If the AF requires access network information at this step, the AF shall include the Required-Access-Info AVP within the ST-Request command, indicating the required information. In this case, the PCRF shall initiate the IP-CAN session modification procedure according to 3GPP TS 29.212. The PCRF shall send then the ST-Answer to the AF including the required data within the 3GPP-User-Location-Info AVP (if available), TWAN-Identifier AVP (if available), User-Location-Info-Time AVP (if available), 3GPP-SGSN-MCC-MNC AVP (if location info is not available) and/or 3GPP-MS-TimeZone AVP (if available).	M	NC	



Text	Qualifier	Compliance	Comment
If the RAN-NAS-Cause feature is supported, and the AF initiated the termination of the AF session upon reception of the ST-Request command, the PCRF shall initiate the IP-CAN session modification procedure according to 3GPP TS 29.212.	C	NC	
If the RAN-NAS-Cause feature is supported, in all the AF session termination cases, the PCRF shall send the ST-Answer to the AF including the access network information within the 3GPP-User-Location-Info AVP (if available), TWAN-Identifier (if available and Netloc-Trusted-WLAN feature is supported) User-Location-Info-Time AVP (if available), 3GPP-SGSN-MCC-MNC AVP (if location info is not available) and/or 3GPP-MS-TimeZone AVP (if available). Additionally, if the PCRF received from the PCEF the RAN cause and/or NAS cause, TWAN cause or untrusted WLAN cause, the PCRF shall provide the received cause(s) in the RAN-NAS-Release-Cause AVP in the ST-Answer command.	C	NC	



4.4.5

Subscription to Notification of Signalling Path Status

Table 6 Subscription to Notification of Signalling Path Status

Text	Qualifier	Compliance	Comment
<p>An AF may subscribe to notifications of the status of the AF Signalling transmission path.</p> <p>When the PCRF receives an AA-Request from the AF where the Media-Sub-Component AVP contains the Flow-Number AVP set to “0”, the PCRF shall perform session binding as described in 3GPP TS 29.213 and acknowledge the AAR command by sending an AA Answer command to the AF.</p>	M	NC	



Text	Qualifier	Compliance	Comment
<p>PCC/QoS rules related to AF Signalling IP Flows should be provisioned to PCEF/BBERF using the corresponding procedures specified at 3GPP TS 29.212 at an earlier stage (e.g. typically at the establishment of the IP-CAN bearer dedicated for AF Signalling IP Flows). The PCRF may install the corresponding dynamic PCC/QoS rule for the AF signalling IP flows if none has been installed before.</p> <p>NOTE 1: Well-known ports (e.g. 3GPP TS 24.229 for SIP) or wildcard ports can be used by PCRF to derive the dynamic PCC/QoS rule for the AF signalling IP flows.</p>	Op	NC	
<p>If the Rx Diameter Session is only used for subscription to Notification of Signalling Path Status, the AF may cancel the subscription to notifications of the status of the AF Signalling transmission path. In that case, the AF shall use a Session-Termination-Request (STR) command to the PCRF, which shall be acknowledged with a Session-Termination-Answer (STA) command.</p>	M	NC	



4.4.5a Provisioning of AF Signalling Flow Information

Table 7 Provisioning of AF Signalling Flow Information

Text	Qualifier	Compliance	Comment
When the PCRF receives from the AF an AA-Request with provisioning information about the AF signalling IP flows between the UE and the AF, the PCRF shall perform session binding as described in 3GPP TS 29.213 and shall acknowledge the AAR command by sending an AA Answer command to the AF.	M	NC	

Text	Qualifier	Compliance	Comment
PCC/QoS Rules related to the AF signalling IP flows could have been provisioned to PCEF/BBERF using the corresponding procedures specified in 3GPP TS 29.212 at an earlier stage (e.g. typically at the establishment of the IP-CAN bearer dedicated for AF Signalling IP Flows). The PCRF shall install the corresponding dynamic PCC/QoS rule for the AF signalling IP flows.	M	NC	
The AF may de-provision the information about the AF signalling IP flows at any time. To do that, if the Rx Diameter session is only used to provide information about the AF Signalling IP flows, the AF shall close the Rx Diameter session by sending a Session-Termination-Request (STR) command to the PCRF, which shall be acknowledged with a Session-Termination-Answer (STA) command. Otherwise, the AF shall remove the IP flows within the Media-Sub-Component AVP by supplying the Flow-Status AVP with value "REMOVED". In both cases, the PCRF shall remove the corresponding dynamic PCC/QoS rule for the AF signalling IP flows.	M	NC	



4.4.6 Traffic Plane Events

4.4.6.1 IP-CAN Session Termination

Table 8 IP-CAN Session Termination

Text	Qualifier	Compliance	Comment
When an IP-CAN session is terminated, the PCRF shall inform the AF about the IP-CAN session termination by sending an ASR (abort session request) command to the AF on each active Rx Diameter session.	M	C	

4.4.6.2 Service Data Flow Deactivation

Table 9 Service Data Flow Deactivation

Text	Qualifier	Compliance	Comment
When the PCRF gets the knowledge that one or more SDFs have been deactivated, (e.g. due to a bearer release or loss of bearer or out of credit condition), the PCRF shall inform the AF accordingly if the AF has previously subscribed using the Specific-Action AVP in the AAR command.	M	C	
When not all the service data flows within the AF session are affected, the PCRF shall inform the AF by sending an RAR (re-authorization request) command. The RAR command shall include the deactivated IP Flows encoded in the Flows AVP and the cause encoded in the Specific-Action AVP.	M	C	



Text	Qualifier	Compliance	Comment
If the RAN-NAS-Cause feature is supported and the PCRF received the access network information from the PCEF/BBERF due to bearer termination, the PCRF shall include in the RAR command the access network information within the 3GPP-User-Location-Info AVP (if available), TWAN-Identifier (if available and Netloc-Trusted-WLAN feature is supported) User-Location-Info-Time AVP (if available), 3GPP-SGSN-MCC-MNC AVP (if location info is not available) and/or 3GPP-MS-TimeZone AVP (if available). Additionally, if the PCRF received from the PCEF the RAN cause and/or NAS cause due to bearer termination, the PCRF shall provide the received cause(s) in the RAN-NAS-Release-Cause AVP in the RAR command.	C	NC	
If the PCRF receives the AAR command, it shall acknowledge the command by sending an AAA (AA-answer) command to the AF.	M	C	
When all the service data flows within the AF session are affected, the PCRF shall inform the AF by sending an ASR command on the Rx Diameter session related to the AF session.	M	C	



4.4.6.3

Notification of Signalling Path Status

Table 10 Notification of Signalling Path Status

Text	Qualifier	Compliance	Comment
In the event that the PCRF is notified of the loss or release of resources associated to the PCC/QoS Rules corresponding with AF Signalling IP Flows, the PCRF shall inform the AF about the Loss of the Signalling Transmission path by sending a Re Authorization Request (RAR) command to the AF.	M	NC	
The RAR shall include the Specific-Action AVP set to the value "INDICATION_OF_LOSS_OF_BEARER" or "INDICATION_OF_RELEASE_OF_BEARER" and the deactivated IP Flow encoded in the Flows AVP.	M	NC	
If the RAN-NAS-Cause feature is supported and the PCRF received the access network information from the PCEF/BBERF due to bearer termination, the PCRF shall include in the RAR command the access network information within the 3GPP-User-Location-Info AVP (if available), TWAN-Identifier (if available and Netloc-Trusted-WLAN feature is supported) User-Location-Info-Time AVP (if available), 3GPP-SGSN-MCC-MNC AVP (if location info is not available) and/or 3GPP-MS-TimeZone AVP (if available). Additionally, if the PCRF received from the PCEF the RAN cause and/or NAS cause due to bearer termination, the PCRF shall provide the received cause(s) in the RAN-NAS-Release-Cause AVP in the RAR command.	C	NC	

4.4.6.4 IP-CAN Type change notification

Table 11 IP-CAN Type change notification

Text	Qualifier	Compliance	Comment
If the AF has successfully subscribed to change notifications in UE's IP-CAN type and RAT type, the PCRF shall provide the UE's IP-CAN type and RAT type in the AA-Answer if already known by the PCRF. The PCRF shall also send an RAR command when a corresponding event occurs, i.e. when the UE's IP-CAN type or RAT type (if the IP-CAN type is GPRS), changes or becomes available.	M	NC	
In this case the RAR from the PCRF shall include the Specific-Action AVP for the subscribed event and include the IP-CAN-Type AVP and RAT-Type AVP (in case of 3GPP IP CAN) for the UE's new IP-CAN/RAT	M	NC	
If the PCRF is informed of an IP-CAN type change due to IP flow mobility as specified in 3GPP TS 29.212, where a subset the flows within the AF session are affected, the PCRF shall include IP-CAN-type and RAT-type information (if applicable) to IP flow mobility affected service data flows. The IP flow mobility affected service data flows are included within the Flows AVP at command level.	M	NC	
NOTE: The RAT type event is only applicable for IP-CAN type GPRS, the PCRF will provide the RAT type information to the AF not only in case of GPRS IP-CAN type, but also in case of other 3GPP IP-CAN types.	M	NC	



4.4.6.5

Access Network Charging Information Notification

Table 12 Access Network Charging Information Notification

Text	Qualifier	Compliance	Comment
If the AF has subscribed to a notification about Access Network Charging Information, the PCRF shall provide the Access Network Charging Information in the response, if already known by the PCRF.	M	NC	
If not available, the PCRF shall provide the Access Network Charging Information by sending a Re-Authorization-Request (RAR) command when the Access Network Charging Information is received from the PCEF	M	NC	
If different Access Network Charging Information is applicable to the IP-CAN session, the PCRF shall notify the AF about the Access Network Charging Information that applies to each authorized flow	M	NC	
The RAR shall include the Specific-Action AVP set to the value "CHARGING_CORRELATION_EXCHANGE" and shall include the assigned Access Network-Charging-Identifier(s) and may include the Access-Network-Charging-Address AVP.	M	NC	

4.4.6.6 Reporting Usage for Sponsored Data Connectivity

Table 13 Reporting Usage for Sponsored Data Connectivity

Text	Qualifier	Compliance	Comment
When the AF session is associated with a sponsor and the AF provided usage monitoring thresholds for such sponsor to the PCRF when the Rx Diameter session was established or modified, the PCRF shall report accumulated usage to the AF, when - the PCRF detects that the usage threshold provided by the AF has been reached; or	M	NC	
- the AF session is terminated by the AF ; or	M	NC	
- the AF session is terminated by the PCRF due to the IP-CAN session termination, the termination of all the service data flows of the AF session or the home operator policy disallowing the UE accessing the sponsored data connectivity in the roaming case.	M	NC	
When the PCRF detects that the usage threshold has been reached, the PCRF shall report the accumulated usage as provided by the PCEF to the AF in a RA-Request (RAR) command with the Specific-Action AVP set to the value USAGE_REPORT.	M	NC	
Otherwise, when the AF session is terminated by the AF or the PCRF, the PCRF shall report the accumulated usage as provided by the PCEF to the AF in ST-Answer (STA) command.	M	NC	



Text	Qualifier	Compliance	Comment
The accumulated usage shall be reported in the Used-Service-Unit AVP within the Sponsored-Connectivity-Data AVP.	M	NC	
NOTE: After the PCRF reports the accumulated usage to the AF, the AF can provide a new usage threshold to the PCRF. The monitoring will not start until the PCRF receives the new threshold from the AF and provide it to the PCEF.	M	NC	

4.4.6.7

Reporting Access Network Information

Table 14 Reporting Access Network Information

Text	Qualifier	Compliance	Comment
When the PCRF receives a request to report the access network information from the AF in an AAR command or in an STR command triggered by the AF, if the PCRF determines that the access network does not support the access network information reporting based on the currently used IP-CAN type or the values of RAT-Type AVP and AN-Trusted AVP or the PCEF/BBERF does not support the access network information reporting based on the Supported-Feature AVP, the PCRF shall respond to AF with an AAA or STA command including the NetLoc-Access-Support AVP set to the value of 0 (NETLOC_ACCESS_NOT_SUPPORTED); otherwise, it shall immediately configure the PCEF or BBBERF to provide such access network information.	M	PC	The SAPC does not support the interaction between Rx and Gxx.



Text	Qualifier	Compliance	Comment
When the PCRF then receives the access network information from the PCEF/BBERF, the PCRF shall provide the corresponding access network information to the AF within the 3GPP-User-Location-Info AVP (if available), TWAN-Identifier AVP (if available), User-Location-Info-Time AVP (if available), 3GPP-SGSN-MCC-MNC AVP (if location info is not available) and/or 3GPP-MS-TimeZone AVP in the RAR command if the Rx session is not being terminated or in the STA command if the Rx session is being terminated. If the information is provided in the RAR command, PCRF shall also provide the ACCESS_NETWORK_INFO_REPORT within Specific-Action AVP.	M	PC	<p>The SAPC does not support the interaction between Rx and Gxx.</p> <p>The SAPC does not support TWAN-Identifier AVP</p> <p>The SAPC does not support UE-Local-IP-Address AVP.</p>



Text	Qualifier	Compliance	Comment
When the PCRF receives the NetLoc-Access-Support AVP set to the value of 0 (NETLOC_ACCESS_NOT_SUPPORTED) from the PCEF/BBERF, the PCRF shall send a RAR command including the Specific-Action AVP set to INDICATION_OF_ACCESS_NETWORK_INFO_REPORTING_FAILURE and the NetLoc-Access-Support AVP set to the value of 0 (NETLOC_ACCESS_NOT_SUPPORTED) if the AF requested the access network information in an AAR command or send an STA command including the NetLoc-Access-Support AVP set to the value of 0 (NETLOC_ACCESS_NOT_SUPPORTED) if the AF requested the access network information in an STR command.	M	PC	The SAPC does not support the interaction between Rx and Gxx.
The PCRF shall not send an RAR command with the ACCESS_NETWORK_INFO_REPORT value within a Specific-Action AVP to report any subsequently received access network information to the AF, unless the AF sends a new request for access network information.	M	C	

4.4.6.8 Temporary Network Failure handling

NC

4.4.7 P-CSCF Restoration Enhancement Support

NC



5 Rx protocol

5.1 Protocol support

Table 15 Protocol support

Text	Qualifier	Compliance	Comment
The Rx application is defined as an IETF vendor specific Diameter application, where the vendor is 3GPP and the Application-Id for the Rx application in the present release is 16777236	M	C	
The vendor identifier assigned by IANA to 3GPP is 10415	M	C	
The Rx application identification shall be included in the Auth-Application-Id AVP.	M	C	
The PCRF acts as Diameter Server, in the sense that it is the network element that handles AF session authorization requests for a particular realm.	M	C	



5.2 Initialization, maintenance and termination of connection and session

Table 16 Initialization, maintenance and termination of connection and session

Text	Qualifier	Compliance	Comment
The initialization and maintenance of the connection between each AF and PCRF pair is defined by the underlying protocol. Establishment and maintenance of connections between Diameter nodes is described in RFC 3588	M	PC	See Reference [1] for further information.
After establishing the transport connection, the PCRF and the AF shall advertise the support of the Rx specific Application by including the value of the application identifier in the Auth-Application-Id AVP and the value of the 3GPP (10415) in the Vendor-Id AVP of the Vendor-Specific-Application-Id AVP contained in the Capabilities Exchange-Request and Capabilities-Exchange-Answer commands.	M	C	

5.3 Rx specific AVPs

Table 17 Rx specific AVPs

Text	Qualifier	Compliance	Comment
Vendor-Id header of all AVPs shall be set to 3GPP (10415).	M	C	
Abort-Cause	M	PC	For supported values, refer to Rx Interface Description.
Access-Network-Charging-Address	M	NC	
Access-Network-Charging-Identifier	M	NC	



Text	Qualifier	Compliance	Comment
Access-Network-Charging-Identifier-Value	M	NC	
Acceptable-Service-Info	M	NC	
AF-Application-Identifier	M	C	
AF-Charging-Identifier	M	C	
Application-Service-Provider-Identity	Op	NC	
Codec-Data	M	NC	
Flow-Description	M	PC	The SAPC does not send an error response (Experimental-Result-Code with value FILTER_RESTRICTIONS) if the AF does not meet IPFilterRule restrictions.
Flow-Number	M	C	
Flows	M	C	
Flow-Status	M	C	
Flow-Usage	M	PC	The Value AF_SIGNALLING is not considered
GCS-Identifier	Op	NC	
Service-URN	M	C	
Specific-Action	M	PC	See Rx Interface Description document for supported values
Max-Requested-Bandwidth-DL	M	C	
Max-Requested-Bandwidth-UL	M	C	
Media-Component-Description	M	PC	The Codec-Data AVP is ignored The Min-Requested-Bandwidth-UL and Min-Requested-Bandwidth-DL AVPs are ignored



Text	Qualifier	Compliance	Comment
Media-Component-Number	M	C	
Media-Sub-Component	M	PC	The AF-Signalling-Protocol AVP is ignored
Media-Type	M	C	
MPS-Identifier	Op	NC	
Min-Requested-Bandwidth-DL	Op	NC	
Min-Requested-Bandwidth-UL	Op	NC	
RR-Bandwidth	M	C	
RS-Bandwidth	M	C	
Service-Info-Status	M	C	
SIP-Forking-Indication	M	C	
Sponsor-Identity	Op	NC	
Sponsored-Connectivity-Data	Op	NC	
AF-Signalling-Protocol	Op	NC	
Required-Access-Info	Op	C	
Rx-Request-Type	Op	PC	PCSCF_RESTORE (2) is not supported
IP-Domain-Id	Op	C	

5.4 Rx re-used AVPs

Table 18 Rx re-used AVPs

Text	Qualifier	Compliance	Comment
3GPP-MS-TimeZone	Op	C	
3GPP-SGSN-MCC-MNC	Op	C	
3GPP-User-Location-Info	Op	C	
User-Location-Info-Time	Op	C	
Called-Station-Id	M	C	
Final-Unit-Action	M	NC	
Framed-IP-Address	M	C	
Framed-IPv6-Prefix	M	C	
Granted-Service-Unit	Op	NC	

Text	Qualifier	Compliance	Comment
IP-CAN-Type	M	NC	
OC-OLR	Op	NC	
OC-Supported-Features	Op	NC	
RAN-NAS-Release-Cause	Op	NC	
NetLoc-Access-Support	Op	C	
RAT-Type	Op	C	
Reservation-Priority	Op	C	
Subscription-Id	Op	C	
Supported-Features	M	C	
Used-Service-Unit	Op	NC	
TWAN-Identifier	Op	NC	

5.4.1 Use of the Supported-Features AVP on the Rx reference point

Compliant

The table below defines the features applicable to the Rx interfaces for the feature list with a Feature-List-ID of 1.

Table 19 Features of Feature-List-ID 1 used in Rx

Feature bit : Feature	Qualifier	Compliance	Comment
0 : Rel8	M	NC	Rx Rel-8 is not supported
1 : Rel9	M	C	This feature indicates the support of the base 3GPP Rel-9 functionality, including the AVPs and corresponding procedures supported by the Rel8 feature bit, but excluding those features represented by separate feature bits.
2 : ProvAFsignalFlow	Op	NC	Not supported
3 : SponsoredConnectivity	Op	NC	Not supported



Feature bit : Feature	Qualifier	Compliance	Comment
4 : Rel10	M	C	This feature indicates the support of the base 3GPP Rel-10 functionality, including the AVPs and corresponding procedures supported by the Rel9 feature bit, but excluding those features represented by separate feature bits.
5 : NetLoc	Op	C	
6 : ExtendedFilter	Op	NC	Not supported
7: SCTimeBasedUM	Op	NC	Not supported
8: Netloc-Trusted-WLAN	Op	NC	Not supported
9: RAN-NAS-Cause	Op	NC	Not supported
10: GroupComService	Op	NC	Not supported
<p>Feature bit: The order number of the bit within the Feature-List AVP where the least significant bit is assigned number "0".</p> <p>Feature: A short name that can be used to refer to the bit and to the feature, for example "EPS".</p> <p>M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O").</p> <p>Description: A clear textual description of the feature.</p>			

Table 20 Features of Feature-List-ID 2 used in Rx

Feature bit : Feature	Qualifier	Compliance	Comment
0:PCSCF-Restoration-Enhancement	Op	NC	Not supported
<p>Feature bit: The order number of the bit within the Feature-List AVP where the least significant bit is assigned number "0".</p> <p>Feature: A short name that can be used to refer to the bit and to the feature, e.g. "EPS".</p> <p>M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O").</p> <p>Description: A clear textual description of the feature.</p>			

5.5 Rx specific Experimental-Result-code AVP values

Table 21 Rx specific Experimental-Result-Code AVP values

Text	Qualifier	Compliance	Comment
The Experimental-Result-Code AVP (AVP Code 298) is of type Unsigned32 and contains a vendor-assigned value representing the result of processing a request. The Vendor-ID AVP shall be set to 3GPP (10415).	M	PC	See Rx Interface Description document for supported values

5.6 Rx messages

Table 22 Rx Messages

Text	Qualifier	Compliance	Comment
Existing Diameter command codes from the Diameter base protocol RFC 3588 and the NASREQ Diameter application (RFC 4005) are used with the Rx specific AVPs.	M	C	
An Rx specific Auth Application id is used together with the command code to identify the Rx messages.	M	C	Auth-Application-Id value is 16777236
AA-Request (AAR)	M	C	



Text	Qualifier	Compliance	Comment
AA-Answer (AAA)	M	C	
Re-Auth-Request (RAR)	M	C	
Re-Auth-Answer (RAA)	M	C	
Session-Termination-Request (STR)	M	C	
Session-Termination-Answer (STA)	M	C	
Abort-Session-Request (ASR)	M	C	
Abort-Session-Answer (ASA)	M	C	

6 Annex A (normative) IMS Related P-CSCF Procedures over Rx

6.1 Provision of Service Information at P-CSCF NR

6.2 Enabling of IP Flows NR

6.3 Support for SIP forking

6.3.1 PCC rule provisioning for early media for forked responses

Table 23 PCC rule provisioning for early media for forked responses

Text	Qualifier	Compliance	Comment
When receiving an AA request containing the SIP-Forking-Indication AVP with value SEVERAL_DIALOGUES, the PCRF shall identify the existing authorization information for that AF session.	M	C	
The PCRF shall send additional PCC Rules or individual service data flow filters to already provided PCC rules as required by the Flow Description AVPs within the session information to the PCEF.	M	C	
The PCRF shall authorize any additional media components and any increased QoS requirements for the previously authorized media components, as requested within the service information.	M	C	
The PCRF shall authorize the maximum bandwidth required by any of the dialogues, but not the sum of the bandwidths required by all dialogues.	M	C	
Thus, the QoS authorized for a media component is equal to the highest QoS requested for that media component by any of the forked responses.	M	C	



Text	Qualifier	Compliance	Comment
The PCRF shall open or close the gates for service flows depending on the flow status that is being provisioned.	M	C	
If a flow ID has been enabled in uplink or downlink direction or both way within previous service information, it shall remain enabled even if the PCRF receives service information that disable this flow ID within an AA request containing the SIP-Forking-Indication AVP with value SEVERAL_DIALOGUES.	M	C	

6.3.2

Updating the provisioned PCC rules at the final answer

Table 24 Updating the provisioned PCC rules at the final answer

Text	Qualifier	Compliance	Comment
When receiving an AA request with no SIP-Forking-Indication AVP or with a SIP-Forking-Indication AVP with value SINGLE_DIALOGUE, the PCRF shall update installed PCC Rules information and Authorized-QoS information to match only the requirements of the service information within this AA request.	M	C	



Text	Qualifier	Compliance	Comment
The PCRF should immediately remove PCC Rule(s) or individual service data flow filters not matching IP flow(s) in the updated Service Information, to reduce the risk for initial clipping of the media stream, and to minimize possible misuse of resources.	Op	C	
The PCRF shall also open or close the gates for service flows according to the flow status in the received service information	M	C	

6.4 Notification of AF Signalling Transmission Path Status

NR

6.5 Indication of Emergency Session

NR

6.6 Notification IP-CAN type change

NR

6.7 Support for Early Session disposition SDP

6.7.1 General

NR



6.7.2 Service Information Provisioning for Early Media

Table 25 Service Information Provisioning for Early Media

Text	Qualifier	Compliance	Comment
NOTE 4: The PCRF will treat service information containing the SIP-Forking-Indication AVP as described in clause A.3.	M	C	

6.7.3 Updating the Provisioned Service Information when Dialogue is established

NR

6.8 Provision of Signalling Flow Information at P-CSCF

NR

6.9 Handling of MPS Session

Table 26 Handling of MPS Session

Text	Qualifier	Compliance	Comment
Upon reception of a request that requires MPS treatment, the PCRF shall derive the PCC/QoS Rules corresponding to the MPS session, as appropriate	M	NC	
The PCRF shall take specific actions on the corresponding IP-CAN to ensure that the MPS session is prioritized, as described in 3GPP TS 29.212, clause 4.5.19.1.3	Op	NC	



Text	Qualifier	Compliance	Comment
When the P-CSCF terminates the MPS session, the PCRF shall delete the PCC/QoS Rules corresponding to the MPS session.	M	NC	
The PCRF shall revoke the actions related to the prioritization of the MPS session in the corresponding IP-CAN, as described in 3GPP TS 29.212, clause 4.5.19.1.3	M	NC	

6.10 Retrieval of network provided location information
NR

6.11 Handling of RAN/NAS release cause values
NR

7 Annex B (normative) Flow identifiers: Format definition and examples

NR

8 Annex C (informative): Void

NR



Reference List

Ericsson Documents

- [1] Diameter Base Protocol
Statement of Compliance, 1/174 02-CRA 119 0019/2 Uen

Standard

- [2] 3GPP Technical Specification Group core Network and Terminals; Policy and Charging Control over Rx reference point, 29.214