3GPP TSG-CN Meeting #26 **NP-040567**

8th ñ 10th December 2004. Athens, Greece.

Source:	**CN3**
Title:	**TS 29.211 v1.0.0 Rx interface and Rx/Gx signalling flows (for information)**
Agenda item:	**9.22**
Document for:	**INFORMATION**

Presentation of Specification to TSG or WG

Presentation to:	**TSG CN Plenary Meeting #26**
Document for presentation:	**TS 29.211, Version 1.0.0**
Presented for:	**Information**

Abstract of document:

The TS defines the Rx reference point specifying the flow based charging procedures between the Charging Rules Function (CRF) and the Application Function (AF)

Changes since last presentation to Meeting #:

The document has not been presented to CN Plenary before.

Outstanding Issues:

- Clarification of relationship with Diameter sessions. by Mar 05
- Conclusion on the need of the mapping table for binding. by Mar 05
- Completion of the Rx Protocol clause. (Clause 7) by Mar 05
- Implications of the simultaneous application of FBC and SBLP for a single AF session by Mar 05
- Final checking and fulfillment of the stage 2 requirements in TS 23.125 by Mar 05
- Final checking that the textual descriptions are aligned by Mar 05

Contentious Issues:

-

3GPP TS 29.211~~XXX~~ V1~~0~~.0.0 (2004-11)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Core Network;
Rx Interface and Rx/Gx signalling flows
(Release 6)

Keywords
UMTS, performance

3GPP

Postal address

3GPP support office address
650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet
http://www.3gpp.org

Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document provides the stage 3 specification of the Rx ~~interface~~reference point interface.

The functional requirements and the stage 2 specifications of the Rx ~~interface~~ reference point are contained in 3GPP TS 23.125 [2]. The Rx ~~interface~~ reference point is used to exchange Flow Based Charging information between the Charging Rules Function (CRF) and the Application Function (AF).

Whenever it is possible the present document specifies the ~~requirements for~~ the protocol by reference to specifications produced by the IETF within the scope of Diameter and to the Gq specification 3GPP TS 29.209 [4]. ~~Where this is not possible, extensions to Diameter are defined within the present document.~~

The present specification also shows FBC signalling flows for provision of service level information and ~~charging rule~~Charging Rules activation. The flows are used as basies ~~of~~ for developing FBC related protocol descriptions for new and existing specifications.

The present specification adds detailed flows for FBC procedures over the interfaces that correspond to Rx and Gx ~~interfaces~~ reference points~~and their relationship with the bearer level signalling flows~~.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.125: "Overall high level functionality and architecture impacts of flow based charging; Stage 2".

[3] 3GPP TS 29.210: "Charging rule provisioning over Gx interface".

[4] 3GPP TS 29.209: "Policy control over Gq interface".

[5] IETF RFC 3588: "Diameter Base Protocol".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply:

Application Function (AF): element offering applications that require the control of IP bearer resources.

NOTE: The AF is capable of communicating with the PDF to transfer dynamic QoS-related application information. One example of an AF is the P-CSCF of the IM CN subsystem.

AF Session: established by an application level signalling protocol offered by the AF that requires a session set-up with explicit session description before the use of the service. An AF session is composed of one or more Service Data Flows.

NOTE: One example of an application session is an IMS session.

Attribute-Value Pair (AVP): See RFC 3588 [5], corresponds to an Information Element in a Diameter message.

Charging Rule: a set of information including the Service Data Flow Filters, and the Charging Key, for a single Service Data Flow (further details can be found in 3GPP TS 23.125 [2] clause 5.2).

Packet Flow: a specific user data flow carried through the Traffic Plane Function. A Packet Flow can be an IP flow.

Rx Session: Diameter session in the Rx interface establish for one UE identifier within an AF session.

Service Data Flow (SDF): aggregate set of Packet Flows. In the case of GPRS, it shall be possible that a Service Data Flow is more granular than a PDP context. From the AF point of view a Service Data Flow corresponds to a Diameter Session.

Service Data Flow Filter: a set of filter parameters used to identify one or more of the Packet Flows constituting a Service Data Flow. At least the following means for the Packet Flow identification shall be supported: source and destination IP address+port, transport protocol, or application protocol.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply:

AAA	AA-Answer
AAR	AA-Request
AF	Application Function
ASA	Abort-Session-Answer
ASR	Abort-Session-Request
AVP	Attribute-Value Pair
CRF	Charging Rule Function
CSCF	Call Session Control Function
DCC	Diameter Credit Control
FBC	Flow Based Charging
IANA	Internet Assigned Numbers Authority
IM	IP Multimedia
IMS	IP Multimedia CN Subsystem
OCS	Online Charging System
P-CSCF	Proxy-CSCF
QoS	Quality of Service
SDI	Session Description Information
STA	Session-Termination-Answer
STR	Session-Termination-Request
TPF	Traffic Plane Function

4 Rx reference point

4.1 Overview

The Rx interface is used to exchange flow based charging control information between the Charging Rules Function (CRF) and the Application Function (AF). As defined in the stage 2 specifications (3GPP TS 23.125 [2]), this information is used by the CRF for the Flow Based Charging (FBC) decisions. The CRF exchanges the flow based charging control information with the Traffic Plane Function (TPF) as specified in 3GPP TS 29.210 [3].

The Rx interface may be an intra- or inter-domain interface. One CRF shall be able to serve more than one AF and one given AF may interact with a number of CRFs, although on an AF session basis, it shall interact with only a single CRF.

Signalling flows related to the both Rx and Gx interfaces are specified in ~~Section~~ clause 8 in this specification.

4.2 Rx reference model

The Rx interface is defined between the CRF and the AF. ~~The Rx interface may be an intra- or inter-domain interface.~~ The CRF is in the same PLMN as the TPF.

The relationships between the different functional entities involved are depicted in figure 4.1.

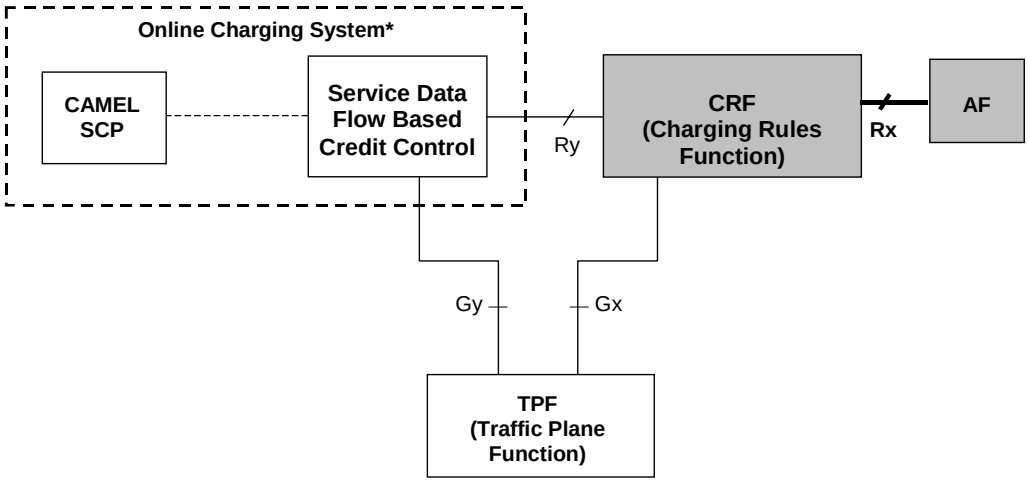


Figure 4.1: Rx interface architecture model

4.3 Functional elements and capabilities

4.34.1 Charging Rules Function (CRF)

The Charging Rules Function provides Service Data Flow level Charging Rules to the TPF and informs AF about bearer session events. The CRF makes the ~~charging rule~~Charging Rule decisions which may be based on the session and media related information obtained from the AF via the Rx reference point, the bearer and subscriber related information obtained from the TPF over the Gx reference point, and subscriber and service related data the CRF may be aware of. The CRF shall provision ~~charging rule~~Charging Rules the TPF via the Gx ~~interface~~reference point. The CRF may also provide policy control like functions based on ~~charging rule~~Charging Rules provisioning to the TPF.

The CRF reports, via the Rx reference point, bearer events from the TPF to the AF, e.g. bearer release and bearer establishment.

4.34.2 Application Function (AF)

The AF is an element offering applications that require the flow based charging of IP bearer resources (e.g. UMTS PS domain/GPRS domain resources). One example of an application function is the P-CSCF. The AF shall use the Rx ~~interface~~ reference point to provide session information to the CRF.

5 FBC Control Procedures over Rx

5.1 CRF

5.1.1 Provision of Session Information

When receiving an initial AA-Request from the AF, the CRF shall check if it contains the Media-Component-Description Attribute-Value Pair(s) (AVP(s)) and if so, the CRF shall store the received Service Information.

If the Specific Action AVP is present in the AAR command, the CRF shall take into account the requested ~~interactions~~ notification for ~~certain~~ the related bearers.

After storing the received Service Information, the CRF shall send back an AA-Answer to the AF. The CRF shall check whether the received Service Information requires Charging Rules to be provisioned towards existing bearer session(s). The CRF identifies suitable bearers using the binding mechanisms described in clause 6.

If CRF identifies that Charging Rules need~~s~~ to be provisioned ~~and if a bearer session for the AF session is available,~~, the CRF ~~should~~ may either start a timer or provide the ~~charging rule~~Charging Rules immediately to the TPF. ~~. The CRF identifies suitable bearers using the binding mechanisms described in clause xxx.~~ If the timer expires before a Charging Rule request for the TPF has been received~~and no request from the TPF has been received~~, the CRF shall initiate an ~~the corresponding Gx interface procedures, i.e.~~ unsolicited ~~charging rule~~Charging Rule provisioning.

If the AA-Request is ~~sent~~ received for a Diameter session already active (due to an AF session modification), the CRF ~~may need to~~shall update the Service Information with the new information received. Due to the updated service information, the CRF~~It~~ may ~~imply~~ trigger the installation, modification or removal of the currently installed Charging Rules via an unsolicited Charging Rule provisioning. ~~. If CRF identifies that Charging Rules needs to be installed, modified, and/or removed, t~~The CRF ~~should~~ may either start a timer or provide the Charging Rule update immediately to the TPF. If the timer expires before a Charging Rule request for the TPF has been received , the CRF shall initiate an unsolicited Charging Rule provisioning.

~~and no request from the TPF has been received, the CRF shall initiate the corresponding Gx interface procedures, i.e. unsolicited charging rule provisioning.~~

5.1.2 FBC Gate function

The AF may indicate to the CRF as part of the Media-Component-Description AVP(s) whether the ~~Charging Rule(s)~~Packet Flows ~~-~~should be enabled or disabled at the bearer level. The CRF may receive a separate AA-Request message(s) from the AF to ~~install or remove specified Charging Rule(s).~~enable or disable Packet Flows ~~The CRF shall reply with an AA-Answer.~~ Based on the received service information, ~~T~~the CRF ~~makes the final decision~~may decide to install or remove the corresponding Charging Rule(s).

5.1.3 AF Session Termination

The CRF may receive a ST-Request from the AF, indicating an AF session termination. If any Charging Rules have been provisioned for this ~~AF session~~Service Data Flow, the CRF ~~shall~~ may either start a timer or remove~~and mark~~ the

Charging Rules ~~to be removed~~from the TPF~~. The CRF shall send a ST-Answer to the AF acknowledging the session termination with the corresponding result in the Result-Code AVP~~. If the timer expires before a ~~charging rule~~Charging Rule request for the TPF has been received , the CRF shall initiate an unsolicited ~~charging rule~~Charging Rule provisioning.

~~and there has been no notification regarding the deactivation of the bearer, the CRF shall initiate the needed actions using the Gx interface, i.e. unsolicited provision for removing the Charging Rules.~~

~~5.1.4 Bearer events~~

~~5.1.4.1 Bearer Establishment~~

~~If the CRF was instructed by the AF to request the full Service Information or to report the establishment of a bearer, upon the reception of CC-Request from the TPF, the CRF shall send a RA-Request to the AF. It will receive back a RA-Answer with the Service Information to perform the Charging Rules decision.~~

5.1.4~~.2~~ Bearer Release

Upon a reception of a CC-Request from the TPF with an indication of bearer deactivation, for each AF session affected the following procedure will be followed:

- If the ~~charging rule~~Charging Rule for an AF Service Data Flow applies to only one bearer of a UE IP address, the CRF shall send a RAR~~-Request~~ to the AF to inform of the bearer release.
- If a ~~charging rule~~Charging Rule for an AF Service Data Flow applies to more than one bearer of a UE IP address, the CRF shall send a RAR~~-Request~~ to the AF when all the bearers of a Service Data Flow for a UE IP address have been removed. Otherwise, when a Charging Rule for a particular service is allowed for multiple bearers, the AF is not aware of the removal of individual bearers.

When sending the RAR~~-Request~~ message, the value for the Specific-Action AVP set to INDICATION_OF_RELEASE_OF_BEARER and shall indicate the affected ~~IP-~~Packet flows with the Flows AVP(s) and the appropriate Abort-Cause AVP value

When the TPF informs the CRF of the bearer release and all Packet~~IP~~ flows within the corresponding AF session are affected, the CRF shall inform the AF about this event by sending the Abort-Session-Request message with the appropriate Abort-Cause AVP value.

5.2 AF

5.2.1 Provision of Service Information at session establishment

When receiving an AF session signalling message initiating a new AF session, the AF shall send the Service Information to the network by sending the AA-Request message. The AF shall include the corresponding Media-Component-Description AVP(s) into the message if the ~~SDI-~~information is already available at the AF. ~~For GPRS, t~~The AF may include the Flow-Grouping AVP(s) to indicate a particular way on how the ~~IP-~~Packet flows described within the service description are distributed to ~~PDP contexts~~several bearers at the bearer establishment. The AF may also include the Specific-Action-Report AVP to request notification for certain bearer events, i.e. bearer ~~establishment and~~ termination.

~~The CRF acknowledges the session modification by issuing an AA-Answer back to the AF.~~

5.2.2 FBC Gate function

The AF shall indicate to the network as part of the Media-Component-Description whether the media ~~IP~~ Packet flow(s) should be enabled or disabled at the bearer level. Depending on the application, the AF may instruct the CRF also during the session when the Packet~~IP~~ flow(s) are to be enabled or disabled to pass through the access network. The AF does this by sending the AA-Request message containing the Media-Component- Description AVP(s) that contains the flow status information for the flows to be enabled or disabled.

~~*Note: Signalling flow for this is missing.*~~

5.2.3 Session modification

During the AF session modification, the AF shall send an update for the session description information to the CRF ~~based on the new SDI exchanged within the AF session signalling~~. ~~*<- Note: is SDI IMS specific? If yes this should be implied in the text as Rx is not IMS specific*~~ The AF does this by sending the AA-Request message containing the Media-Component-Description AVP(s) containing the updated service information.

~~The CRF acknowledges the session modification by issuing an AA-Answer back to the AF. *<- Note: changed because CRF procedures do not belong here*~~

5.2.4 AF Session Termination

When an AF session is terminated, the AF shall send Session-Termination-Request message to the CRF.

~~After processing the request the CRF acknowledges with a ST-Answer.~~

~~5.2.5 Bearer events~~

~~5.2.5.1 Bearer Establishment~~

~~The CRF may contact the AF at the resource reservation (for GPRS, the PDP Context Activation) if this was requested previously by the AF, by sending the Re-Auth-Request message with request for the Service Information. The AF shall respond with the Re-Auth-Answer message containing the Media-Component-Description AVP(s). The information in the Media-Component-Description AVP(s) may be based on the session description information negotiated within the AF session signaling. The receiving of session description request does not trigger the sending of a new authorization request back to the CRF.~~

5.2.5~~.2~~ Bearer Release

~~*Note: This should be carefully checked*~~

~~*Does FBC bearer release over Rx lead to termination of the AF session? SBLP bearer release over Gx is different from this (different concept)*~~

~~Upon a reception of RA-Request to the AF, the AF shall answer with an AS-Answer and a ST-Request with the corresponding Diameter session included in the Media-Component-Information AVP. The CRF will finally acknowledge the session termination sending a ST-Answer to the AF.~~

Upon the reception of a Re-Auth-Request including an Abort-Cause AVP indicating that some of the Packet~~IP~~ Flows (included in the Flows AVP) of the AF session are being discontinued (typically PDP_CONTEXT_RELEASE cause), the AF will issue a Re-Auth-Answer as a response to the CRF. ~~The AF may optionally issue a AA-Request from updating the Service Information within the Media-Component-Description AVP. If so, the CRF will respond back with a AA-Answer.~~

6 Binding the AF and the Bearer Sessions

Binding the AF Service Data Flows and Bearer Sessions means binding the Rx and Gx Diameter session. The relationship may be many to many (i.e for GPRS one AF ~~session~~ Service Data Flow carried in several PDP contexts or several AF ~~sessions~~ Service Data Flows carried in the same PDP context).

The following ~~M~~mechanisms shall be used:

- For all bearer types, the UE IP Address ~~is~~ shall be used for binding purposes. ~~as a basis for all bearer types~~

- In particular, ~~F~~for GPRS, it is also recommended to use TFT filters (from TPF via Gx) and IP Flow Filters (from AF via Rx) are used to ~~identify the correct PDP context~~select the Changing Rules matching to a PDP context.

  Also ~~–~~f~~F~~or GPRS, the QoS information (QoS negotiated from the TPF and Requested Bandwith from the AF) may be used for further analysis. Note: needs a mapping table. If QoS comparison is required, it would be beneficial to sent the bandwitdh information from TPF to the CRF, i.e, to add it to the Gx reference point.

  ~~–~~The GPRS binding mechanism does not necessary identify a single PDP context, therefore the same ~~rule~~ Charging Rule for an AF ~~s~~Session IP Flow may be installed over several PDP contexts.~~!~~

7 Rx Protocol

7.1 Protocol Support

The Rx reference point shall be based on Gq protocol as specified in 3GPP TS 29.209 [4]. Most of the the AVPs from the Gq protocol are reused as specified in sub-clause 7.2~~3~~.

Editor's note: The new application id needs to be allocated for Rx Protocol from IANA.

The Rx application is defined as an IETF vendor specific Diameter application, where the vendor is 3GPP. The vendor identifier assigned by IANA to 3GPP (http://www.iana.org/assignments/enterprise-numbers) is 10415.

With regard to the Diameter protocol defined over the Rx reference point, the CRF acts as a Diameter server, in the sense that it is the network element that handles ~~charging rule~~Charging Rule control for a particular realm. The AF acts as the Diameter Client, in the sense that is the network element requesting FBC control in the bearer path network resources.

The support of Diameter agents between the CRF and the AF, is optional for the IMS, where the Rx is intra operator i.e. for GPRS: TPF, CRF and P-CSCF are all in the same network.

7.1.1 Advertising application support

The AF and the CRF 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 Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands. The Capabilities-Exchange-Request and Capabilities-Exchange-Answer commands are specified in the Diameter Base Protocol.

~~7.2 Specific AVPs~~

7.2~~3~~ Gq re-used AVPs

Table 7.3.1 lists the re-used Application specific AVPs, defined in the Gq protocol specification, see ref [4]. ~~Table 7.3.1 describes the Application Specific Diameter AVPs defined for the Rx interface protocol, their AVP Code values, types, possible flag values and whether or not the AVP may be encrypted.~~ The Vendor-Id header of all AVPs defined in the present document shall be set to 3GPP (10415).

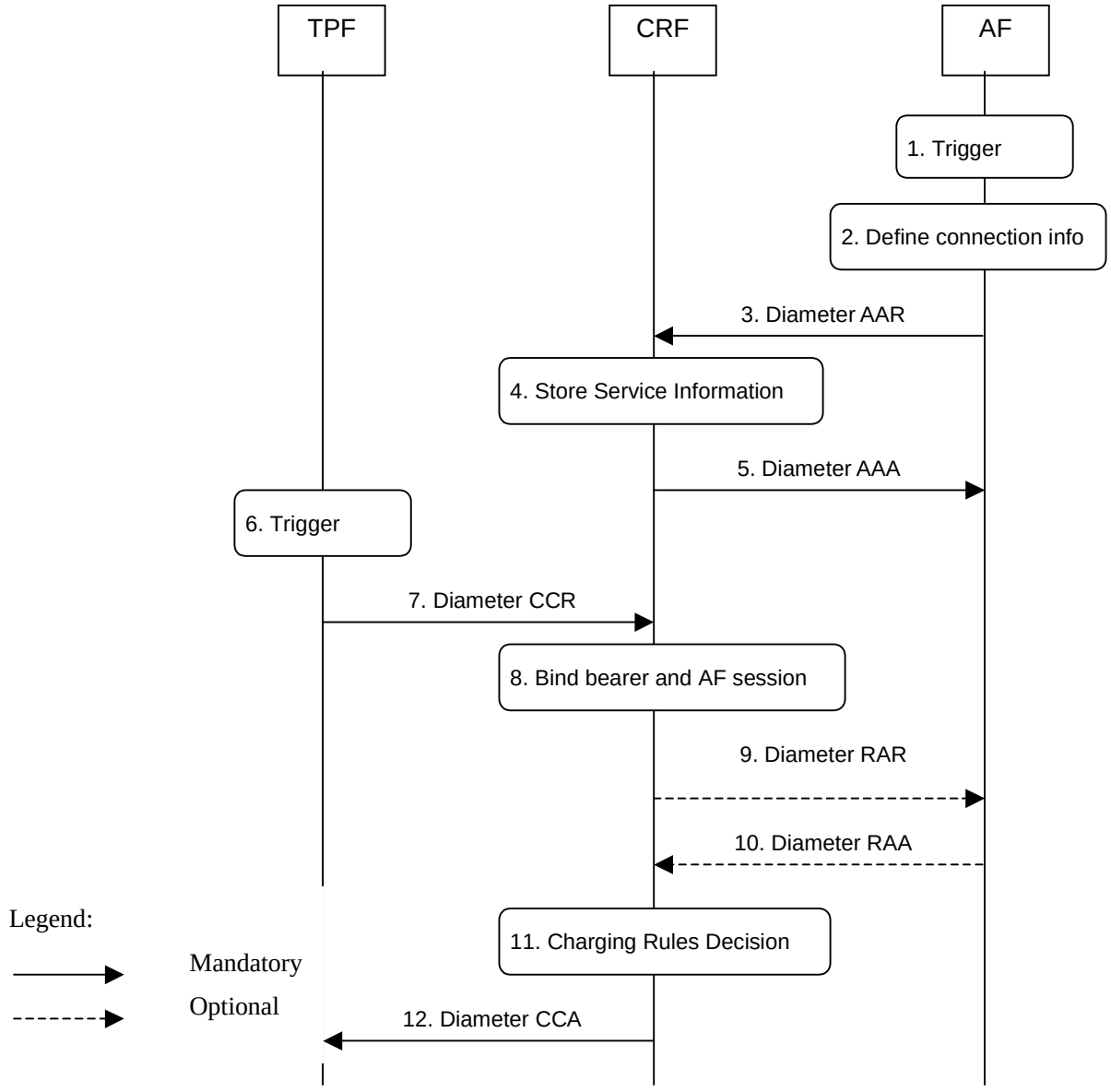
Table 7.3.1: Rx re-used Diameter AVPs

Attribute Name	Reference	Comments
Abort-Cause	3GPP TS 29.209 [4]	
AF-Application-Identifier	3GPP TS 29.209 [4]	
AF-Charging-Identifier	3GPP TS 29.209 [4]	
Flow-Description	3GPP TS 29.209 [4]	
Flow-Number	3GPP TS 29.209 [4]	
Flows	3GPP TS 29.209 [4]	
Flow-Status	3GPP TS 29.209 [4]	
Flow-Usage	3GPP TS 29.209 [4]	FFS
Max-Requested-Bandwidth	3GPP TS 29.209 [4]	
Max-Requested-Bandwidth-DL	3GPP TS 29.209 [4]	
Max-Requested-Bandwidth-UL	3GPP TS 29.209 [4]	
Media-Component-Description	3GPP TS 29.209 [4]	
Media-Component-Number	3GPP TS 29.209 [4]	
Media-Sub-Component AVP	3GPP TS 29.209 [4]	
Media-Type	3GPP TS 29.209 [4]	
RR-Bandwidth	3GPP TS 29.209 [4]	
RS-Bandwidth	3GPP TS 29.209 [4]	
SIP-Forking-Indication	3GPP TS 29.209 [4]	FFS
Specific-Action	3GPP TS 29.209 [4]	Editor's Note: The value 1 is not used for Rx? Editors note: what about 0? FFS if new values needed for: INDICATION_OF_ESTABLISMENT OF BEARER (5) INDICATION_OF_QOS_CHANGE_OF_BEARER (6)

8 Rx/Gx Signalling Flows

8.1 AF session establishment or modification in case of no bearer

This clause covers the provision of service information and related Charging Rules when an AF session is being established or modified and the CRF is not aware of any bearer being established. For GPRS, the AF session modification in case of no existing bearer may be an IMS session for which a new media components is added and it is to be transported in a new secondary PDP context.



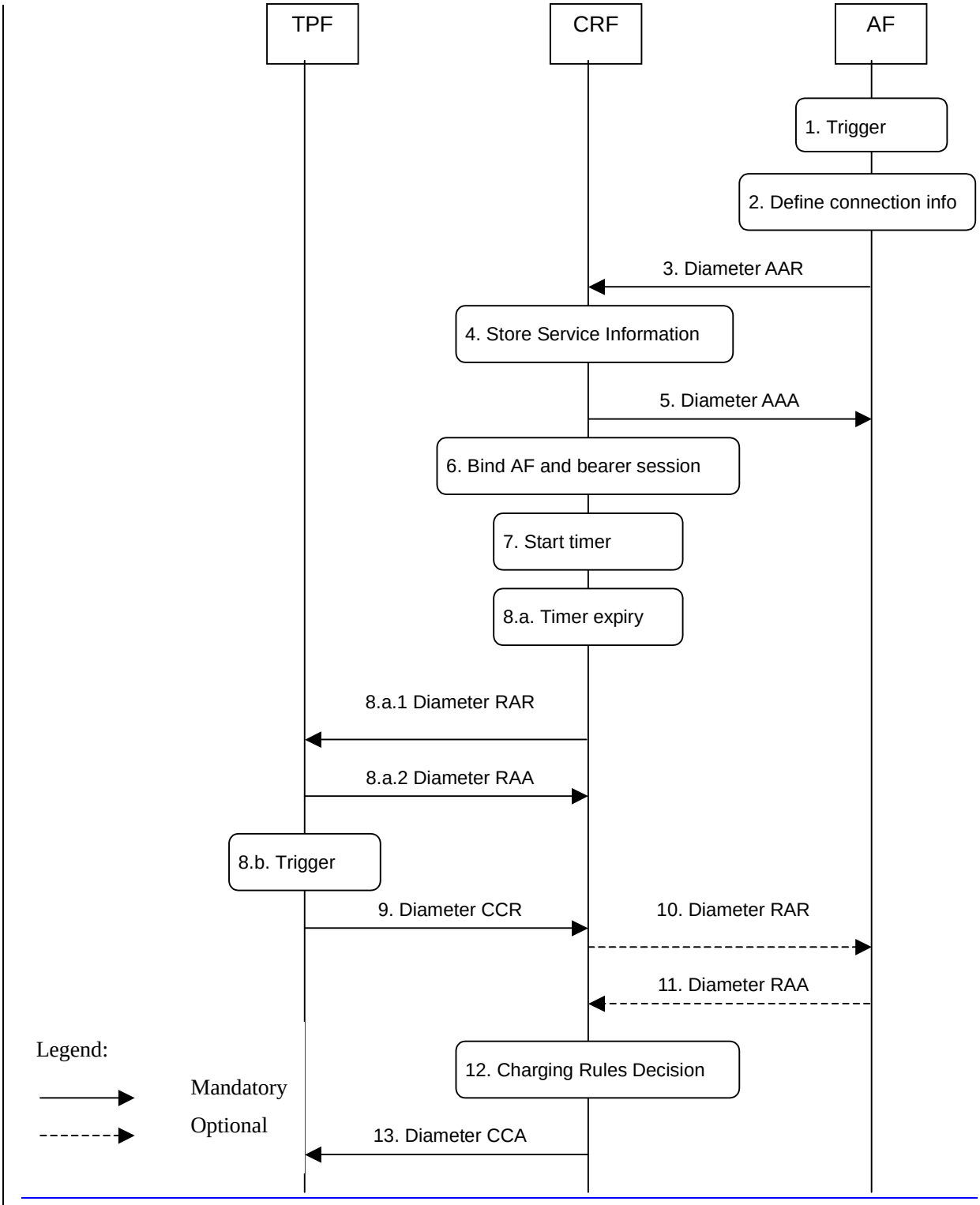
1. The AF receives an internal or external trigger to provide service information, at a set up of a new AF session or at a modification of an existing AF session.
2. The AF identifies the connection information needed (e.g. IP address of the IP flow(s), port numbers to be used etcÖ).
3. The AF provides the service information to the CRF by sending a Diameter AAR for a new, or in case of AF session modification for the existing Diameter session. The AF may instruct the CRF to request the full service information from the AF at resource reservation. The AF may also forward part of or the entire service information at this stage.
4. The CRF shall store the received service information.
5. An ACK is sent to the AF by sending a Diameter AAA
6. A bearer set up triggers the request of Charging Rules. For GPRS, this is the PDP Context Activation.
7. The Charging Rules are requested by the TPF, using the Diameter CCR.
7. The Charging Rules are requested by the TPF, using the Diameter CCR.
8. The CRF binds the bearer session to the AF session using the bearer information received from the TPF and the service information received from the AF. *Refer to chapter xxx*
9. The CRF sends a Diameter RAR to that AF to request the full service information or to report the establishment of a bearer, if instructed by the AF in step 3.
10. If step 9 happens, the AF sends an Diameter RAA message including the service information to the CRF.
11. The CRF identifies the Charging Rules to be installed.
12. The Charging Rules are provisioned to the TPF using Diameter CCA.

Figure 8.1: AF session establishment or modification in case of no bearer.

8.2 AF session establishment or modification in case of bearer established

This clause covers the provision of service information and related Charging Rules when an AF session is being established or modified and a bearer is already established. This clause does not consider a case where the AF session modification leads to bearer removal, e.g. removing an IMS media component from an IMS session being the last media flow in an PDP context

The timer mechanism shown in the signalling flow is optional. The CRF may either start a timer or provide the Charging Rule update immediately to the TPF. If the timer expires before a Charging Rule request for the TPF has been received , the CRF shall initiate an unsolicited Charging Rule provisioning.


TPF
CRF
AF
1. Trigger
2. Define connection info
3. Diameter AAR
4. Store Service Information
5. Diameter AAA
6. Bind AF and bearer session
7. Start timer
8.a. Timer expiry
8.a.1 Diameter RAR
8.a.2 Diameter RAA
8.b. Trigger
9. Diameter CCR
10. Diameter RAR
11. Diameter RAA
12. Charging Rules Decision
13. Diameter CCA
Legend:
Mandatory
Optional

1. The AF receives an internal or external trigger to provide service information, at a set up of a new AF session or at a modification of an existing AF session.
2. The AF identifies the connection information needed (e.g. IP address of the IP flow(s), port numbers to be used etcÖ).
3. The AF provides the service information to the CRF by sending a Diameter AAR for a new, or in case of AF session modification for the existing Diameter session. The AF may instruct the CRF to request the full service information from the AF at resource reservation. The AF may also forward the part of or the entire service information at this stage.
4. The CRF shall store the received service information
5. An ACK is sent to the AF by sending a Diameter AAA.
6. The CRF identifies established bearer session(s) by binding the AF session to bearer session(s) using the bearer information previously received from the TPF and the service information received from the AF.
7. A timer is started.

8.a If the timer expires:
8.a.1 The timer expires but the TPF has not requested Charging Rules from the CRF. The CRF sends Diameter RAR to trigger the TPF to request Charging Rules.
8.a.2 The TPF sends RAA to acknowledge the RAR.

8.b If the timer does not expire. I.e. the TPF is triggered to request Charging Rules before the timer expires. For GPRS, this is the PDP Context Modification.

9. The Charging Rules are requested by the TPF, using the Diameter CCR.
10. The CRF sends a Diameter RAR to that AF to request the full service information, if instructed by the AF in step 3.
11. If step 10 happens, the AF sends an Diameter RAA message including the service information to the CRF.
12. The CRF identifies the Charging Rules to be installed.
13. The Charging Rules are provisioned to the TPF using Diameter CCA.

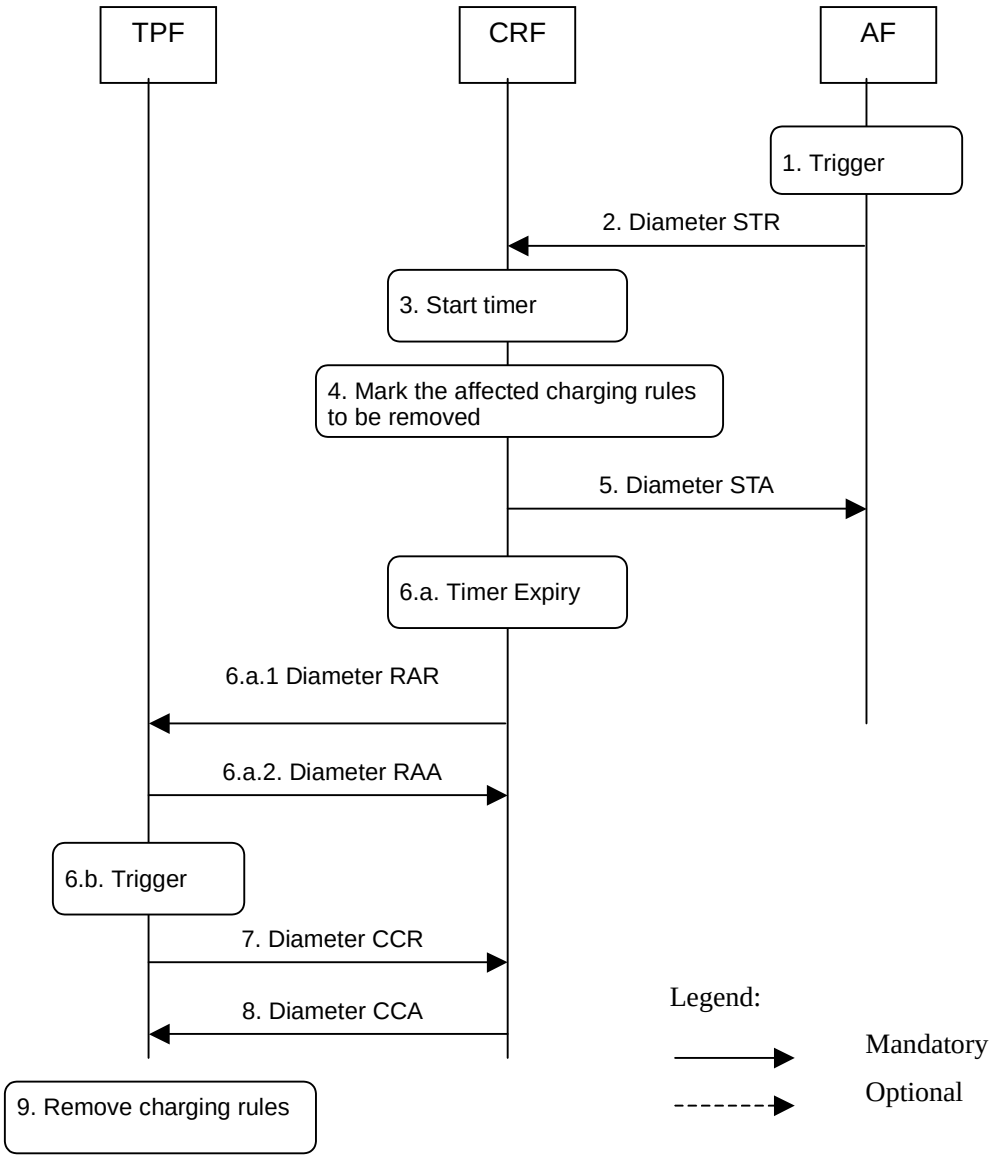
Figure 8.2: AF session establishment or modification in case of bearer already established.

.

8.3 Removal of Charging Rules at AF session release

This clause covers the removal of Charging Rules at the AF session release, when the related bearer sessions are not released. For AF session release followed by a bearer session(s) release, see clause 4.4.

The timer mechanism shown in the signalling flow is optional. The CRF may either start a timer or remove the Charging Rules from the TPF. If the timer expires before a Charging Rule request for the TPF has been received , the CRF shall initiate an unsolicited Charging Rule provisioning



1. The AF receives an internal or external trigger for a session release.
2. The AF sends session termination request, Diameter STR, to the CRF to indicate the removal of the session.
3. The CRF starts timer.
4. The CRF marks the Charging Rules for the affected IP flow(s) of this AF session to be removed.
5. The CRF sends Diameter STA , session termination answer, to the AF.

6.a If the timer expires:
6.a.1 The timer expires but the CRF has not been notified that the affected bearer(s), for GPRS the PDP context(s), have been modified. The CRF sends Diameter RAR to trigger the TPF to request Charging Rules.
6.a.2. The TPF sends Diameter RAA to acknowledge the RAR.

6.b If the timer does not expire. I.e. the TPF is triggered to request Charging Rules before the timer expires. For GPRS, this is the PDP Context Modification.

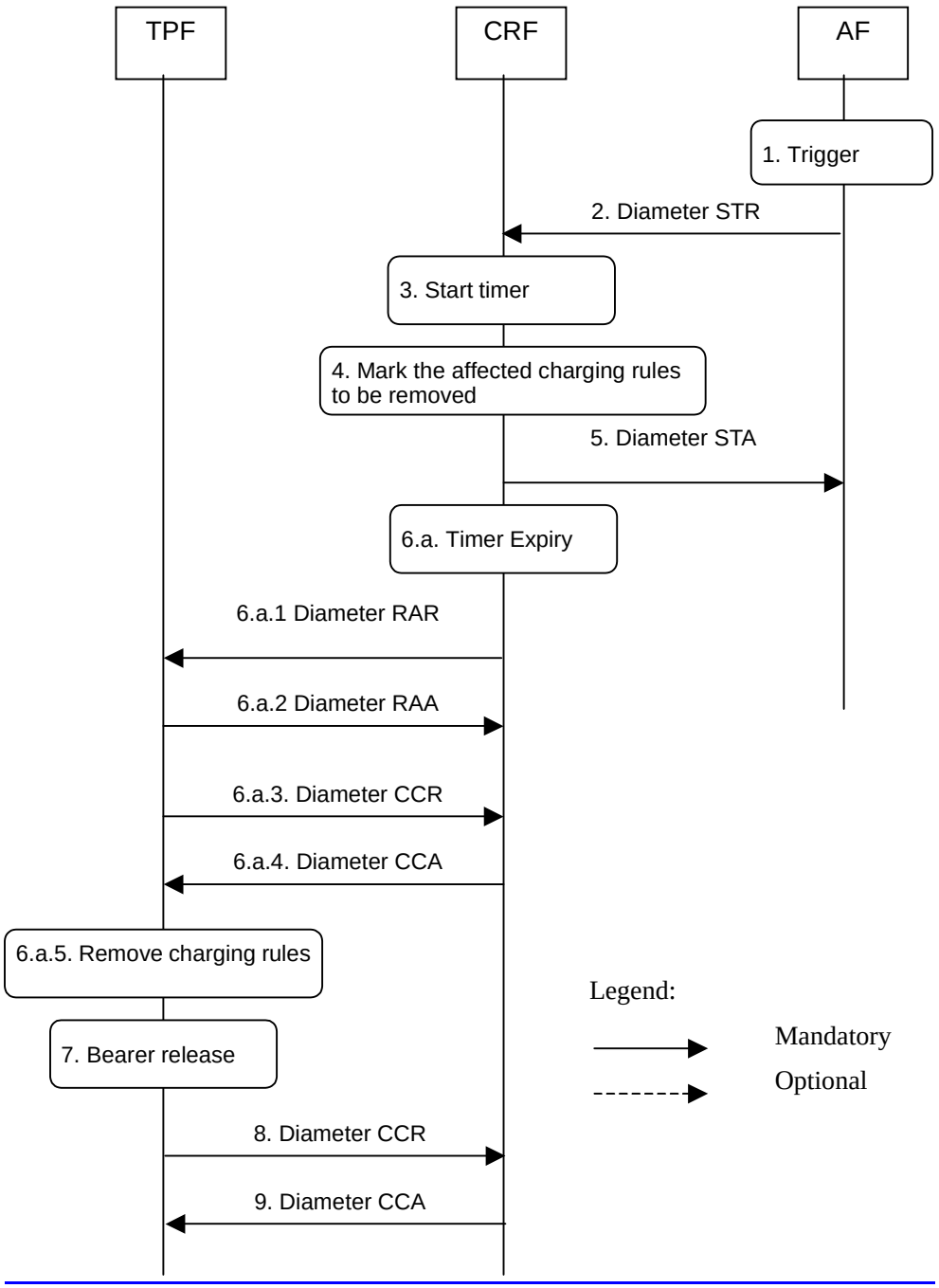
7. The Charging Rules are requested by the TPF, using the Diameter CCR.
8. The CRF removes the affected Charging Rules by using Diameter CCA.
9. The TPF removes the indicated Charging Rules.

Figure 8.3: Removal of Charging Rules at AF session release

8.4 Bearer release at AF session release

This clause covers the AF session release, which is followed by the release of the bearer that carries the IP flow(s) for that AF session.

The timer mechanism shown in the signalling flow is optional. The CRF may either start a timer or remove the Charging Rules from the TPF. If the timer expires before a Charging Rule request for the TPF has been received , the CRF shall initiate an unsolicited Charging Rule provisioning



1. The AF receives an internal or external trigger for a session release.
2. The AF sends session termination request, Diameter STR, to the CRF to indicate the removal of the session.
3. The CRF starts timer.
4. The CRF marks the Charging Rules for the affected IP flow(s) of this AF session to be removed.
5. The CRF sends Diameter STA , session termination answer, to the AF.

6.a If the timer expires:
6.a.1 The timer expires but the CRF has not been notified that the affected bearer(s), for GPRS the PDP context(s), have been terminated. The CRF sends Diameter RAR to trigger the TPF to request Charging Rules.
6.a.2. The TPF sends Diameter RAA to acknowledge the RAR.
6.a.3 The Charging Rules are requested by the TPF, using the Diameter CCR.
6.a.4 The CRF removes the affected Charging Rules by using Diameter CCA.
6.a.5 The TPF removes the indicated Charging Rules.

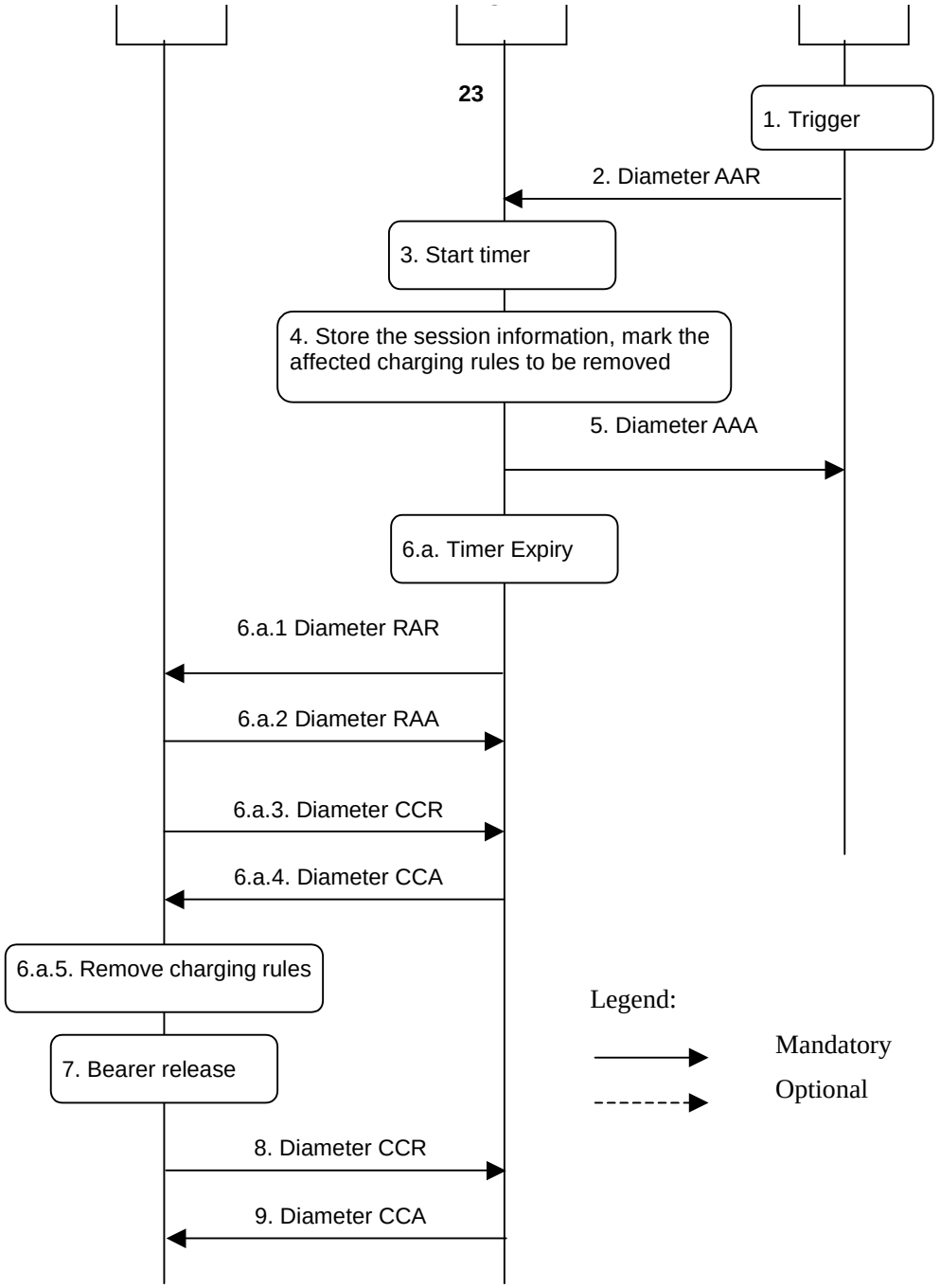
7. The bearer is deactivated.

8. The TPF sends a Diameter CCR message to the CRF, indicating bearer termination.
9. The CRF acknowledges the bearer termination by sending a Diameter CCA message.

Figure 8.4: Bearer release at AF session release

8.5 Bearer release at AF session modification

This clause covers the AF session modification, which is followed by the release of the bearer that carries the IP flow(s) for that AF session. The AF session modification disables the IP flow(s) for the released bearer.


1. Trigger
2. Diameter AAR
3. Start timer
4. Store the session information, mark the affected charging rules to be removed
5. Diameter AAA
6.a. Timer Expiry
6.a.1 Diameter RAR
6.a.2 Diameter RAA
6.a.3. Diameter CCR
6.a.4. Diameter CCA
6.a.5. Remove charging rules
7. Bearer release
8. Diameter CCR
9. Diameter CCA
Legend:
Mandatory
Optional

1. The AF receives an internal or external trigger to provide service information. In this case the session is modified by disabling IP flow(s).
2. The AF provides the new service information to the CRF by sending a Diameter AAR.
3. The CRF starts timer.
4. The CRF stores the new session information marks the Charging Rules for the affected IP flow(s) of this AF session to be removed.
5. An ACK is sent to the AF by sending a Diameter AAA

The following steps shall be performed separately for each bearer session that is affected by the AF session release. For GPRS these are the PDP contexts where the Charging Rule(s) to be removed are provisioned.

6.a If the timer expires:
6.a.1 The timer expires but the CRF has not been notified that the affected bearer(s), for GPRS the PDP context(s), have been terminated. The CRF sends Diameter RAR to trigger the TPF to request Charging Rules.
6.a.2. The TPF sends Diameter RAA to acknowledge the RAR.
6.a.3 The Charging Rules are requested by the TPF, using the Diameter CCR.
6.a.4 The CRF removes the affected Charging Rules by using Diameter CCA.
6.a.5 The TPF removes the indicated Charging Rules.

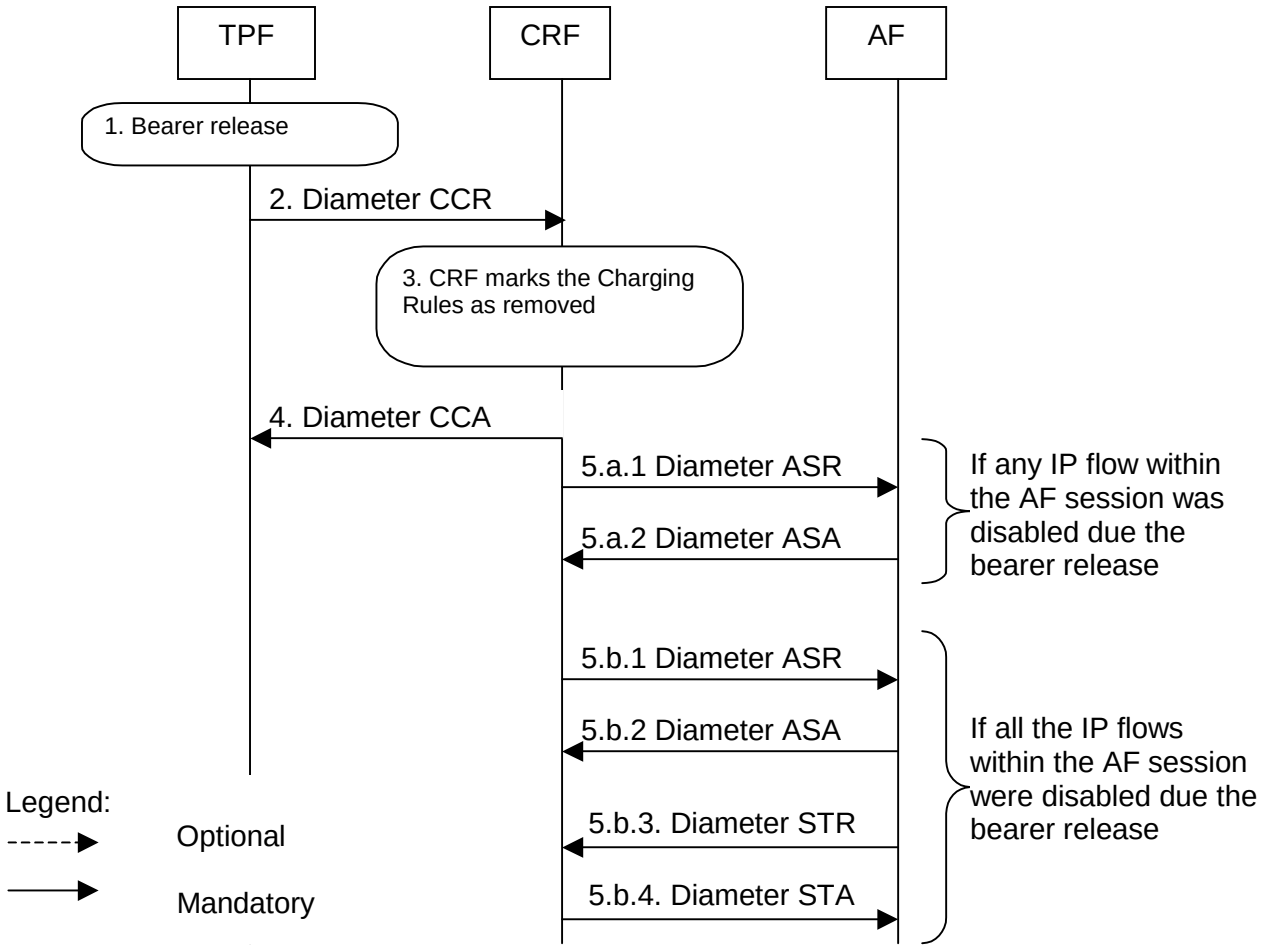
7. The bearer is deactivated.
8. The TPF sends a Diameter CCR message to the CRF, indicating bearer termination.
9. The CRF acknowledges the bearer termination by sending a Diameter CCA message.

Figure 8.5: Bearer release at AF session modification

8.6 Bearer Release

This clause covers the bearer release, which may be indicated to the AF. Three cases are covered: bearer release that does not cause IP flow(s) within an AF session to be disabled for certain, bearer release that causes at least one but not all the IP flow(s) within an AF session to be disabled, and bearer release that causes all the IP flows within an AF session to be disabled.

The case were the bearer release that does not cause IP flow(s) within an AF session to be disabled for certain is the one were Charging Rule(s) for the affected IP flow(s) are provisioned to more than one bearers. For GPRS, these are the secondary PDP context(s) within an PDP session. The CRF does not know for sure in PDP context(s) the IP flow(s) are possibly carried thus a release of a PDP context does not necessarily mean that the IP flow(s) are disabled.



1. A bearer is deactivated. For GPRS and IMS, the SGSN deactivates the PDP context carrying IP flow(s) of IMS media component(s) by sending the Delete PDP Context Request message to the GGSN.
2. The TPF sends a Diameter CCR message to the CRF, indicating bearer termination.
3. The CRF marks the Charging Rules for the terminated bearer as removed. For GPRS, this is the corresponding PDP context.
4. The CRF acknowledges the bearer termination by sending a Diameter CCA message.

The following steps shall be performed separately for each AF session that is affected by the bearer release as explained below. For IMS and GPRS, these are the IMS session(s) for which the IMS media component(s) were carried within the terminated PDP Context.

5.a If at least one but not all of the IP flow(s) within the AF session are discontinued by the bearer release:
5.a.1 The CRF indicates the release of the bearer by sending a Diameter RAR to the AF.
5.a.2 The AF responds by sending a Diameter RAA to the CRF.

5.b If all IP flow(s) within the AF session are discontinued by the bearer release:
5.b.1 The CRF indicates the session abort to the AF by sending a Diameter ASR message to the AF.
5.b.2 The AF responds by sending a Diameter ASA message to the CRF.
5.b.3 The AF sends a Diameter STR message to the CRF to indicate that the session has been terminated.
5.b.4 The CRF responds by sending a Diameter STA message to the AF.

Figure 8.6: Bearer Release

Annex A (informative): Change history

Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New