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Contents

Foreword

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

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- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document is part of a series of documents that specify charging functionality and charging management in GSM/UMTS networks. The GSM/UMTS core network-charging architecture and principles are specified in TS 32.240 [1], which provides an umbrella for other charging management documents that specify.

- The content of the CDRs' per domain and subsystem (offline charging);
- The content of real-time charging messages per domain / subsystem (online charging);
- The functionality of online and offline charging for those domains and subsystems;
- The interfaces that are used in the charging framework to transfer the charging information (i.e. CDRs or charging events).

The complete document structure for these TSs is defined in TS 32.240 [1].

The present document specifies in detail the Diameter based offline and online charging applications for 3GPP networks. It includes all charging parameters, scenarios and message flows..

All terms, definitions and, abbreviations used in the present document, that are common across 3GPP TSs, are defined in TR 21.905 [100]. Those that are common across charging management in GSM/UMTS domains, services or subsystems are provided in the umbrella document TS 32.240 [1] and are copied into clause 3 of the present document for ease of reading. Finally, those items that are specific to the present document are defined exclusively in the present document.

Furthermore, requirements that govern the charging work are specified in TS 22.115 [101].

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, edition number, version number, etc.) 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 TS 32.240: "Telecommunication management; Charging management; Charging Architecture and Principles".

[2]-[99] Void.

[100] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications"

[101] 3GPP TS 22.115: "Service aspects; Charging and billing".

[102]-[199] Void.

[200] 3GPP TS 23.207: "End to end quality of service concept and architecture".

[201] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[202] 3GPP TS 24.229: "IP Multimedia Call Control Protocol based on SIP and SDP; Stage 3."

[203] 3GPP TS 29.207: "Policy control over Go interface".

[204] 3GPP TS 29.229: "Cx and Dx Interfaces based on the Diameter protocol; Protocol Details".

[205] Void.

[206] 3GPP TS 29.230: "3GPP specific codes and identifiers".

[207] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[208] 3GPP TS 23.140: " Multimedia Messaging Service (MMS); Functional description; Stage 2".

[209] OMA "Multimedia Messaging Service; Encapsulation Protocol".

[210] OMNA WSP Content Type Numbers
http://www.openmobilealliance.org/tech/omna/omna-wsp-content-type.aspx

[211] OMA-CP-POC: "OMA PoC Control Plane"

[212] 3GPP 29.234: "3GPP system to Wireless Local Area Network (WLAN) interworking; Stage 3".

[213] 3GPP TS 29.140: "MM10 interface based on Diameter protocol; Stage 3".

[214] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point; Stage 3".

[215] 3GPP TS 29.212: "Policy and Charging Control (PCC); Reference points".

[216] 3GPP TS 23.040: "Technical realization of Short Message Service (SMS)".

[217] 3GPP TS 22.142: "Value Added Services (VAS) for Short Message Service (SMS) requirements".

[218] 3GPP TS 23.203: "Policy and Charging control architecture".

[219] 3GPP TS 29.272: " Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol".

[220] 3GPP TS 24.605: "Conference (CONF) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification".

[221] 3GPP TS 29.329: "Sh Interface based on the Diameter protocol;Protocol details".

[222] 3GPP TS 29.658: "SIP Transfer of IP Multimedia Service Tariff Information".

[223] OMA-DDS-Charging_Data: "Charging Data".

[224] 3GPP TS 23.003: "Numbering, Addressing and Identification".

[225] 3GPP TS 29.060: "General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp interface".

[226] 3GPP TS 29.274: "Evolved GPRS Tunnelling Protocol for Control Plane (GTPv2-C); Stage 3".

[227] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[228] 3GPP TS 23.167: "IP Multimedia Subsystem (IMS) emergency sessions".

[229] 3GPP TS 29.173: "Location Services (LCS);Diameter-based SLh interface for Control Plane LCS".

[230] 3GPP TS 29.272: "Evolved Packet System (EPS);Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol".

[231] - [236] Void.

[237] 3GPP TS 29.273: "Evolved Packet System (EPS); 3GPP EPS AAA Interfaces".

[238]-[400] Void.

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

[402] IETF RFC 4006: "Diameter Credit Control Application"

[403] IETF RFC 5580: "Carrying Location Objects in RADIUS"

[404] IETF RFC 3455 , "Private Extensions to the Session Initiation Protocol (SIP) for the 3rd Generation Partnership Projects (3GPP)".

[405] IETF RFC 3261: "SIP: Session Initiation Protocol".

[406] IETF RFC 4566: "SDP: Session Description Protocol".

[407] IETF RFC 4005: "Diameter Network Access Server Application".

[408] IETF RFC 3264: An Offer/Answer Model with the Session Description Protocol (SDP).

[409] IEEE Std 802.11-2012: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

NOTE: The above reference will need to be updated to reference the assigned RFC number, once the draft achieves RFC status within the IETF.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

middle tier (charging) TS: term used for the 3GPP charging TSs that specify the domain / subsystem / service specific, online and offline, charging functionality. These are all the TSs in the numbering range from 3GPP TS 32.250 to 3GPP TS 32.279, e.g. 3GPP TS 32.250 [10] for the CS domain, or 3GPP TS 32.270 [30] for the MMS service. Currently, there is only one "tier 1" TS in 3GPP, which is the TS 32.240 that specifies the charging architecture and principles. Finally, there are a number of top tier TSs in the 32.29x numbering range ([50] ff) that specify common charging aspects such as parameter definitions, encoding rules, the common billing domain interface or common charging applications.

offline charging: charging mechanism where charging information **does not** affect, in real-time, the service rendered

online charging: charging mechanism where charging information can affect, in real-time, the service rendered and therefore a direct interaction of the charging mechanism with session/service control is required

3.2 Symbols

For the purposes of the present document, the following symbols apply:

Rf	Offline Charging Reference Point between a 3G network element and the CDF.
Ro	Online Charging Reference Point between a 3G network element and the OCS.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

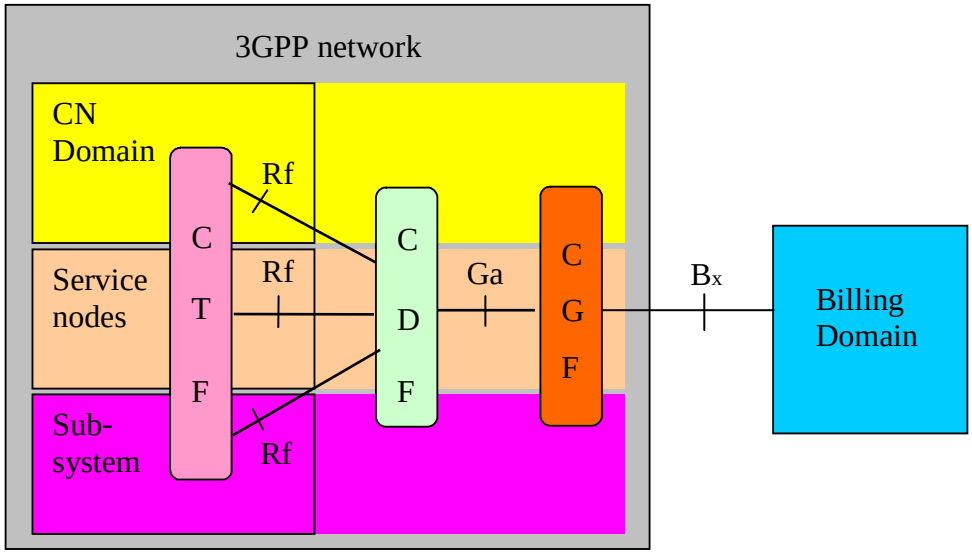
ACA	ACcounting Answer
ACR	ACcounting Request
AoC	Advice of Charge
AS	Application Server
ASA	Abort Session Answer
ASR	Abort Session Request
AVP	Attribute Value Pair
CCA	Credit Control Answer
CCR	Credit Control Request
CDF	Charging Data Function
CDR	Charging Data Record
CEA	Capabilities Exchange Answer
CER	Capabilities Exchange Request
CGI	Cell Global Identification
CI	Cost-Information
CSG	Closed Subscriber Group
CSG ID	Closed Subscriber Group Identity
DBPA	Diameter Base Protocol Accounting
DCD	Dynamic Content Delivery
DPA	Disconnect Peer Answer
DPR	Disconnect Peer Request
DRM	Digital Rights Management
DWA	Device Watchdog Answer
DWR	Device Watchdog Request
ECGI	E-UTRAN Cell Global Identifier
ECUR	Event Charging with Unit Reservation
FQDN	Fully Qualified Domain Name
FUI	Final-Unit-Indication

HSGW	HRPD Serving GateWay
GSU	Granted-Service-Unit
IEC	Immediate Event Charging
IM	Instant Messaging
IMS	IP Multimedia Subsystem
IMS-AGW	IMS Access Media Gateway
MSCC	Multiple Services Credit Control
NetLoc	Network provided Location information
NNI	Network to Network Interface
OCS	Online Charging System
RAA	Re-Auth Answer
RAI	Routeing Area Identity
RAR	Re-Auth Request
RAVEL	Roaming Architecture for VoicE over IMS with Local breakout
SAI	Service Area Identifier
SCCP	Signalling Connection Control Part
SDP	Session Description Protocol
TAI	Tracking Area Identity
TrGW	Transition GateWay
TWAG	Trusted WLAN Access Gateway
TWAN	Trusted WLAN Access Network

4 Architecture Considerations

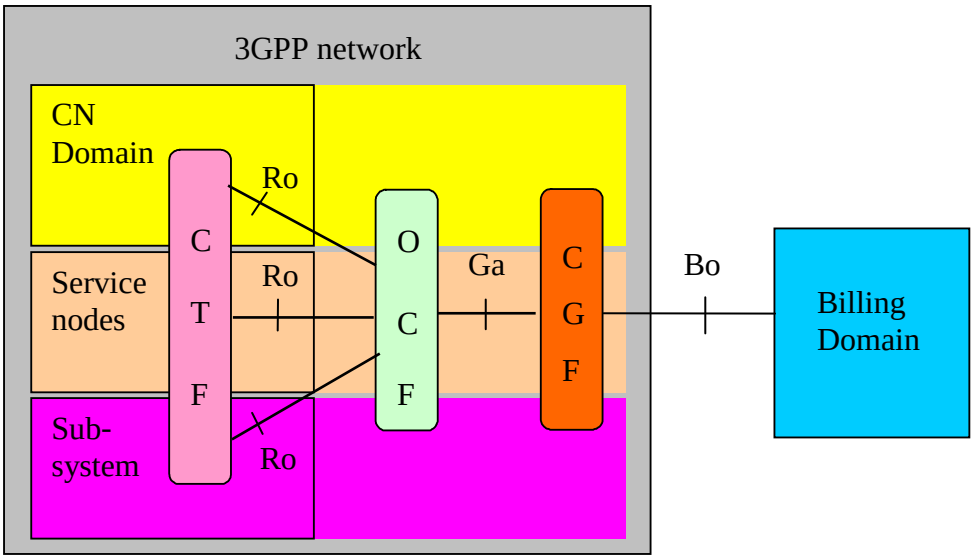
4.1 High level architecture

The Rf and the Ro are reference points from the Charging Trigger Function (CTF) to the Charging Data Function (CDF) and the Online Charging Function (OCF) respectively, and are intended for the transport of charging events. Rf is used for offline charging whereas Ro is used for online charging. The following figures depict the position of the Rf and Ro reference points within the overall 3GPP online and offline charging architecture.



CTF: **C**harging **T**rigger **F**unction
CDF: **C**harging **D**ata **F**unction
CGF: **C**harging **G**ateway **F**unction
BD: **B**illing **D**omain. This may also be a billing mediation device / post-processing system.

Figure 4.1.1: Logical ubiquitous offline charging architecture



CTF: **C**harging **T**rigger **F**unction
OCF: **O**nline **C**harging **F**unction
CGF: **C**harging **G**ateway **F**unction
BD: **B**illing **D**omain. This may also be a billing mediation device / post-processing system.

Figure 4.1.2: Logical ubiquitous online charging architecture

Different mappings of the ubiquitous offline charging functions, CTF, CDF and CGF, onto physical implementations are possible. Further details of the configuration refer toTS 32.240 [1]. Details of the implementation options per domain / subsystem / service (usually a subset of the overall possible variants described above) are specified in the respective middle tier TS.

4.1.1 Charging related transfer requirements

Each CTF would have CDF and OCF address list to which it can send its charging events and/or charging requests. The list will be organized in address priority order. If the primary charging function is not available (e.g., out of service) then the CTF shall send the charging information to the secondary charging function and so on.

Within the scope of this release, each network element that generates charging information will send the information only to the charging entities of the same PLMN, and not to charging entities in other PLMNs.

Each CDF in the PLMN may know of other CDFs' network addresses (e.g., for redundancy reasons, to be able to recommend another CDF address with the Redirection Request message). This is achieved by OAM&P configuration facilities that will enable each CDF to have a configurable list of peer CDF addresses.

5 3GPP charging applications requirements

5.1 Offline Charging Scenarios

5.1.1 Basic Principles

Offline charging for both events and sessions between CTF and the CDF is performed using the Rf reference point as defined in TS 32.240[1].

Two basic scenarios are used:

- Event based Charging;
- Session based Charging.

5.1.1.1 Event based charging

In the following scenario, CTF asks the CDF to store event related charging data.

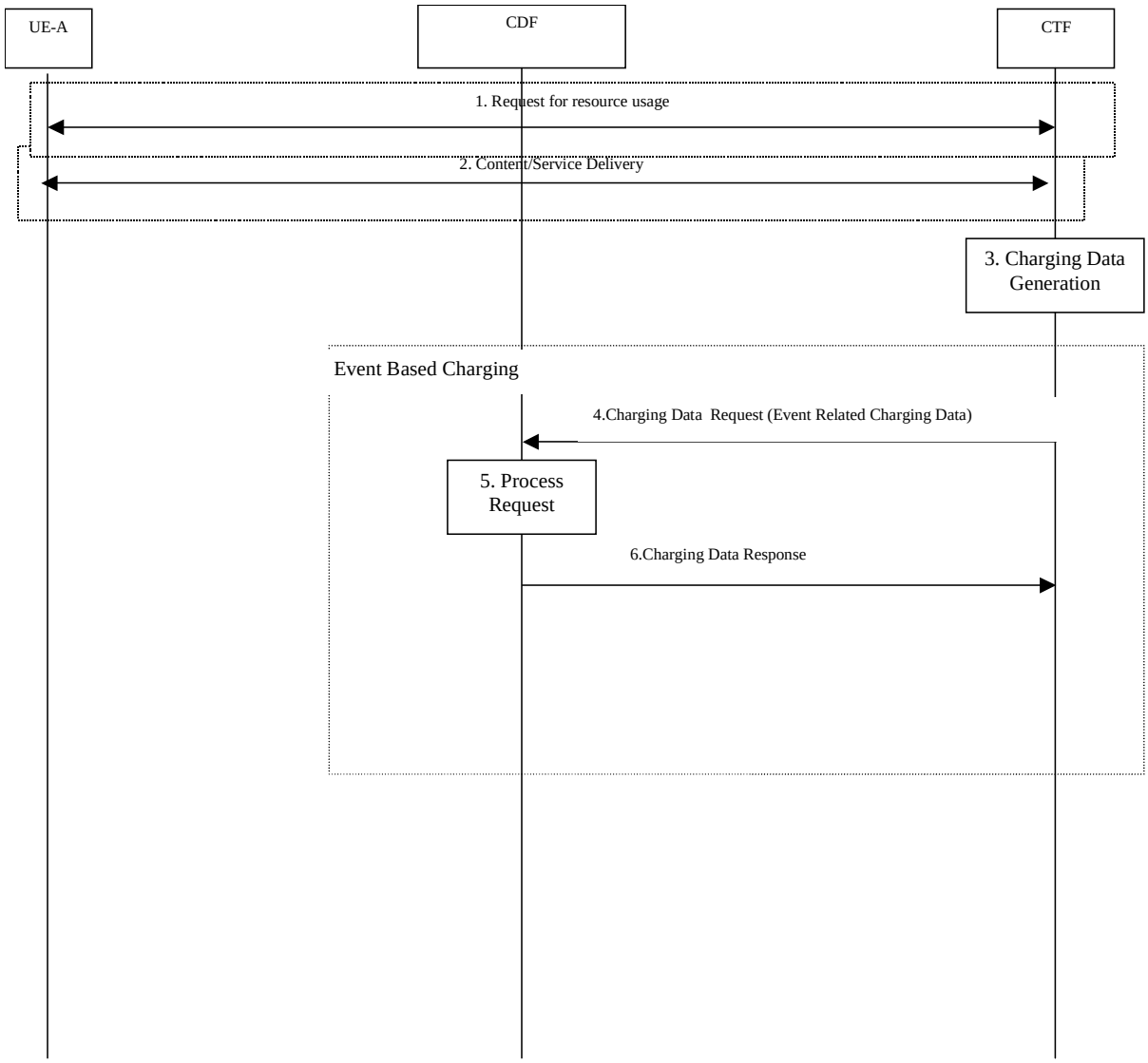


Figure 5.1.1.1: Event Based Charging

1. **Request for resource usage:** UE-A requests the desired resource from the network element.
2. **Content/Service Delivery:** the network element delivers the content/service.
3. **Charging Data Generation:** the CTF generates charging data related to service delivery
4. **Record Charging Data Request:** the CTF requests the CDF to store event related charging data for CDR generation purposes.
5. **Process Request:** CDF stores received information. Whether the CDR is generated or not depends on CDR generation configuration.
6. **Record Charging Data Response:** the CDF informs the CTF that charging data was stored.

5.1.1.2 Session based charging

In the following scenario, CTF asks the CDF to store session related charging data.

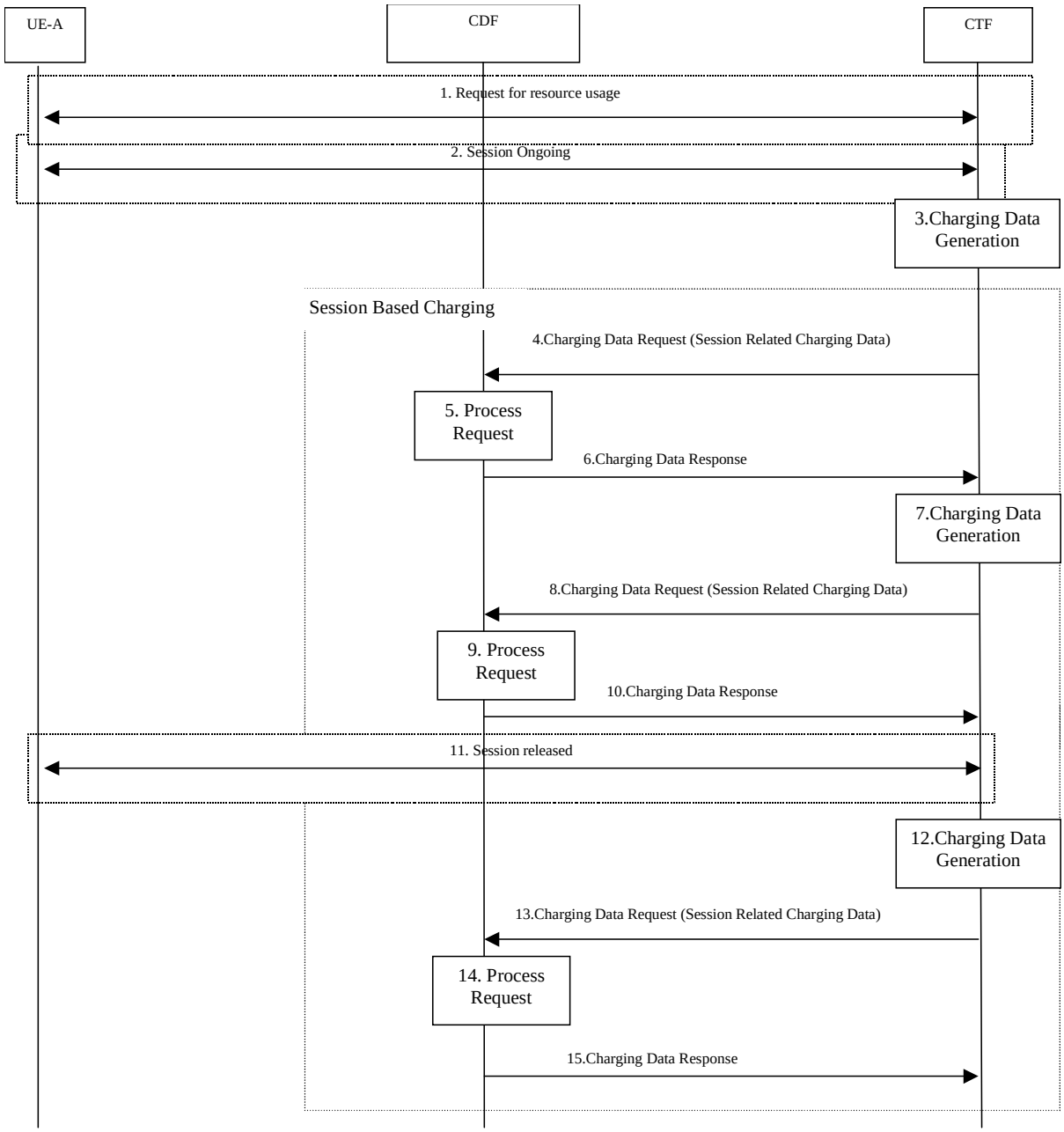


Figure 5.1.1.2: Session based charging

1. **Request for resource usage:** UE-A requests the desired session from the network element.
2. **Session ongoing:** the network element establish the session
3. **Charging Data Generation:** the CTF generates charging data related to session.
4. **Record Charging Data Request:** the CTF requests the CDF to store session related charging data for CDR generation purposes.
5. **Process Request:** CDF stores received information. Whether the CDR is generated or not depends on CDR generation configuration.
6. **Record Charging Data Response:** the CDF informs the CTF that charging data was stored
7. **Charging Data Generation:** the CTF generates charging data related to session due of e.g. intermediate timer expiry

8. **Record Charging Data Request:** the CTF requests the CDF to store session related charging data for CDR generation purposes.
9. **Process Request:** CDF stores received information. Whether the CDR is generated or not depends on CDR generation configuration.
10. **Record Charging Data Response:** the CDF informs the CTF that charging data was stored
11. **Session release:** the session is released
12. **Charging Data Generation:** the CTF generates charging data related to session due of session termination.
13. **Record Charging Data Request:** the CTF requests the CDF to store session related charging data for CDR generation purposes.
14. **Process Request:** CDF stores received information. Whether the CDR is generated or not depends on CDR generation configuration.
15. **Record Charging Data Response:** the CDF informs the CTF that charging data was stored.

5.1.2 Basic Operation

Event and session based Charging are performed by the use of the "*Charging Data Transfer*" operation:

- "*Charging Data Request*"; sent from CTF → CDF
  After detecting a chargeable event, the CTF sends a Charging Data Request to the CDF.

- "*Charging Data Response*"; sent from CDF → CTF
  The CDF replies with a Charging Data Response, which informs the CTF that charging data was received.

Table 5.1.2.1 and table 5.1.2.2 describe the content of these operations.

Table 5.1.2.1: Charging Data Request Content

Charging Data Request	Category	Description
Session Identifier	M	This field identifies the operation session.
Originator Host	M	This field contains the identification of the source point of the operation and the realm of the operation originator.
Originator Domain	M	This field contains the realm of the operation originator.
Destination Domain	M	This field contains the realm of the operation destination.
Operation Type	M	This field defines the transfer type: event for event based charging and start, interim, stop for session based charging.
Operation Number	M	This field contains the sequence number of the transferred messages.
Operation Identifier	O_M	The field corresponds to the unique operation identification.
User Name	O_C	The field contains the identification of the service user.
Destination Host	O_C	This field contains the identification of the destination point of the operation.
Operation Interval	O_C	
Origination State	O_C	
Origination Timestamp	O_C	This field contains the time when the operation is requested.
Proxy Information	O_C	This field contains the parameter of the proxy.
Route Information	O_C	This field contains the parameter of the route.
Operation Token	O_M	This field identifies the domain, subsystem or service and release.
Service information	O_M	This parameter holds the individual service specific parameters as defined in the corresponding 'middle tier' TS.

Table 5.1.2.2: Charging Data Response Content

Charging Data Response	Category	Description
Session Identifier	M	This field identifies the operation session.
Operation Result	M	This field identifies the result of the operation.
Originator Host	M	This field contains the identification of the source point of the operation and the realm of the operation originator.
Originator Domain	M	This field contains the realm of the operation originator.
Operation Type	M	This field defines the transfer type: event for event based charging and start, interim, stop for session based charging.
Operation Number	M	This field contains the sequence number of the transferred messages.
Operation Identifier	O_M	The field corresponds to the unique operation identification.
Operation Interval	O_C	
Error Reporting Host	O_C	If proxies exist between the accounting client and the accounting server this field contains the identity of the proxy that sent a response other than 2001 (Success).
Origination State	O_C	
Origination Timestamp	O_C	This field contains the time when the operation is requested.
Proxy Information	O_C	This field contains the parameter of the proxy.

5.2 Online Charging scenarios

Online charging for both events and sessions between CTF and the OCF is performed using the Ro reference point. The Ro reference point supports integrity protection and authentication for the case that the CTF is outside the operator domain.

5.2.1 Basic principles

There are two sub-functions for online charging that affect online charging principles and require a more detailed description: rating and unit determination. Both rating and unit determination can be implemented centralized, i.e. on the OCF, or decentralized, that is, on the CTF.

Unit determination refers to the calculation of the number of non-monetary units (service units, data volume, time and events) that shall be assigned prior to starting service delivery.

- With Centralized Unit Determination, the OCF determines the number of non-monetary units that a certain service user can consume based on a service key received from the CTF.
- With the Decentralized Unit Determination approach, the CTF determines itself how many units are required to start service delivery, and requests these units from the OCF.

After checking the service user's account balance, the OCF returns the number of granted units to the CTF. The CTF is then responsible for the supervision of service delivery. Particularly, the CTF shall limit service delivery to the corresponding number of granted units.

Rating refers to the calculation of a price out of the non-monetary units calculated by the unit determination function.

- With the Centralized Rating approach, the CTF and the OCF exchange information about non-monetary units. The OCF translates these units into monetary units.
- With the Decentralized Rating approach, the corresponding rating control is performed within the CTF. Consequently, CTF and OCF exchange information about monetary units.

Three cases for online charging can be distinguished: immediate event charging (IEC), event charging with unit reservation (ECUR) and session charging with unit reservation (SCUR). These cases are further described in TS 32.240 [1].

5.2.2 Charging Scenarios

In order to perform event charging via Ro, the scenarios between the involved entities UE-A, OCF and CTF need to be defined. The charging flows shown in this subclause include scenarios with immediate event charging and event charging with reservation. In particular, the following cases are shown:

1 Immediate Event Charging
   a) Decentralized Unit Determination and Centralized Rating
   b) Centralized Unit Determination and Centralized Rating
   c) Decentralized Unit Determination and Decentralized Rating

2 Event charging with Reservation
   a) Decentralized Unit Determination and Centralized Rating
   b) Centralized Unit Determination and Centralized Rating
   c) Decentralized Unit Determination and Decentralized Rating

3 Session charging with Reservation
   a) Decentralized Unit Determination and Centralized Rating
   b) Centralized Unit Determination and Centralized Rating
   c) Decentralized Unit Determination and Decentralized Rating

The combination of Centralized Unit Determination with Decentralized Rating is not possible.

5.2.2.1 Immediate Event Charging

5.2.2.1.1 Decentralized Unit Determination and Centralized Rating

In the following scenario, CTF asks the OCF to assign a defined number of units.

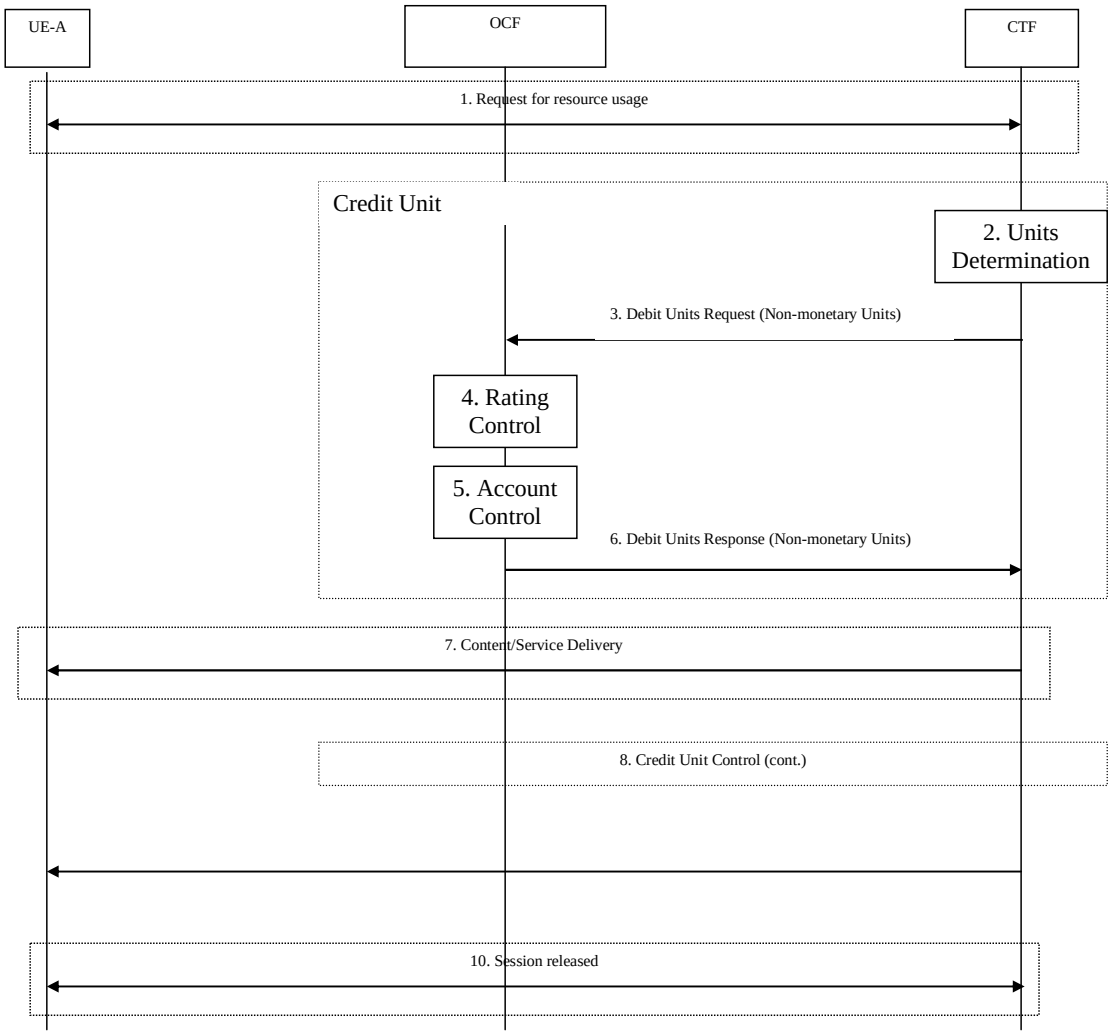


Figure 5.2.2.1.1: Immediate Event Charging with Centralized Rating and Decentralized Unit Determination

1. **Request for resource usage:** UE-A requests the desired resource from the network element.
2. **Units Determination:** depending on the requested service the CTF determines the number of units accordingly.
3. **Debit Units Request:** the CTF requests the OCF to assign the defined number of units.
4. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units that represents the price for the number of units determined in item 2.
5. **Account Control:** provided that the user's credit balance is sufficient, the OCF triggers the deduction of the calculated amount from the subscriber's account.
6. **Debit Units Response:** the OCF informs the CTF of the number of granted units.
7. **Content/Service Delivery:** the CTF delivers the content/service at once, in fractions or in individually chargeable items, corresponding to the number of granted units.
8. **Credit Unit Control (cont.):** this function block is optional and a replication of items 2 to 6.
9. **Content/Service Delivery (cont.):** the continuation of content delivery occurs in correspondence with the occurrence of item 8.
10. **Session released:** Session is released.

5.2.2.1.2 Centralized Unit Determination and Centralized Rating

In the following scenario, CTF asks the OCF to assign units based on the service key specified by the CTF.

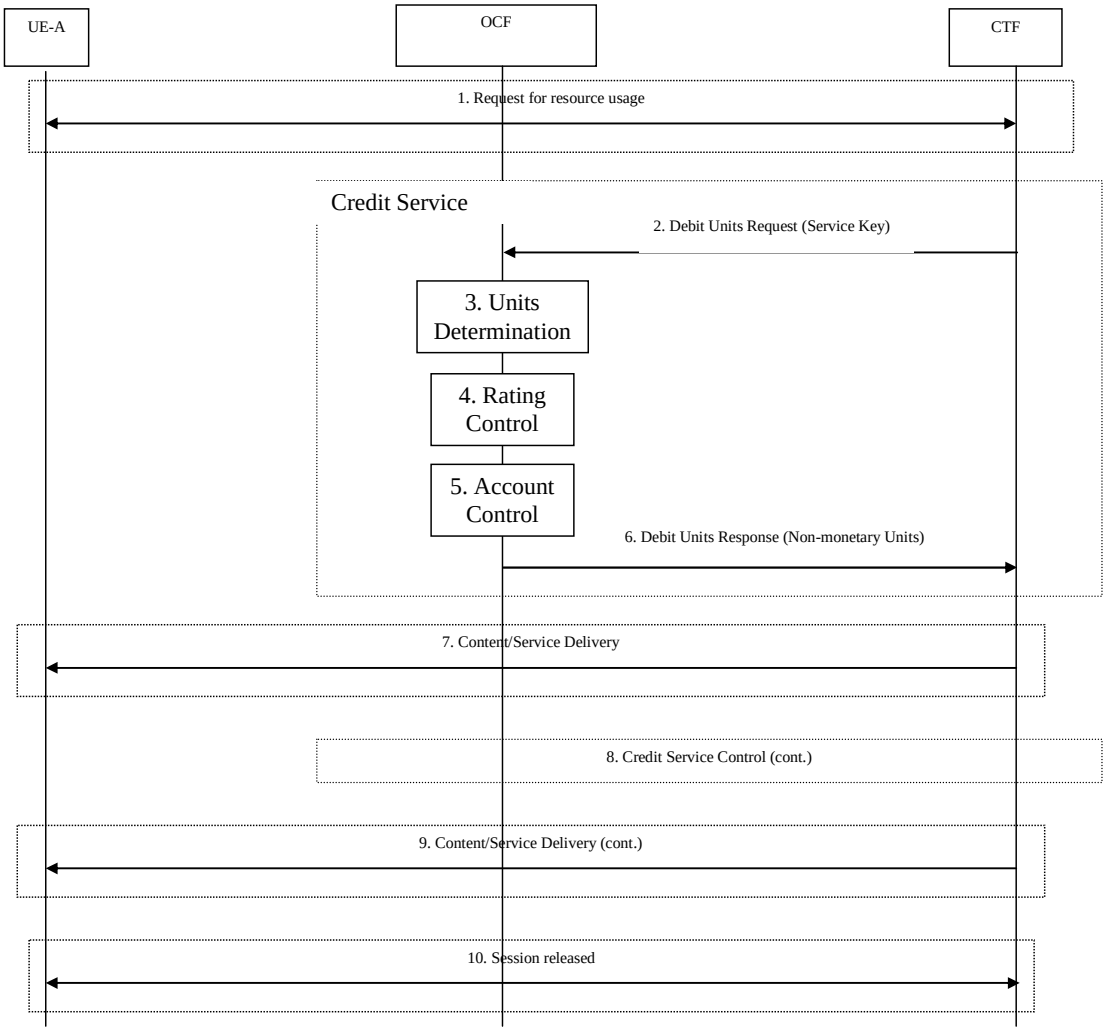


Figure 5.2.2.1.2: Immediate Event Charging with Centralized Rating and Centralized Unit Determination

1. **Request for resource usage:** The UE-A requests the desired resource or content from the network element.
2. **Debit Units Request:** depending on the service requested by the UE-A, the CTF determines the service key and forwards the Debit Units Request with service key to the OCF.
3. **Units Determination:** the OCF determines the number of non-monetary units needed for the content/service delivery, based on the received service key.
4. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units that represent the price for the number of units determined in item 3.
5. **Account Control:** provided that the user's credit balance is sufficient, the OCF triggers the deduction of the calculated amount from the subscriber's account.
6. **Debit Units Response:** the OCF informs the CTF of the number of granted units. This includes the case where the number of units granted indicates the permission to render the service that was identified by the received service key.
7. **Content/Service Delivery:** the CTF delivers the content/service at once, in fractions or in individually chargeable items, corresponding to the number of granted units.
8. **Credit Service Control (cont.):** this function block is optional and a replication of items 2 to 6.

9. **Content/Service Delivery (cont.):** the continuation of content delivery occurs in correspondence with the occurrence of item 8.
10. **Session released:** the session is released.

5.2.2.1.3 Decentralized Unit Determination and Decentralized Rating

In the following scenario, the CTF asks the OCF to assure the deduction of an amount of the specified number of monetary units from the subscriber's account.

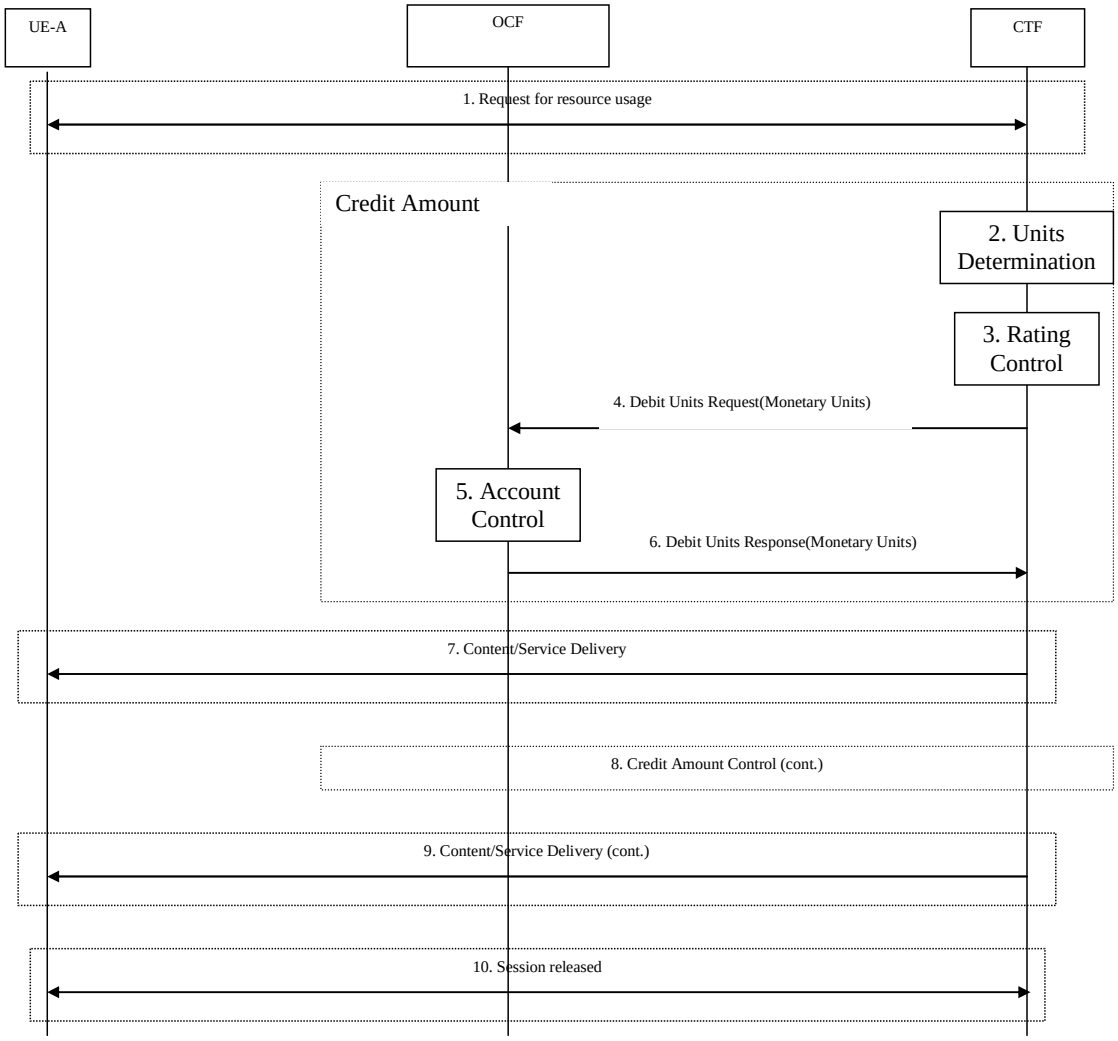


Figure 5.2.2.1.3: Immediate Event Charging with Decentralized Rating and Decentralized Unit Determination

1. **Request for resource usage:** The UE-A requests the desired content from the network element.
2. **Units Determination:** depending on the service requested by the UE-A, the CTF determines the number of units accordingly.
3. **Rating Control:** the CTF calculates the number of monetary units that represent the price for the number of units determined in item 2.
4. **Debit Units Request:** the CTF requests the OCF to assure the deduction of an amount corresponding to the calculated number of monetary units from the subscriber's account.
5. **Account Control:** provided that the user's credit balance is sufficient, the OCF triggers the deduction of the calculated amount from the subscriber's account.
6. **Debit Units Response:** the OCF indicates to the CTF the number of deducted monetary units.
7. **Content/Service Delivery:** the CTF delivers the content/service at once, in fractions or in individually chargeable items, corresponding to the number of units as specified in items 2 and 3.
8. **Credit Amount Control (cont.):** this function block is optional and a replication of items 2 to 6.
9. **Content/Service Delivery (cont.):** the continuation of content delivery occurs in correspondence with the occurrence of item 8.
10. **Session released:** the session is released.

5.2.2.1.4 Further Options

In addition to the flows that are specified in the previous subclauses, the Debit Unit operation may alternatively be carried out concurrently with service delivery, or after completion of service delivery.

5.2.2.2 Event Charging with Reservation

5.2.2.2.1 Decentralized Unit Determination and Centralized Rating

In the following scenario, the CTF requests the reservation of units prior to service delivery. An account debit operation is carried out following the conclusion of service delivery.

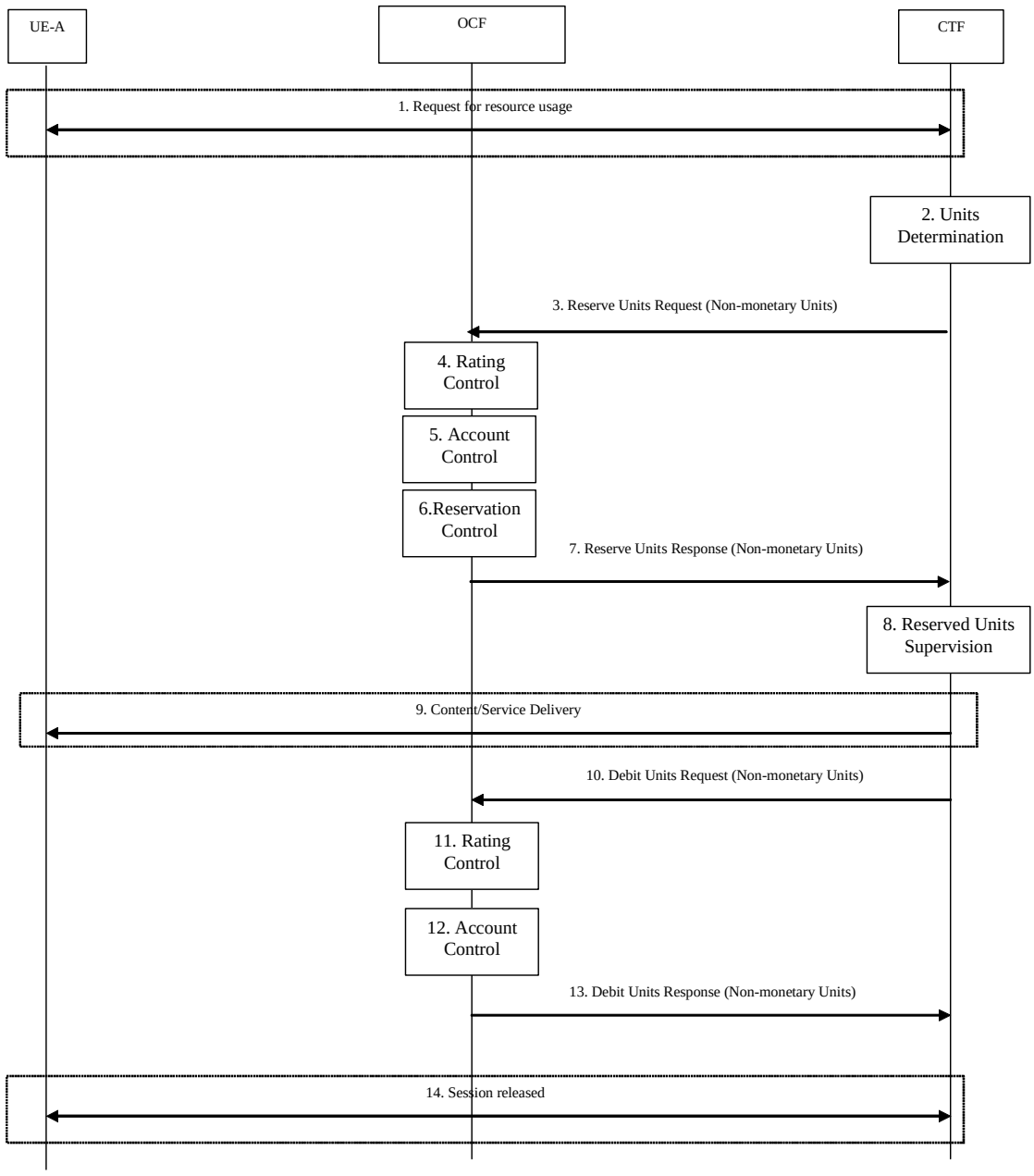


Figure 5.2.2.2.1: Event Charging with Reservation / Decentralized Unit Determination and Centralized Rating

1. **Request for resource usage:** The UE-A requests the desired content/service from the NE.
2. **Units Determination:** depending on the requested service the CTF determines the number of units accordingly.
3. **Reserve Units Request:** the CTF requests the OCF to reserve the number of units determined in item 2.
4. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units that represents the price for the number of units determined in item 2.
5. **Account Control:** the OCF checks whether the user's account balance is sufficient for the requested reservation.
6. **Reservation Control:** if the user's account balance is sufficient then the corresponding reservation is made.

7. **Reserve Units Response:** the OCF informs the CTF of the reserved number of units.
8. **Reserved Units Supervision:** simultaneously with the service delivery, the CTF monitors the consumption of the reserved units.
9. **Content/Service Delivery:** the CTF delivers the content/service at once, in fractions or in individually chargeable items, corresponding to the reserved number of units.
10. **Debit Units Request:** the CTF requests the OCF to assure the deduction of an amount corresponding to the consumed number of units from the subscriber's account. In the case that no further units are required for this service, an appropriate indication triggering the release of the remaining reservation is given.
11. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units to deduct from the subscriber's account.
12. **Account Control:** the OCF triggers the deduction of the calculated amount from the subscriber's account.
13. **Debit Units Response:** the OCF informs the CTF of the actually deducted units.
14. **Session Release:** the session is released.

5.2.2.2.2 Centralized Unit Determination and Centralized Rating

In the following scenario, the CTF requests the OCF to reserve units based on the service key specified by the CTF. An account debit operation is carried out following the conclusion of service delivery.

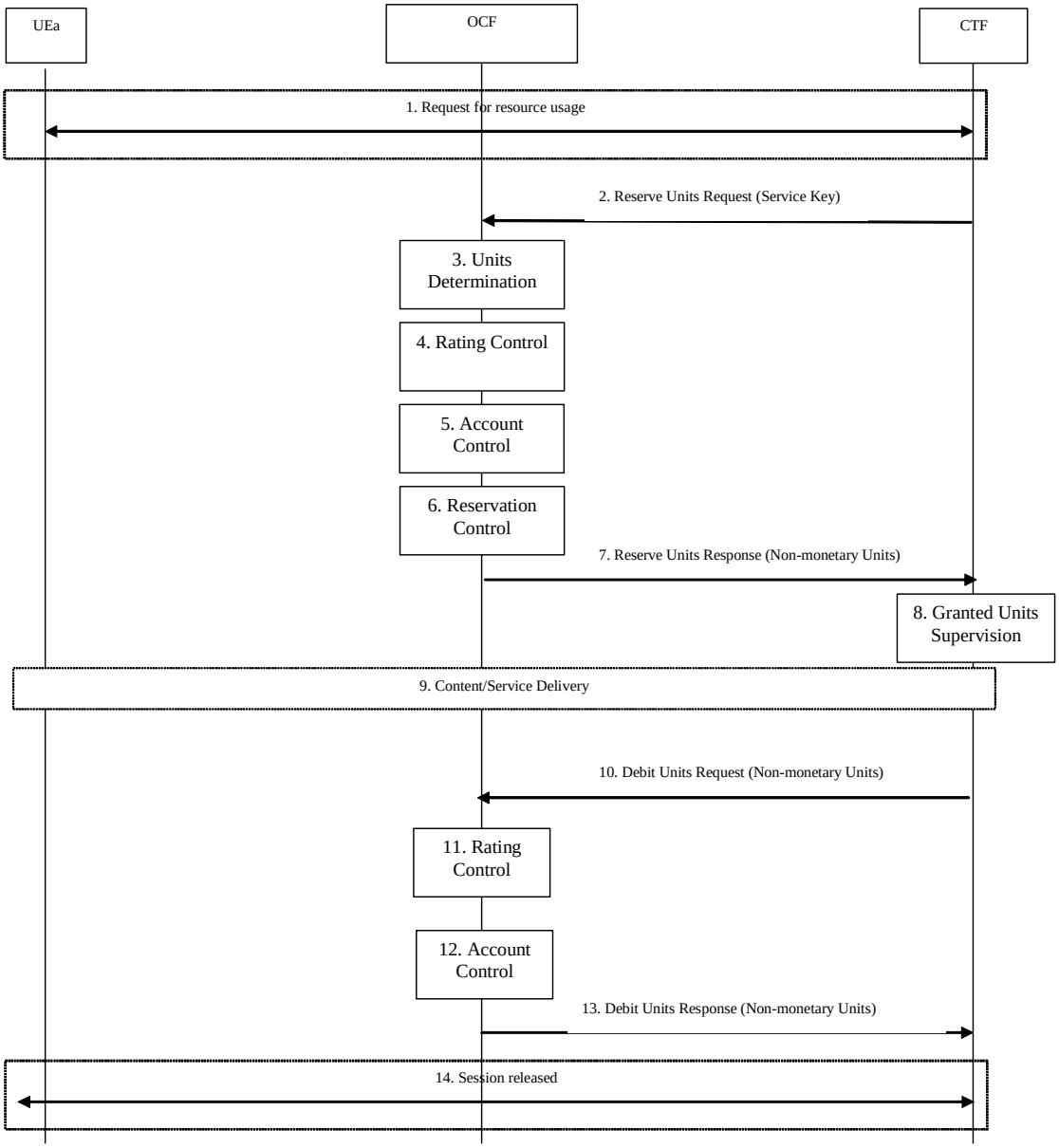


Figure 5.2.2.2.2: Event Charging with Reservation / Centralized Unit Determination and Centralized Rating

1. **Request for resource usage:** The UE-A requests the desired content from the CTF.
2. **Reserve Units Request:** depending on the service requested by the UE-A, the CTF determines the service key and forwards the Reserve Units Request with service key to the OCF.
3. **Units Determination:** the OCF determines the number of non-monetary units needed for the content/service delivery, based on the received service key.
4. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units that represent the price for the number of units determined in item 3.
5. **Account Control:** the OCF checks whether the user's account balance is sufficient for the requested reservation.
6. **Reservation Control:** if the user's account balance is sufficient, then the corresponding reservation is made.
7. **Reserve Units Response:** the OCF informs the CTF of the reserved number of units. This includes the case where the number of units reserved indicates the permission to render the service that was identified by the received service key.

8. **Granted Units** Supervision**:** simultaneously with the service delivery, the CTF monitors the consumption of the reserved units.
9. **Content/Service Delivery:** the CTF delivers the content/service at once, in fractions or in individually chargeable items, corresponding to the reserved number of units.
10. **Debit Units Request:** the CTF provides according to previous Reserve Units Response the request to deduct the amount of units corresponding to the consumed number of units.
11. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units to deduct from the subscriber's account.
12. **Account Control:** the OCF triggers the deduction of the calculated amount from the subscriber's account.
13. **Debit Units Response:** the OCF informs the CTF of the actually deducted units.
14. **Session Released:** the session is released.

5.2.2.2.3 Decentralized Unit Determination and Decentralized Rating

In the following scenario, the CTF request the OCF to assure the reservation of an amount of the specified number of monetary units from the subscriber's account. An account debit operation that triggers the deduction the amount from the subscriber's account is carried out following the conclusion of service delivery.

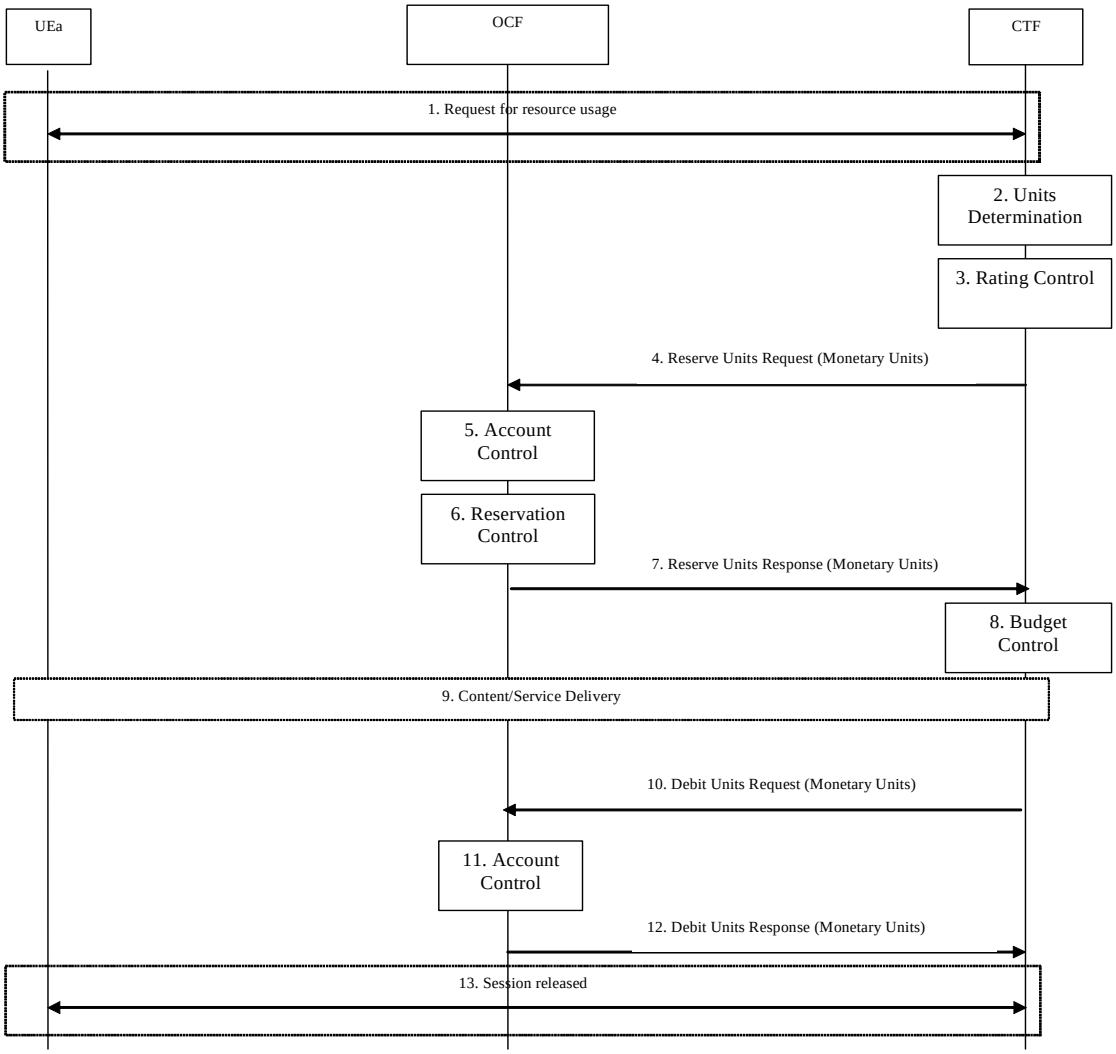


Figure 5.2.2.2.3: Event Charging with Reservation / Centralized Unit Determination and Centralized Rating

1. **Request for resource usage:** The UE-A requests the desired content from the CTF.
2. **Units Determination:** depending on the service requested by the UE-A, the CTF determines the number of units accordingly.
3. **Rating Control:** the CTF calculates the number of monetary units that represent the price for the number of units determined in item 2.
4. **Reserve Units Request:** the CTF requests the OCF to assure the reservation of an amount corresponding to the calculated number of monetary units from the subscriber's account.
5. **Account Control:** the OCF checks whether the user's account balance is sufficient for the requested reservation.
6. **Reservation Control:** if the user's credit balance is sufficient, then the corresponding reservation is made.
7. **Reserve Units Response:** the OCF informs the CTF of the reserved number of monetary units.
8. **Budget Control:** simultaneously with the service delivery, the CTF monitors the consumption of the granted amount.
9. **Content/Service Delivery:** the CTF delivers the content/service at once, in fractions or in individually chargeable items, corresponding to the number of units.

10. **Debit Units Request:** the CTF requests the OCF to assure the deduction of an amount corresponding to the consumed number of monetary units from the subscriber's account.
11. **Account Control:** the OCF triggers the deduction of the consumed amount from the subscriber's account.
12. **Debit Units Response:** the OCF indicates to the CTF the number of deducted monetary units.
13. **Session Released:** the session is released.

5.2.2.3 Session charging with Reservation

5.2.2.3.1 Decentralized Unit Determination and Centralized Rating

In the following scenario, the CTF requests the reservation of units prior to session supervision. An account debit operation is carried out following the conclusion of session termination.

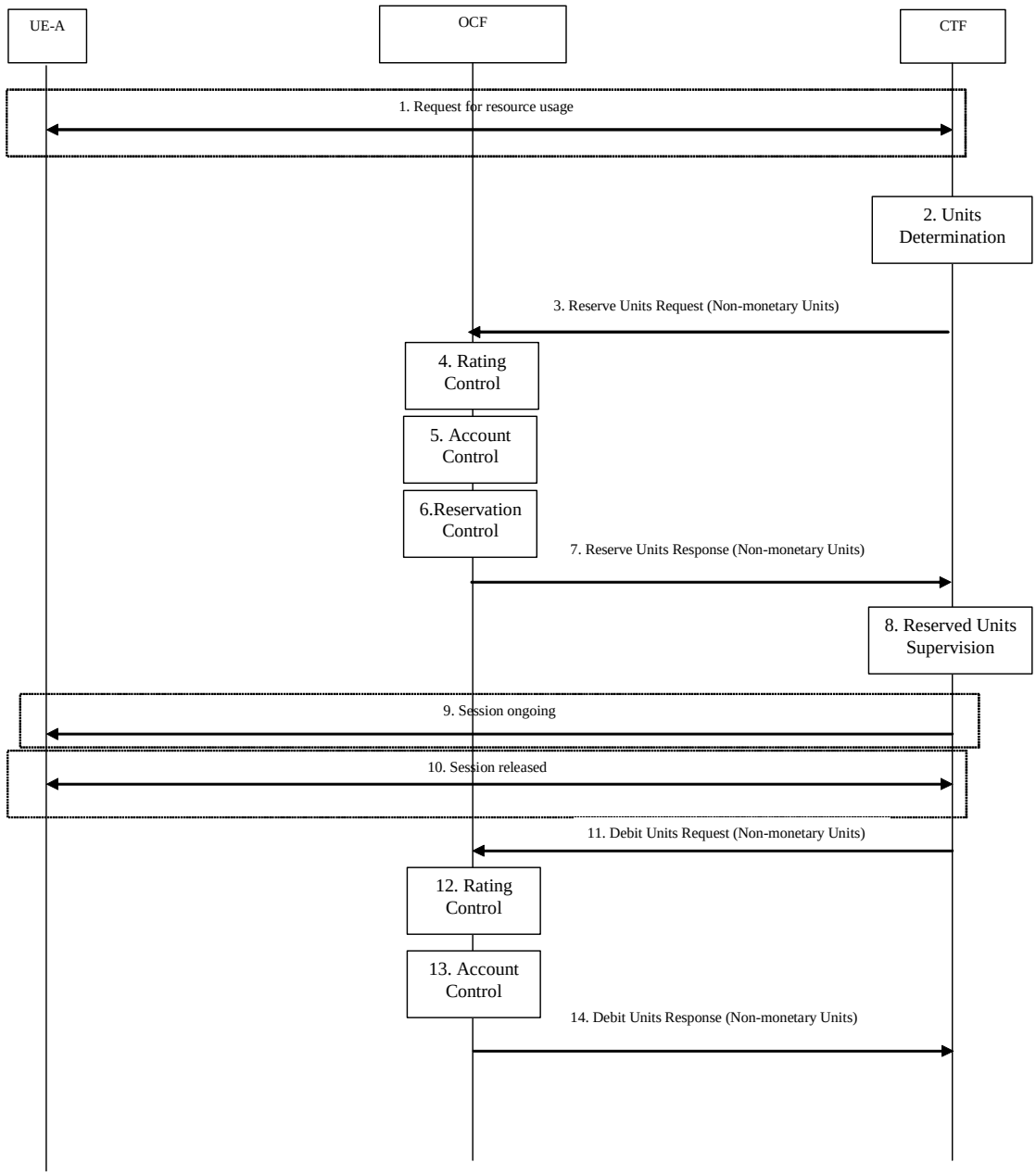


Figure 5.2.2.3.1: Session Charging with Reservation / Decentralized Unit Determination and Centralized Rating

1. **Request for resource usage:** The UE-A requests session establishment from the CTF.

2. **Units Determination:** depending on the requested type of the session the CTF determines the number of units accordingly.
3. **Reserve Units Request:** the CTF requests the OCF to reserve the number of units determined in item 2
4. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units that represents the price for the number of units determined in item 2.
5. **Account Control:** the OCF checks whether the user's account balance is sufficient for the requested reservation.
6. **Reservation Control:** if the user's account balance is sufficient then the corresponding reservation is made.
7. **Reserve Units Response:** the OCF informs the CTF of the reserved number of units.
8. **Reserved Units Supervision:** simultaneously with the ongoing session, the CTF monitors the consumption of the reserved units.
9. **Session ongoing:** the CTF maintains the session. One or more debit and reserve operations may be performed when the session is ongoing.
10. **Session Release:** the session is released
11. **Debit Units Request:** the CTF requests the OCF to assure the deduction of an amount corresponding to the consumed number of units from the subscriber's account.
12. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units to deduct from the subscriber's account.
13. **Account Control:** the OCF triggers the deduction of the calculated amount from the subscriber's account.
14. **Debit Units Response:** the OCF informs the CTF of the actually deducted units.

5.2.2.3.2 Centralized Unit Determination and Centralized Rating

In the following scenario, the CTF requests the OCF to reserve units based on the service key specified by the CTF. An account debit operation is carried out following the conclusion of session.

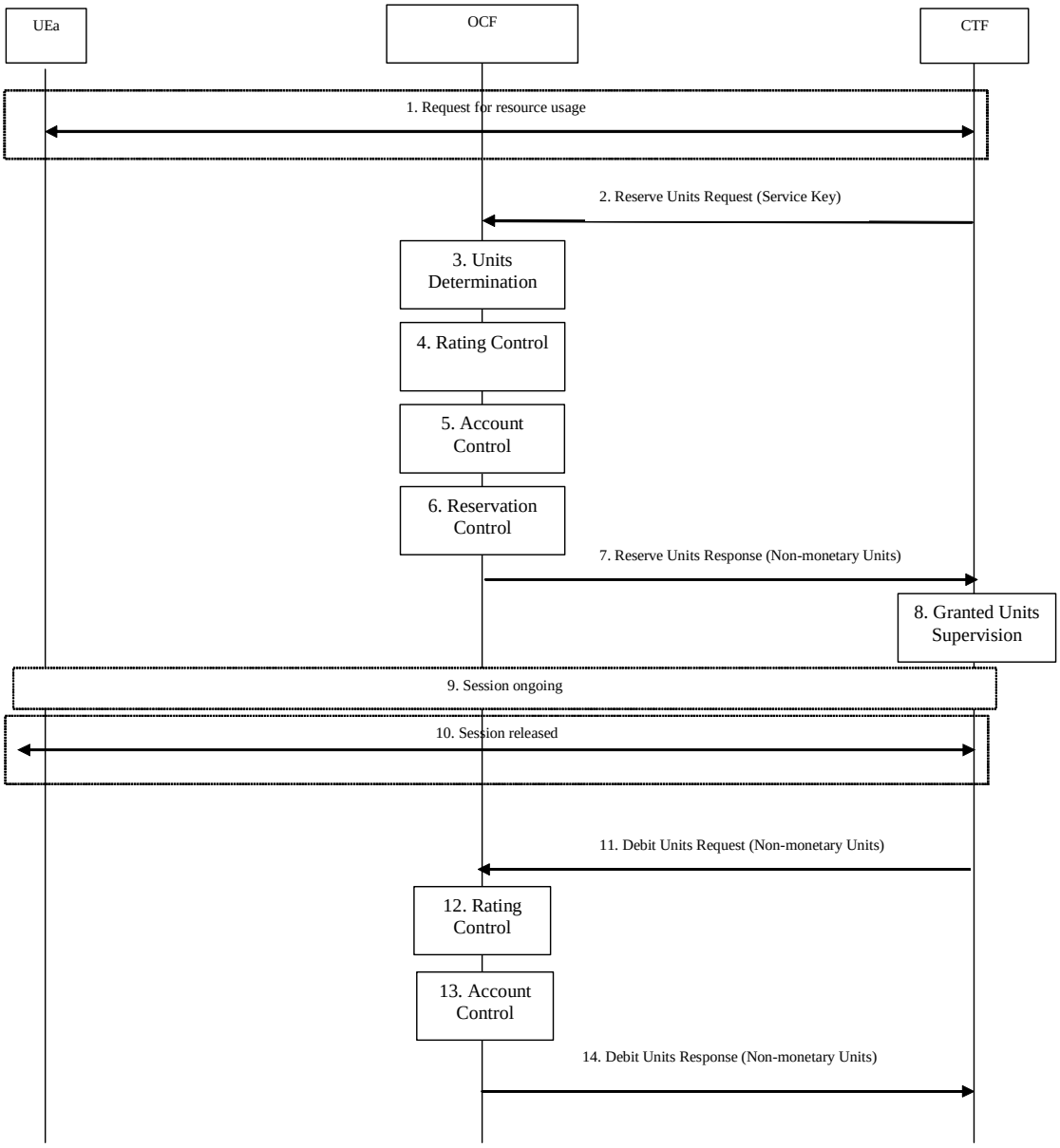


Figure 5.2.2.3.2: Session Charging with Reservation / Centralized Unit Determination and Centralized Rating

1. **Request for resource usage:** The UE-A requests the session establishment from the CTF.
2. **Reserve Units Request:** depending on the requested type of the session by the UE-A, the CTF determines the service key identifier and forwards the Reserve Un with service key its Request to the OCF.
3. **Units Determination:** the OCF determines the number of non-monetary units needed for the content/service delivery, based on the received service key.
4. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units that represent the price for the number of units determined in item 3.
5. **Account Control:** the OCF checks whether the user's account balance is sufficient for the requested reservation.
6. **Reservation Control:** if the user's account balance is sufficient, then the corresponding reservation is made.

7. **Reserve Units Response:** the OCF informs the CTF of the reserved number of units. This includes the case where the number of units reserved indicates the permission to render the service that was identified by the received service key.
8. **Granted Units** Supervision**:** simultaneously with the ongoing session, the CTF monitors the consumption of the reserved units.
9. **Session ongoing:** the CTF maintains the session. One or more debit and reserve operations may be performed when the session is ongoing.
10. **Session Released:** the session is released.
11. **Debit Units Request:** the CTF requests the OCF to assure the deduction of an amount corresponding to the consumed number of units from the subscriber's account
12. **Rating Control:** assisted by the rating entity the OCF calculates the number of monetary units to deduct from the subscriber's account.
13. **Account Control:** the OCF triggers the deduction of the calculated amount from the subscriber's account.
14. **Debit Units Response:** the OCF informs the CTF of the actually deducted units.

5.2.2.3.3 Decentralized Unit Determination and Decentralized Rating

In the following scenario, the CTF request the OCF to assure the reservation of an amount of the specified number of monetary units from the subscriber's account. An account debit operation that triggers the deduction the amount from the subscriber's account is carried out following the conclusion of session establishment.

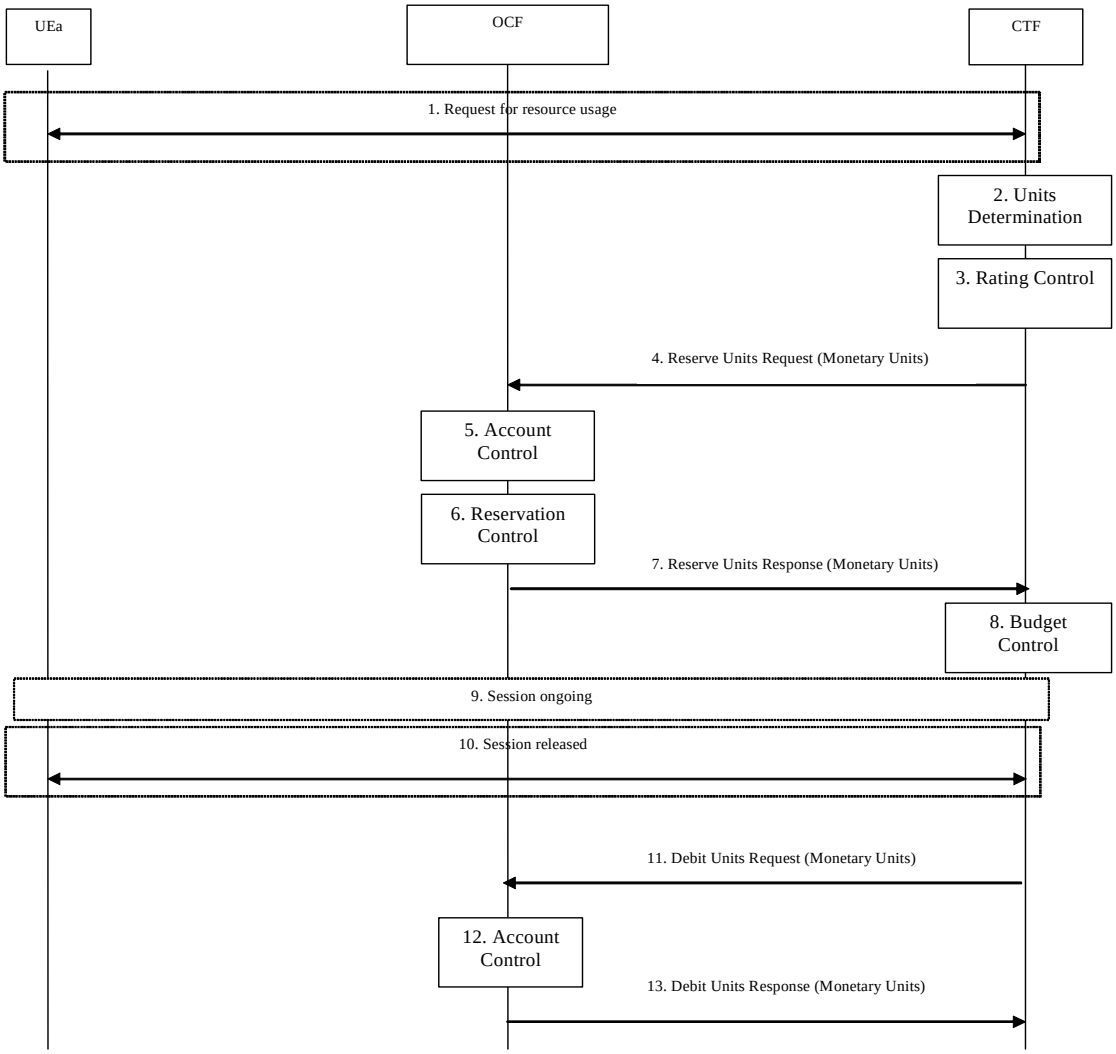


Figure 5.2.2.3.3: Session Charging with Reservation / Decentralized Unit Determination and Decentralized Rating

1. **Request for resource usage:** The UE-A requests the session establishment from the CTF.
2. **Units Determination:** depending on the requested type of the session by the UE-A, the CTF determines the number of units accordingly.
3. **Rating Control:** the CTF calculates the number of monetary units that represent the price for the number of units determined in item 2.
4. **Reserve Units Request:** the CTF requests the OCF to assure the reservation of an amount corresponding to the calculated number of monetary units from the subscriber's account.
5. **Account Control:** the OCF checks whether the user's account balance is sufficient for the requested reservation.
6. **Reservation Control:** if the user's credit balance is sufficient, then the corresponding reservation is made.
7. **Reserve Units Response:** the OCF informs the CTF of the reserved number of monetary units.
8. **Budget Control:** simultaneously with the ongoing session, the CTF monitors the consumption of the granted amount.
9. **Session ongoing:** the CTF maintains the session. One or more debit and reserve operations may be performed when the session is ongoing.

10. **Session Released:** the session is released.
11. **Debit Units Request:** the CTF requests the OCF to assure the deduction of an amount corresponding to the consumed number of monetary units from the subscriber's account.
12. **Account Control:** the OCF triggers the deduction of the consumed amount from the subscriber's account.
13. **Debit Units Response:** the OCF indicates to the CTF the number of deducted monetary units.

5.2.3 Basic Operations

On-line credit control uses two basic logical operations: Debit Units and Reserve Units.

- "*Debit Units Request*"; sent from CTF → OCF
  After receiving a service request from the subscriber, the CTF sends a *Debit Units Request* to the OCF. The CTF may either specify a service key (centralised unit determination) or the number of units requested (decentralised unit determination).
  For refund purpose, the CTF sends a *Debit Units Request* to the OCF as well.

- "*Debit Units Response*"; sent from OCF → CTF
  The OCF replies with a *Debit Units Response*, which informs the CTF of the number of units granted as a result of the *Debit Units Request*. This includes the case where the number of units granted indicates the permission to render the requested service.
  For refund purpose, the OCF replies with a *Debit Units Response*.

- "*Reserve Units Request*"; sent from CTF → OCF
  Request to reserve a number of units for the service to be provided by an CTF. In case of centralised unit determination, the CTF specifies a service key in the *Reserve Unit Request*, and the OCF determines the number of units requested. In case of decentralised unit determination, the number of units requested is specified by the CTF.

- "*Reserve Units Response*"; sent from OCF → CTF
  Response from the OCF which informs the CTF of the number of units that were reserved as a result of the "*Reserve Units Request*".

IEC uses the Direct Debiting One Time Event procedure specified in RFC 4006 and therefore is performed by the use of the logical "Debit Units" operation, as specified in section 6.3.3.

SCUR and ECUR use both the "Debit Units" and "Reserve Units" operations.

SCUR uses the Session Based Credit Control procedure specified in RFC 4006. In session charging with unit reservation, when the "Debit Units" and "Reserve Units" operations are both needed, they shall be combined in one message, as specified in section 6.3.5.

For SCUR and ECUR the consumed units are deducted from the subscriber's account after service delivery. Thus, the reserved and consumed units are not necessarily the same. Using this operation, it is also possible for the CTF to modify the current reservation, including the return of previously reserved units.

Table 5.2.3.1 and table 5.2.3.2 describe the content of these operations.

Table 5.2.3.1: Debit and Reserve Units Request Content

Debit and Reserve Units Request	Category	Description
Session Identifier	M	This field identifies the operation session.
Originator Host	M	This field contains the identification of the source point of the operation.
Originator Domain	M	This field contains the realm of the operation originator.
Destination Domain	M	This field contains the realm of the operation destination.
Operation Identifier	M	This field is a unique operation identifier.
Operation Token	M	This field contains the service identifier.
Operation Type	M	This field defines the transfer type: event for event based charging and start, interim, stop for session based charging.
Operation Number	M	This field contains the sequence number of the transferred messages.
Destination Host	O_C	This field contains the identification of the destination point of the operation.
User Name	O_C	This field contains the identification of the user.
Origination State	O_C	Tbd.
Origination Timestamp	O_C	This field contains the time when the operation is requested.
Subscriber Identifier	O_M	This field contains the identification of the mobile subscriber (i.e. MSISDN) that uses the requested service.
Termination Cause	O_C	This field contains the termination reason of the service.
Requested Action	O_C	This field contains the requested action.
Multiple Operation	O_M	This field indicate the occurrence of multiple operations.
Multiple Unit Operation	O_C	This field contains the parameter for the quota management.
Subscriber Equipment Number	O_C	This field contains the identification of the mobile device (i.e. IMEI) that uses the subscriber.
Proxy Information	O_C	This field contains the parameter of the proxy.
Route Information	O_C	This field contains the parameter of the route.
Service Information	O_M	This parameter holds the individual service specific parameters as defined in the corresponding 'middle tier' TS.

Table 5.2.3.2: Debit and Reserve Units Response Content

Debit and Reserve Units Response	Category	Description
Session Identifier	M	This field identifies the operation session.
Operation Result	M	This field identifies the result of the operation.
Originator Host	M	This field contains the identification of the source point of the operation.
Originator Domain	M	This field contains the realm of the operation originator.
Operation Identifier	M	This field is a unique operation identifier.
Operation Type	M	This field defines the transfer type: event for event based charging and start, interim, stop for session based charging.
Operation Number	M	This field contains the sequence number of the transferred messages.
Operation Failover	O_C	This field contains an indication to the CTF whether or not a failover handling is to be used when necessary.
Multiple Unit Operation	O_C	This field contains the parameter for the quota management.
Operation Failure Action	O_C	For credit control sessions the content of this field enables the credit-control client to decide what to do if sending credit-control messages to the credit-control server has been temporarily prevented.
Operation Event Failure Action	O_C	For one time event direct debiting the content of this field enables the credit-control client to decide what to do if sending credit-control messages to the credit-control server has been temporarily prevented.
Redirection Host	O_C	Tbd.
Redirection Host Usage	O_C	Tbd.
Redirection Cache Time	O_C	Tbd.
Proxy Information	O_C	This field contains the parameter of the proxy.
Route Information	O_C	This field contains the parameter of the route.
Failed parameter	O_C	This field contains missing and/or unsupported parameter that caused the failure.
Service Information	O_C	This parameter holds the individual service specific parameters as defined in the corresponding 'middle tier' TS.

5.3 Other requirements

5.3.1 Re-authorization

The server may specify an idle timeout associated with a granted quota. Alternatively, the client may have a configurable default value. The expiry of that timer shall trigger a re-authorization request.

Mid-session service events (re-authorisation triggers) may affect the rating of the current service usage. The server may instruct the credit control client to re-authorize the quota upon a number of different session related triggers that can affect the rating conditions.

When a re-authorization is trigger, the client shall reports quota usage. The reason for the quota being reported shall be notified to the server.

5.3.2 Threshold based re-authorization triggers

The server may optionally include an indication to the client of the remaining quota threshold that shall trigger a quota re-authorization.

5.3.3 Termination action

The server may specify to the client the behaviour on consumption of the final granted units, or zero units granted in the first place; this is known as termination action.

5.3.4 Account Expiration

The server may provide to the client the date and time of account expiration, which the client may use depending on operator policy.

6 3GPP Charging Applications – Protocol Aspects

6.1 Basic Principles for Diameter Offline Charging

In order to support the offline charging principles described in the present document, the Diameter client and server must implement at least the following Diameter options listed in RFC 3588 [401], i.e. the basic functionality of Diameter accounting, as defined by the Diameter Base Protocol (RFC 3588 [401]) is re-used..

The charging architecture implementing Diameter adheres to the structure where all communications for offline charging purposes between the CTF (Diameter client) and the CDF (Diameter server) are carried out on the Diameter Rf reference point, where the CTF reports charging information to the Charging Data Function (CDF). The CDF uses this information to construct and format CDRs. The above-mentioned reference points are defined in TS 32.240 [1].

A configurable timer is supported in the CDF to supervise the reception of the ACR [Interim] and/or ACR [Stop]. An instance of the "Timer" is started at the beginning of the accounting session, reset on the receipt of an ACR [Interim] and stopped at the reception of the ACR [Stop]. Upon expiration of the timer, the CDF stops the accounting session with the appropriate error indication.

For offline charging, the CTF implements the accounting state machine described in RFC 3588 [401]. The server (CDF) implements the accounting state machine "SERVER, STATELESS ACCOUNTING" as specified in RFC 3588 [401], i.e. there is no order in which the server expects to receive the accounting information.

The offline charging functionality is based on the network elements reporting accounting information upon reception of various messages which trigger charging generation, as most of the accounting relevant information is contained in these messages. This reporting is achieved by sending Diameter *Accounting Requests* (ACR) [Start, Interim, Stop and Event] from the network elements to the CDF.

Following the Diameter base protocol specification, the following "types" of accounting data may be sent with regard to offline charging:

- START session accounting data.
- INTERIM session accounting data.
- STOP session accounting data.
- EVENT accounting data.

Two cases are currently distinguished for offline charging purposes:

- Event based charging; and
- Session based charging.

ACR types START, INTERIM and STOP are used for accounting data related to successful sessions. In contrast, EVENT accounting data is unrelated to sessions, and is used e.g. for a simple registration or interrogation and successful service event triggered by a network element. In addition, EVENT accounting data is also used for unsuccessful session establishment attempts.

The flows and scenarios for the above two described cases are further detailed below.

6.1.1 Event based charging

In the case of event based charging, the network reports the usage or the service rendered where the service offering is rendered in a single operation. It is reported using the ACR EVENT.

The following figure shows the transactions that are required on the Diameter offline interface in order to perform event based charging. The operation may alternatively be carried out prior to, concurrently with or after service/content delivery.

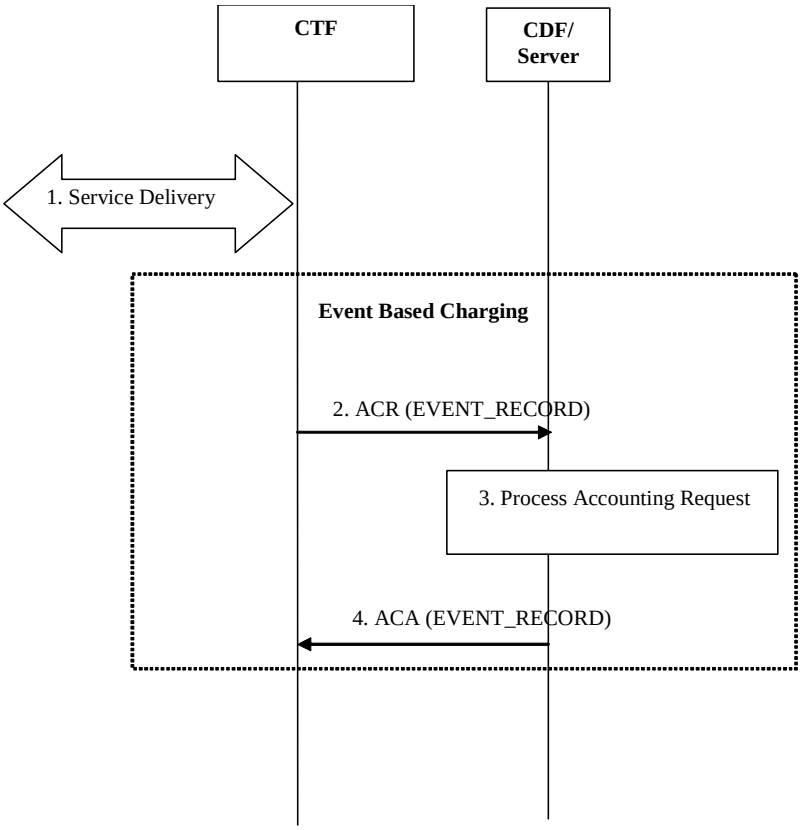


Figure 6.1.1: Event Based offline charging

Step 1: The network element receives indication that service has been used/delivered.

Step 2: The network element (acting as client) sends *Accounting-Request* (ACR) with *Accounting-Record-Type* AVP set to EVENT_RECORD to indicate service specific information to the CDF (acting as server).

Step 3: The CDF receives the relevant service charging parameters and processes accounting request.

Step 4: The CDF returns *Accounting-Answer* message with *Accounting-Record-Type* AVP set to EVENT_RECORD to the network element in order to inform that charging information was received.

6.1.2 Session based charging

Session based charging is the process of reporting usage reports for a session and uses the START, INTERIM & STOP accounting data. During a session, a network element may transmit multiple ACR Interims' depending on the proceeding of the session.

The following figure shows the transactions that are required on the Diameter offline interface in order to perform session based charging.

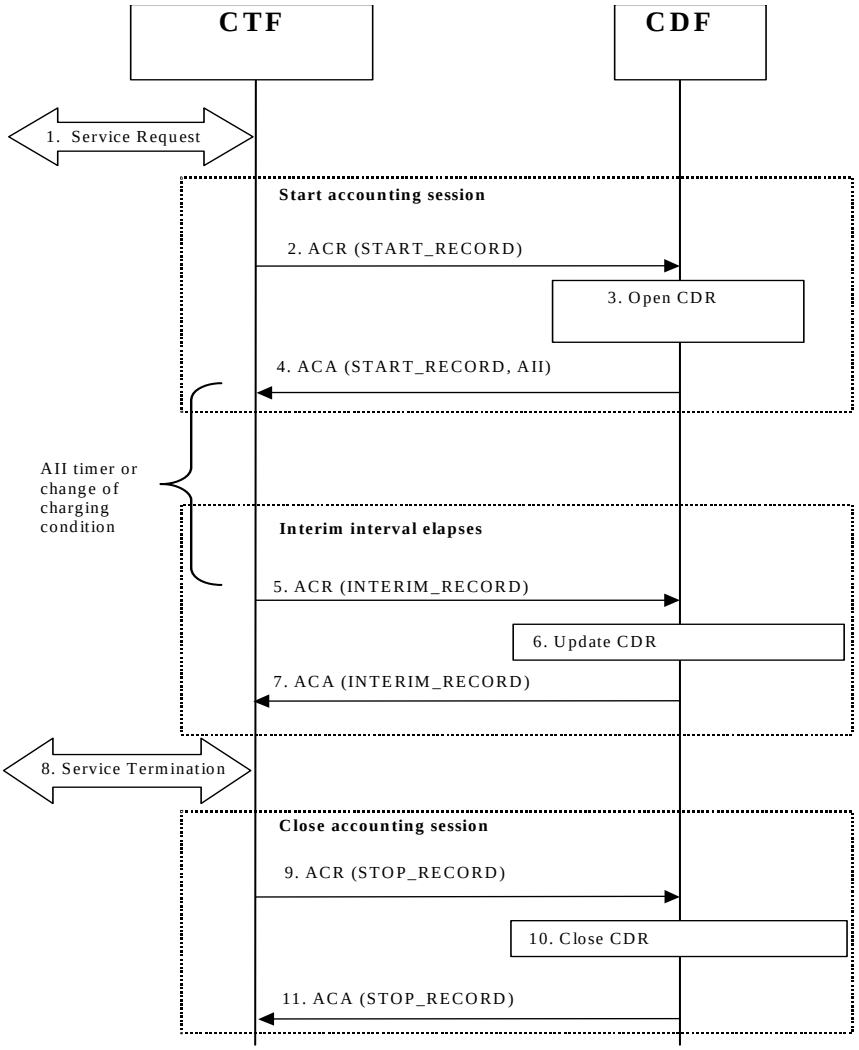


Figure 6.1.2: Session based offline charging

Step 1: The network element receives a service request. The service request may be initiated either by the user or the other network element.

Step 2: In order to start accounting session, the network element sends a *Accounting-Request* (ACR) with *Accounting-Record-Type* AVP set to START_RECORD to the CDF.

Step 3: The CDF opens a CDR for current session.

Step 4: The CDF returns *Accounting-Answer* (ACA) message with *Accounting-Record-Type* set to START_RECORD to the network element and possibly *Acct-Interim-Interval AVP* (AII) set to non-zero value indicating the desired intermediate charging interval.

Step 5: When either AII elapses or charging conditions changes are recognized at Network Element (NE), the NE sends an *Accounting-Request* (ACR) with *Accounting-Record-Type* AVP set to INTERIM_RECORD to the CDF.

Step 6: The CDF updates the CDR in question.

Step 7: The CDF returns *Accounting-Answer* (ACA) message with *Accounting-Record-Type* set to INTERIM_RECORD to the network element.

Step 8: The service is terminated.

Step 9: The network element sends a *Accounting-Request* (ACR) with *Accounting-Record-Type* AVP set to STOP_RECORD to the CDF.
Step 10: The CDF updates the CDR accordingly and closes the CDR.
Step 11: The CDF returns *Accounting-Answer* (ACA) message with *Accounting-Record-Type* set to STOP_RECORD to the network element.

6.1.3 Offline charging error cases - Diameter procedures

6.1.3.1 CDF Connection Failure

When the connection towards the primary CDF is broken, the process of sending accounting information should continue towards a secondary CDF (if such a CDF is configured). For further CDF connection failure functionality, see subclause "*Transport Failure Detection*" in the RFC 3588 [401].

If no CDF is reachable the network element may buffer the generated accounting data in non-volatile memory. Once the CDF connection is working again, all accounting messages stored in the buffer is sent to the CDF, in the order they were stored in the buffer.

6.1.3.2 No Reply from CDF

In case a network element does not receive an ACA in response to an ACR, it may retransmit the ACR message. The waiting time until a retransmission is sent, and the maximum number of repetitions are both configurable by the operator. When the maximum number of retransmissions is reached and still no ACA reply has been received, the network element executes the CDF connection failure procedure as specified above.

If retransmitted ACRs' are sent, they are marked with the T-flag as described in RFC 3588 [401], in order to allow duplicate detection in the CDF, as specified in the next subclause.

6.1.3.3 Duplicate Detection

A Diameter client marks possible duplicate request messages (e.g. retransmission due to the link fail over process) with the T-flag as described in RFC 3588 [401].

If the CDF receives a message that is marked as retransmitted and this message was already received, then it discards the duplicate message. However, if the original of the re-transmitted message was not yet received, it is the information in the marked message that is taken into account when generating the CDR. The CDRs are marked if information from duplicated message(s) is used.

6.1.3.4 CDF Detected Failure

The CDF closes a CDR when it detects that expected Diameter ACRs for a particular session have not been received for a period of time. The exact behaviour of the CDF is operator configurable.

6.2 Message Contents for Offline Charging

6.2.1 Summary of Offline Charging Message Formats

6.2.1.1 General

The corresponding Diameter accounting application messages for the Charging Data Transfer operation is Accounting Request (ACR) and Accounting Answer (ACA) as specified in the Diameter Base Protocol Accounting (DBPA) application in RFC 3588 [401].

The following table describes the use of these messages which are adapted for 3GPP offline charging.

Table 6.2.1.1: Offline Charging Messages Reference Table

Command-Name	Source	Destination	Abbreviation
Accounting-Request	CTF	CDF	ACR
Accounting-Answer	CDF	CTF	ACA
Capabilities-Exchange-Request	CTF	CDF	CER
Capabilities Exchange Answer	CDF	CTF	CEA

Additional Diameter messages (i.e. DPR/DPA, DWR/DWA)are used according to the Diameter Base Protocol Accounting (DBPA) specification in RFC 3588 [401].

6.2.1.2 Structure for the Accounting Message Formats

The following is the basic structure shared by all offline charging messages. This is based directly on the format of the messages defined in the Diameter Base Protocol Application specification in RFC 3588 [401].

Those Diameter Accounting AVPs that are used for 3GPP Offline Charging are marked in the table 6.2.2 and table 6.2.3 with a category as specified in TS 32.240 [1].

An AVP in grey strikethrough in the message format (in grey in the tables) is not used by 3GPP.

The following symbols are used in the message format definition:

- <AVP> indicates a mandatory AVP with a fixed position in the message.
- {AVP} indicates a mandatory AVP in the message.
- [AVP] indicates an optional AVP in the message.
- *AVP indicates that multiple occurrences of an AVP is possible.

6.2.2 Accounting-Request Message

The ACR messages, indicated by the Command-Code field set to 271 is sent by the CTF to the CDF in order to send charging information for the requested bearer / subsystem /service.

The ACR message format is defined according to the Diameter Base Protocol in RFC 3588 [401] as follows:

```
<ACR> ::= < Diameter Header: 271, REQ, PXY >

          < Session-Id >
          { Origin-Host }
          { Origin-Realm }
          { Destination-Realm }
          { Accounting-Record-Type }
          { Accounting-Record-Number }
          [ Acct-Application-Id ]
          [ Vendor-Specific-Application-Id ]
          [ User-Name ]
          [ Destination-Host ]
          [ Accounting-Sub-Session-Id ]
          [ Acct-Session-Id ]
          [ Acct-Multi-Session-Id ]
          [ Acct-Interim-Interval ]
          [ Accounting-Realtime-Required ]
          [ Origin-State-Id ]
          [ Event-Timestamp ]
        * [ Proxy-Info ]
        * [ Route-Record ]
          [ Service-Context-Id ]
          [ Service-Information ]
        * [ AVP ]
```

NOTE: Similar information as in subscription_id should be added as 3GPP parameter, IMEI.

Table 6.2.2 illustrates the basic structure of a 3GPP Diameter *Accounting-Request* message as used for 3GPP offline charging.

Table 6.2.2: 3GPP Accounting-Request Message Contents

AVP	Category	Description
Session-Id	M	This field identifies the operation session.
Origin-Host	M	This field contains the identification of the source point of the operation and the realm of the operation originator.
Origin-Realm	M	This field contains the realm of the operation originator.
Destination-Realm	M	This field contains the realm of the operator domain. The realm will be addressed with the domain address of the corresponding public URI.
Accounting-Record-Type	M	This field defines the transfer type: event for event based charging and start, interim, stop for session based charging.
Accounting-Record-Number	M	This field contains the sequence number of the transferred messages.
Acct-Application-Id	O_M	The field corresponds to the application ID of the Diameter Accounting Application and is defined with the value 3.
Vendor-Specific-Application-Id	-	Not used in 3GPP.
Vendor-Id	-	Not used in 3GPP.
Auth-Application-Id	-	Not used in 3GPP.
Acct-Application-Id	-	Not used in 3GPP.
User-Name	O_C	Contains the user name determined by the domain: bearer, sub-system or service as described in middle tier TS.
Destination-Host	O_C	This field contains the destination address of the CDF.
Accounting-Sub-Session-Id	-	Not used in 3GPP.
Accounting-Session-Id	-	Not used in 3GPP.
Acct-Multi-Session-Id	-	Not used in 3GPP.
Acct-Interim-Interval	O_C	
Accounting-Realtime-Required	-	Not used in 3GPP.
Origin-State-Id	O_C	This field contains the state associated to the CTF.
Event-Timestamp	O_C	This field corresponds to the exact time the accounting is requested.
Proxy-Info	O_C	This field contains information of the host.
Proxy-Host	M	This field contains the identity of the host that added the Proxy-Info field.
Proxy-State	M	This field contains state local information.
Route-Record	Oc	This field contains an identifier inserted by a relaying or proxying node to identify the node it received the message from.
Service-Context-Id	O_M	This field indicates the service and the corresponding 'middle tier' TS.
Service-Information	O_M	This parameter holds the individual service specific parameters as defined in the corresponding ‘middle tier’ TS.
AVP	Oc	

NOTE: A detailed description of the AVPs is provided in clause 7.

6.2.3 Accounting-Answer Message

The Accounting Answer (ACA) messages, indicated by the Command-Code field set to 271 is sent by the CDF to the CTF in order to reply to the ACR.

The ACA message format is defined according to the Diameter Base Protocol in RFC 3588 [401] as follows:

```
<ACA> ::= < Diameter Header: 271, PXY >

          < Session-Id >
          { Result-Code }
          { Origin-Host }
          { Origin-Realm }
          { Accounting-Record-Type }
          { Accounting-Record-Number }
          [ Acct-Application-Id ]
          [ Vendor-Specific-Application-Id ]
          [ User-Name ]
          [ Accounting-Sub-Session-Id ]
          [ Acct-Session-Id ]
          [ Acct-Multi-Session-Id ]
          [ Error-Reporting-Host ]
          [ Acct-Interim-Interval ]
          [ Accounting-Realtime-Required ]
          [ Origin-State-Id ]
          [ Event-Timestamp ]
        * [ Proxy-Info ]
        * [ AVP ]
```

Table 6.2.3 illustrates the basic structure of a 3GPP Diameter *Accounting-Answer* message as used for offline charging. This message is always used by the CDF as specified below, regardless of the CTF it is received from and the ACR record type that is being replied to.

Table 6.2.3: 3GPP Accounting-Answer (ACA) Message Content

AVP	Category	Description
Session-Id	M	This field identifies the operation session.
Result-Code	M	This field contains the result of the specific query.
Origin-Host	M	This field contains the identification of the source point of the operation and the realm of the operation originator.
Origin-Realm	M	This field contains the realm of the operation originator.
Accounting-Record-Type	M	This field defines the transfer type: event for event based charging and start, interim, stop for session based charging.
Accounting-Record-Number	M	This field contains the sequence number of the transferred messages.
Acct-Application-Id	O_M	The field corresponds to the application ID of the Diameter Accounting Application and is defined with the value 3.
Vendor-Specific-Application-Id	-	Not used in 3GPP
Vendor-Id	-	Not used in 3GPP
Auth-Application-Id	-	Not used in 3GPP
Acct-Application-Id	-	Not used in 3GPP
User-Name	O_C	Contains the user name determined by the domain: bearer, sub-system or service as described in middle tier TS.
Accounting-Sub-Session-Id	-	Not used in 3GPP
Accounting-RADIUS-Session-Id	-	Not used in 3GPP
Acct-Multi-Session-Id	-	Not used in 3GPP
Error-Reporting-Host	O_C	This field contains the identity of the Diameter host that sent the Result-Code AVP to a value other than 2001 (Success) if the host setting the Result-Code is different from the one encoded in the Origin-Host AVP.
Acct-Interim-Interval	O_C	
Accounting-Realtime-Required	-	Not used in 3GPP
Origin-State-Id	O_C	
Event-Timestamp	O_C	This field contains the time when the operation is requested.
Proxy-Info	O_C	This field contains information of the host.
Proxy-Host	M	This field contains the identity of the host that added the Proxy-Info field.
Proxy-State	M	This field contains state local information.
AVP	O_C	Not used in 3GPP

6.3 Basic Principles for Diameter Online charging

Editor's note: This clause has been added to update the document to the Rel-6 IETF dependency on the Diameter Credit Control Application and currently does not exist in the 3GPP Rel-5 3GPP TS 32.225 Page: 9
Here we have:- Basic principles
- List of mandatory Diameter Credit Control Application AVPs used for online charging,
- No 3GPP AVPs unless they MUST be used every and each domain
- Basic client - server signalling flow showing how CCR/CCA is used
- Signalling flows for and + other common methods
- (Maybe) Content of CCR/CCA in INITIAL/UPDATE/TERMINATE/EVENT cases

6.3.1 Online Specific Credit Control Application Requirements

For online charging, the basic functionality as defined by the IETF Diameter Credit Control application is used. The basic structure follows a mechanism where the online client (CTF) requests resource allocation and reports credit control information to the Online Charging System (OCS).

The usage and values of *Validity-Time* AVP and the timer "Tcc" are under the sole control of the credit control server (OCS) and determined by operator configuration of the OCS.

Editor's note: There may be a requirement to add a minimum value for the *Validity-Time* AVP. It may need to be moved the subsection where the *Validity-Time AVP* is handled.

The online client implements the state machine described in RFC 4006 [402] for "CLIENT, EVENT BASED" and/or "CLIENT, SESSION BASED". I.e. when the client applies IEC it uses the "CLIENT, EVENT BASED" state machine, and when the client applies ECUR defined in 3GPP it uses the "CLIENT, SESSION BASED" state machine for the first and final interrogations.

The OCS implements the state machine described in RFC 4006 [402] for the "SERVER, SESSION AND EVENT BASED" in order to support Immediate Event Charging and Event Charging with Unit Reservation.

6.3.2 Diameter Description on the Ro reference point

Editor's note: Message flows and scenarios should be moved into clause 5.

6.3.2.1 Basic Principles

For online charging the Diameter Credit Control Application (DCCA) defined in RFC 4006 [402] is used with additional AVPs defined in the present document.

Three cases for control of user credit for online charging are distinguished:

- Immediate Event Charging IEC; and
- Event Charging with Unit Reservation (ECUR).
- Session Charging with Unit Reservation (SCUR)

In the case of Immediate Event Charging (IEC),the credit control process for events is controlled by the corresponding *CC-Requested-Type* EVENT_REQUEST that is sent with Credit-*Control-Request (*CCR) for a given credit control event.

In the case of Event Charging with Unit Reservation (ECUR) the *CC-Request-Type* INITIAL / TERMINATION_REQUEST are used for charging for a given credit control event, however, where a reservation is made prior to service delivery and committed on execution of a successful delivery.

Session Charging with Unit Reservation is used for credit control of sessions and uses the *CC-Request-Type* INITIAL / UPDATE and TERMINATION_REQUEST.

The network element may apply IEC, where CCR Event messages are generated, or ECUR, using CCR Initial and Termination. The decision whether to apply IEC or ECUR is based on the service and/or operator's policy.

6.3.3 Immediate Event Charging (IEC)

Figure 6.3.3 shows the transactions that are required on the Ro reference point in order to perform event based Direct Debiting operation. The Direct Debiting operation may alternatively be carried out prior to service/content delivery. The Network Element must ensure that the requested service execution is successful, when this scenario is used.

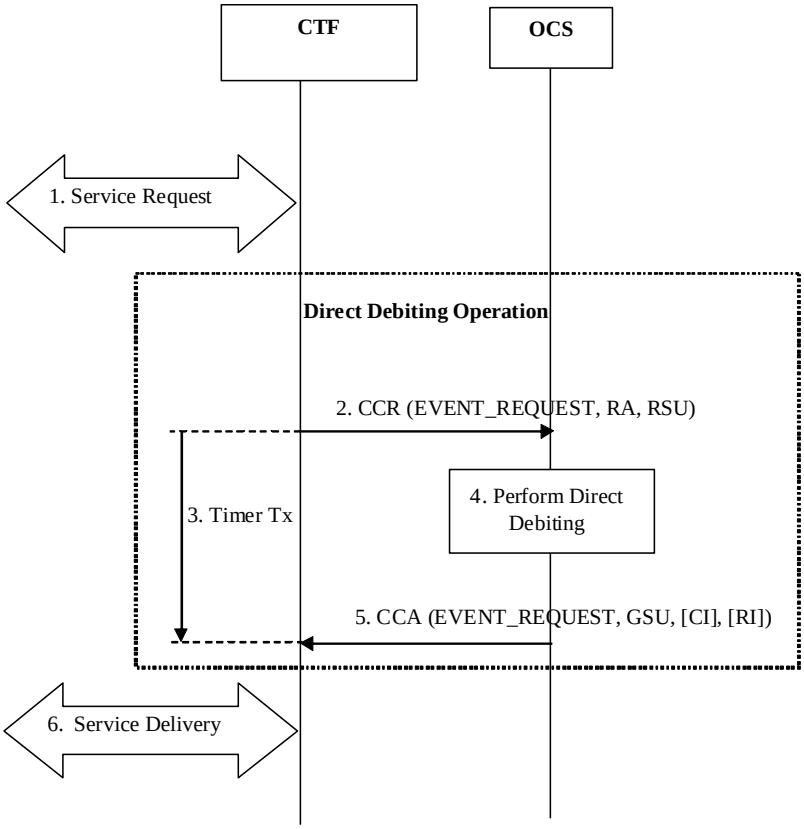


Figure 6.3.3: IEC Direct Debiting Operation

Step 1. The network element receives a service request.
The Direct Debiting Operation is performed as described in RFC 4006 [402].

Step 2. The network element performs direct debiting prior to service execution. Network element (acting as DCCA client) sends *Credit-Control-Request* (CCR) with *CC-Request-Type* AVP set to EVENT_REQUEST to indicate service specific information to the OCS (acting as DCCA server). The *Requested-Action* AVP (RA) is set to DIRECT_DEBITING. If known, the network element may include *Requested-Service-Unit* AVP (RSU) (monetary or non-monetary units) in the request message.

Step 3. Having transmitted the *Credit-Control-Request* message the network element starts the communication supervision timer 'Tx' (RFC 4006 [402]). Upon receipt of the *Credit-Control-Answer* (CCA) message the network element shall stop timer Tx.

Step 4. The OCS determines the relevant service charging parameters .

Step 5. The OCS returns *Credit-Control-Answer* message with *CC-Request-Type* AVP set to EVENT_REQUEST to the network element in order to authorize the service execution (*Granted-Service-Unit* AVP (GSU) and possibly *Cost-Information* AVP (CI) indicating the cost of the service and *Remaining-Balance* AVP are included in the *Credit-Control-Answer* message). The *Credit-Control-Answer* message has to be checked by the network element accordingly and the requested service is controlled concurrently with service delivery. The *Refund-Information* AVP may be included in the *Credit-Control-Answer* message in order to be sent during the REFUND-ACCOUNT mechanism, see below scenario.

Step 6. Service is being delivered.

NOTE: It is possible to perform also, CHECK_BALANCE and PRICE_ENQUIRY using above described mechanism RFC 4006 [402].

Figure 6.3.3a shows the transactions for refund purpose.

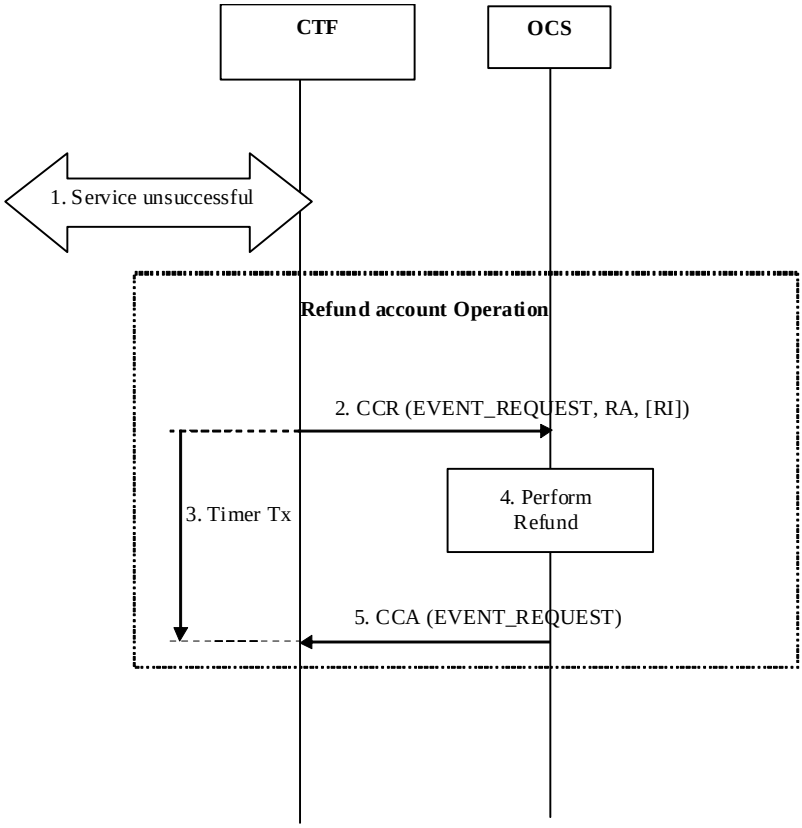


Figure 6.3.3a: IEC Direct Debiting Operation for refund purpose

The Direct debiting operation is performed, previously, as described in RFC 4006 [402].

Step 1. The service charged previously through Direct Debiting Operation is finally proved to be unsuccessfully delivered.

Step 2. As a consequence, the network element performs direct debiting operation in order to perform the related refund. Network element (acting as DCCA client) sends *Credit-Control-Request* (CCR) with *CC-Request-Type* AVP set to EVENT_REQUEST to indicate service specific information to the OCS (acting as DCCA server). The *Requested-Action* AVP (RA) is set to REFUND-ACCOUNT. The network element includes *Refund-Information AVP* if received in the previous IEC CCA.

Step 3. Having transmitted the *Credit-Control-Request* message the network element starts the communication supervision timer 'Tx' (RFC 4006 [402]). Upon receipt of the *Credit-Control-Answer* (CCA) message the network element shall stop timer Tx.

Step 4. The OCS reads the AVPs included in the CCR and performs the refund accordingly.

Step 5. The OCS returns *Credit-Control-Answer* message with *CC-Request-Type* AVP set to EVENT_REQUEST and the related result code.

6.3.4 Event Charging with Unit Reservation (ECUR)

Figure 6.3.4 shows the transactions that are required on the Ro reference point in order to perform the ECUR. ECUR is used when event charging needs separate reserve and commit actions.

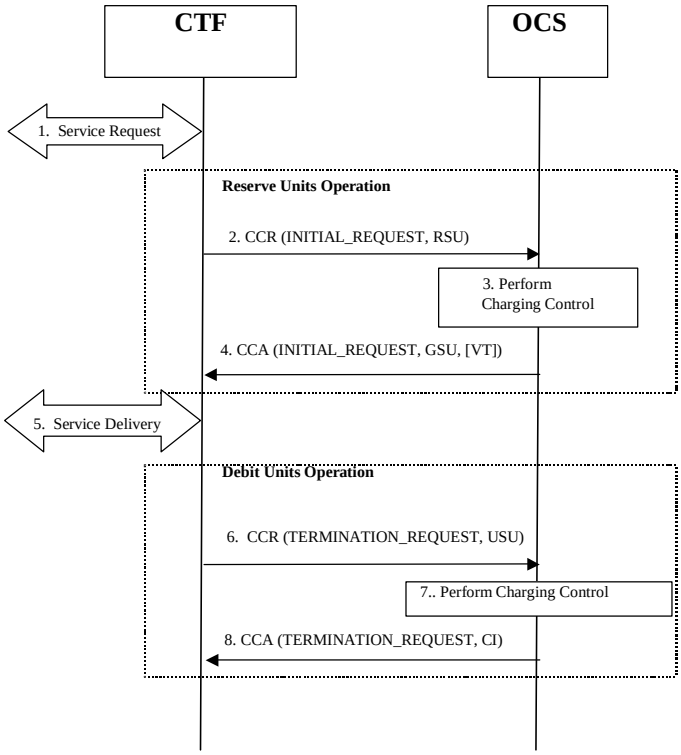


Figure 6.3.4: ECUR for session based credit control

Step 1. The network element receives a service request. The service request may be initiated either by the user or the other network element.

Step 2. In order to perform Reserve Units operation for a number of units (monetary or non-monetary units), the network element sends a *Credit-Control-Request* (CCR) with *CC-Request-Type* AVP set to INITIAL_REQUEST to the OCS. If known, the network element may include *Requested-Service-Unit* (RSU) AVP (monetary or non monetary units) in the request message.

Step 3. If the service cost information is not received by the OCS, the OCS determines the price of the desired service according to the service specific information received by issuing a rating request to the Rating Function. If the cost of the service is included in the request, the OCS directly reserves the specified monetary amount. If the credit balance is sufficient, the OCS reserves the corresponding amount from the users account.

Step 4. Once the reservation has been made, the OCS returns *Credit-Control-Answer* (CCA) message with *CC-Request-Type* set to INITIAL_REQUEST to the network element in order to authorize the service execution (*Granted-Service-Unit* and possibly *Cost-Information* indicating the cost of the service and *Remaining-Balance* AVP are included in the *Credit-Control-Answer* message). The OCS may return the *Validity-Time* (VT) AVP with value field set to a non-zero value. The OCS may indicate in the *Low-Balance-Indication* AVP that the subscriber account balance has fallen below a predefined treshold of this account.

Step 5. Content/service delivery starts and the reserved units are concurrently controlled.

Step 6. When content/service delivery is completed, the network element sends CCR with *CC-Request-Type* AVP set to TERMINATION_REQUEST to terminate the active credit control session and report the used units.

Step 7. The OCS deducts the amount used from the account. Unused reserved units are released, if applicable.

Step 8. The OCS acknowledges the reception of the CCR message by sending CCA message with *CC-Request-Type* AVP indicating TERMINATION_REQUEST (possibly *Cost-Information* AVP indicating the cumulative cost of the service and *Remaining-Balance* AVP are included in the *Credit-Control-Answer* message).

NOTE: This scenario is supervised by corresponding timers (e.g. validity time timer) that are not shown in the figure 6.3.4.

6.3.5 Session Charging with Unit Reservation (SCUR)

Figure 6.3.5 shows the transactions that are required on the Ro reference point in order to perform the SCUR.

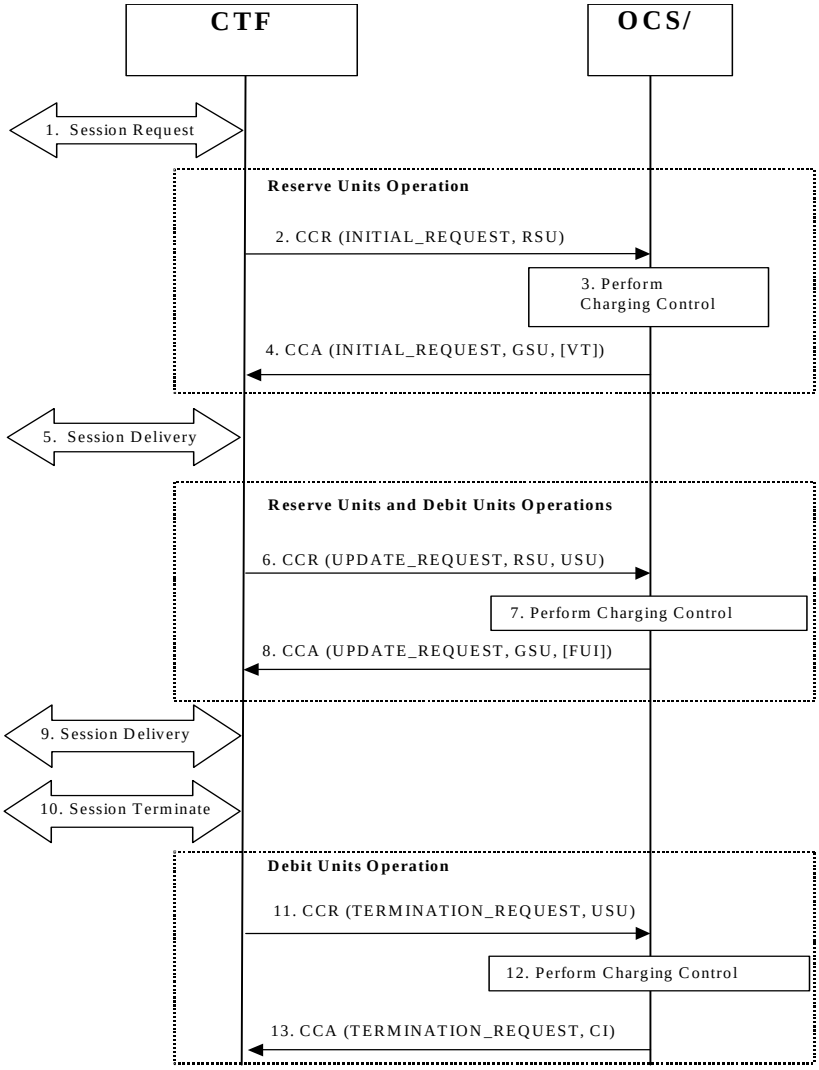


Figure 6.3.5: SCUR for session based credit control

Step 1. The network element receives a session initiation. The session initiation may be done either by the user or the other network element.

Step 2. In order to perform Reserve Units operation for a number of units (monetary or non-monetary units), the network element sends a *Credit-Control-Request* (CCR) with *CC-Request-Type* AVP set to INITIAL_REQUEST to the OCS. If known, the network element may include *Requested-Service-Unit* (RSU) AVP (monetary or non monetary units) in the request message.

Step 3. If the service cost information is not received by the OCS, the OCS determines the price of the desired service according to the service specific information received by issuing a rating request to the Rating Function. If the cost of the service is included in the request, the OCS directly reserves the specified monetary amount. If the credit balance is sufficient, the OCS reserves the corresponding amount from the users account.

Step 4. Once the reservation has been made, the OCS returns *Credit-Control-Answer* (CCA) message with *CC-Request-Type* set to INITIAL_REQUEST to the network element in order to authorize the service execution (*Granted-Service-Unit* and possibly *Cost-Information* indicating the cost of the service and *Remaining-Balance* AVP are included in the *Credit-Control-Answer* message). The OCS may return the *Validity-Time* (VT) AVP with value field set to a non-zero value. The OCS may indicate in the *Low-Balance-Indication* AVP that the subscriber account balance has fallen below a predefined threshold of this account.

Step 5. Content/service delivery starts and the reserved units are concurrently controlled.

Step 6. During session delivery, in order to perform Debit Units and subsequent Reserve Units operations, the network element sends a CCR with *CC-Request-Type* AVP set to UPDATE_REQUEST, to report the units used and request additional units, respectively. The CCR message with *CC-Request-Type* AVP set to UPDATE_REQUEST must be sent by the network element between the INITIAL_REQUEST and TERMINATION_REQUEST either on request of the credit control application within the validity time or if the validity time is elapsed. If known, the network element may include *Requested-Service-Unit* AVP (monetary or non monetary units) in the request message. The *Used-Service-Unit* (USU) AVP is complemented in the CCR message to deduct units from both the user's account and the reserved units, respectively.

Step 7. The OCS deducts the amount used from the account. If the service cost information is not received by the OCS, the OCS determines the price of the desired service according to the service specific information received by issuing a rating request to the Rating Function. If the cost of the service is included in the request, the OCS directly reserves the specified monetary amount. If the credit balance is sufficient, the OCS reserves the corresponding amount from the users account.

Step 8. Once the deduction and reservation have been made, the OCS returns *Credit-Control-Answer* message with *CC-Request-Type* set to UPDATE_REQUEST to the network element, in order to allow the content/service delivery to continue (new *Granted-Service-Unit (GSU) AVP* and possibly *Cost-Information (CI) AVP* indicating the cumulative cost of the service and *Remaining-Balance* AVP are included in the *Credit-Control-Answer* message). The OCS may include in the CCA message the *Final-Unit-Indication* (FUI) AVP to indicate the final granted units. The OCS may indicate in the *Low-Balance-Indication* AVP that the subscriber account balance has fallen below a predefined threshold of this account.

Step 9. Session delivery continues and the reserved units are concurrently controlled.

Step 10. The session is terminated at the network element.

Step 11. The network element sends CCR with *CC-Request-Type* AVP set to TERMINATION_REQUEST to terminate the active credit control session and report the used units.

Step 12. The OCS deducts the amount used from the account. Unused reserved units are released, if applicable.

Step 13. The OCS acknowledges the reception of the CCR message by sending CCA message with *CC-Request-Type* AVP indicating TERMINATION_REQUEST (possibly *Cost-Information* AVP indicating the cumulative cost of the service and *Remaining-Balance* AVP are included in the *Credit-Control-Answer* message).

NOTE: This scenario is supervised by corresponding timers (e.g. validity time timer) that are not shown in figure 6.3.5.

6.3.6 Error Cases and Scenarios

This subclause describes various error cases and how these should be handled.

The failure handling behaviour is locally configurable in the network element. If the *Direct-Debiting-Failure-Handling* or *Credit-Control-Failure-Handling* AVP is not used, the locally configured values are used instead.

6.3.6.1 Duplicate Detection

The detection of duplicate request is needed and must be enabled. To speed up and simplify as much as possible the duplicate detection, the all-against-all record checking should be avoided and just those records marked as potential duplicates need to be checked against other received requests (in real-time) by the receiver entity.

The network element marks the request messages that are retransmitted after a link fail over as possible duplicates with the T-flag as described in RFC 3588 [401]. For optimized performance, uniqueness checking against other received requests is only necessary for those records marked with the T-flag received within a reasonable time window. This focused check is based on the inspection of the *Session-Id* and *CC-Request-Number* AVP pairs.

Note that for EBCC the duplicate detection is performed in the Correlation Function that is part of the OCS. The OCS that receives the possible duplicate request should mark as possible duplicate the corresponding request that is sent over the 'Rc' reference point. However, this assumption above is for further study and needs to be clarified.

For credit control duplicate detection, please refer to the Diameter Credit Control.

6.3.6.2 Reserve Units and Debit Units Operation Failure

In the case of an OCS connection failure, and/or receiving error responses from the OCS, please refer to RFC 3588 [401] and RFC 4006 [402] for failure handling descriptions.

6.3.7 Support of Tariff Changes during an Active User Session

6.3.7.1 Support of Tariff Changes using the Tariff Switch Mechanism

After a tariff switch has been reached, all the active user sessions shall report their session usage by the end of the validity period of the current request and receive new quota for resource usage for the new tariff period.

In order to avoid the need for mass simultaneous quota refresh, the traffic usage can be split into resource usage before a tariff switch and resources used after a tariff switch.

The Tariff-Time-Change AVP is used to determine the tariff switch time as described by RFC 4006 [402]. In addition to the scenarios described in RFC 4006 [402], the Tariff-Time-Change AVP may also be used in the context of continuously time-based charging.

The Tariff-Change-Usage AVP is used within the Used-Service-Units AVP to distinguish reported usage before and after the tariff time change.

The Tariff-Change-Usage AVP is not used directly within the Multiple-Services-Credit-Control AVP.

6.3.7.2 Support of Tariff Changes using Validity Time AVP

Changes to the tariffs pertaining to the service during active user sessions may also be handled using the Validity Time AVP.

NOTE: RFC 4006 does not directly describe how tariff changes are handled with validity time. If validity time is used for tariff time changes it might overload the client and the server.

6.3.8 Support of Re-authorisation

Mid Diameter CC session re-authorisations of multiple active resource quotas within a DCC session can be achieved using a single Diameter *Credit Control Request/Answer* message sequence.

The OCS may also re-authorise multiple active resource quotas within a DCC session by using a single Diameter *Re-Auth-Request/Answer* message sequence.

New quota allocations received by the Network Element override any remaining held quota resources after accounting for any resource usage while the re-authorisation was in progress.

6.3.9 Support of Failure Handling

The Credit-Control-Failure-Handling AVP as defined in RFC 4006 [402] determines what to do if the sending of Diameter credit-control messages to the OCS has been temporarily prevented. The usage of Credit-Control-Failure-Handling AVP gives flexibility to have different failure handling for credit-control session.

This AVP may be received from the OCS or may be locally configured. The value received from the OCS in the Diameter Credit-Control-Answer message always override any already existing value.

As defined in RFC 4006 [402], the Tx timer is introduced to limit the waiting time in the CTF for an answer to the credit control request sent to the OCS. When the Tx timer elapses the CTF takes an action to the end user according to the value of the Credit-Control-Failure-Handling AVP.

It is possible that several concurrent Credit Control Request messages are triggered for the same online charging session. In this case, each Credit Control Request message shall reset the Tx timer as defined in RFC 4006 [402].

6.3.10 Support of Failover

As defined in RFC 4006 [402] if a failure occurs during an ongoing credit-control session, the CTF may move the credit control message stream to an alternative OCS if the primary OCS indicated FAILOVER_SUPPORTED in the CC-Session-Failover AVP. In case CC-Session-Failover AVP is set to FAILOVER_NOT SUPPORTED the credit control message stream is not moved to a backup OCS.

For new credit control sessions, failover to an alternative OCS should be performed if possible. For instance, if an implementation of the CTF can determine primary OCS unavailability it can establish the new credit control sessions with a possibly available secondary OCS.

Since the OCS has to maintain session states, moving the credit-control message stream to a backup OCS requires a complex charging context transfer solution. This charging context transfer mechanism by OCS is out of the scope of the 3GPP standardization work.

6.3.11 Credit Pooling

Credit pooling shall be supported as described in TS 32.240 [1].

Note: Credit pooling is not applicable to IEC since there is no quota management between CTF and OCF.

6.4 Message formats for Online Charging

6.4.1 Summary of Online Charging Message Formats

6.4.1.1 General

The corresponding Diameter credit control application messages for the Debit / Reserve Unit Request operation is Credit-Control-Request (CCR) and for the Debit / Reserve Unit Response operation is Credit-Control-Answer (CCA) as specified in RFC 4006 [402].

The Diameter Credit-Control Application (DCCA) specifies an approach based on a series of "interrogations":

- Initial interrogation.
- Zero, one or more interim interrogations.
- Final interrogation.

In addition to a series of interrogations, also a one time event (interrogation) can be used e.g. in the case when service execution is always successful.

All of these interrogations use Credit-*Control-Request* and *Credit-Control-Answer* messages. The *Credit-Control-Request* for the "interim interrogation" and "final interrogation" reports the actual number of "units" that were used, from what was previously reserved. This determines the actual amount debited from the subscriber's account.

Table 6.4.1.1 describes the use of these Diameter messages which are adapted for 3GPP online charging.

Table 6.4.1.1: Online Charging Messages Reference Table

Command-Name	Source	Destination	Abbreviation
Credit-Control-Request	CTF	OCS	CCR
Credit-Control-Answer	OCS	CTF	CCA
Capabilities-Exchange-Request	CTF	OCS	CER
Capabilities Exchange Answer	OCS	CTF	CEA

Additional Diameter messages (i.e. ASR/ASA, DPR/DPA, DWR/DWA, RAR/RAA) are used according to the Diameter Base Protocol Accounting (DBPA) specification in RFC 3588 [401] and to the DCCA specification in RFC 4006 [402].

6.4.1.2 Structure for the Credit Control Message Formats

The following is the basic structure shared by all online charging messages. This is based directly on the format of the messages defined in RFC 4006 [402].

Those Diameter Accounting AVPs that are used for 3GPP online charging are marked in the table of contents 6.4.2 and 6.4.3 with a category as specified in TS 32.240 [1].

In the definition of the Diameter Commands, the AVPs that are specified in the referenced specifications but not used by the 3GPP charging specifications are marked with strikethrough, e.g. ~~[Acct-Multi-Session-Id]~~.

The following symbols are used in the message format definitions:

- <AVP> indicates a mandatory AVP with a fixed position in the message.
- {AVP} indicates a mandatory AVP in the message.
- [AVP] indicates an optional AVP in the message.
- *AVP indicates that multiple occurrences of an AVP is possible.

6.4.2 Credit-Control-Request Message

The CCR messages, indicated by the Command-Code field set to 272 is sent by the CTF to the OCF in order to request credits for the request bearer / subsystem /service.

The CCR message format is defined according to RFC 4006 [402] as follows:

```
<CCR> ::= < Diameter Header: 272, REQ, PXY >

          < Session-Id >
          { Origin-Host }
          { Origin-Realm }
          { Destination-Realm }
          { Auth-Application-Id }
          { Service-Context-Id }
          { CC-Request-Type }
          { CC-Request-Number }
          [ Destination-Host ]
          [ User-Name ]
          [ CC-Sub-Session-Id ]
          [ Acct-Multi-Session-Id ]
          [ Origin-State-Id ]
          [ Event-Timestamp ]
         *[ Subscription-Id ]
          [ Service-Identifier ]
          [ Termination-Cause ]
          [ Requested-Service-Unit ]
          [ Requested-Action ]
         *[ Used-Service-Unit ]
          [ AoC-Request-Type ]
          [ Multiple-Services-Indicator ]
         *[ Multiple-Services-Credit-Control ]
         *[ Service-Parameter-Info ]
          [ CC-Correlation-Id ]
          [ User-Equipment-Info ]
         *[ Proxy-Info ]
         *[ Route-Record ]
          [ Service-Information ]
         *[ AVP ]
```

Table 6.4.2 illustrates the basic structure of a 3GPP Diameter Credit Control *Credit-Control-Request* message as used for Online Charging.

Table 6.4.2: 3GPP Credit-Control-Request Message Content

AVP	Category	Description
Session-Id	M	This field identifies the operation session.
Origin-Host	M	This field contains the identification of the source point of the operation and the realm of the operation originator.
Origin-Realm	M	This field contains the realm of the operation originator.
Destination-Realm	M	This field contains the realm of the operator domain. The realm will be addressed with the domain address of the corresponding public URI.
Auth-Application-Id	M	The field corresponds to the application ID of the Diameter Credit Control Application and is defined with the value 4.
Service-Context-Id	M	This field indicates the supported protocol version.
CC-Request-Type	M	This field defines the transfer type: event for event based charging and initial, update, terminate for session based charging.
CC-Request-Number	M	This field contains the sequence number of the transferred messages.
Destination-Host	O_C	This field contains the destination peer address of the OCS identity.
User-Name	O_C	Contains the user name determined by the domain: bearer, sub-system or service as described in middle tier TS.
CC-Sub-Session-Id	-	Not used in 3GPP.
Acct-Multi-Session-Id	-	Not used in 3GPP.
Origin-State-Id	O_C	This field contains the state associated to the CTF.
Event-Timestamp	O_C	This field corresponds to the exact time the quota is requested.
Subscription-Id	O_M	This field contains the identification of the user that is going to access the service in order to be identified by the OCS.
Subscription-Id-Type	M	This field determines the type of the identifier, e.g. t value 0 is used for the international E.164 format according to ITU-T E.164 numbering plan.
Subscription-Id-Data	M	This field contains the user data content e.g. the MSISDN.
Service-Identifier	-	Not used in 3GPP.
Termination-Cause	O_C	This field contains the reason the credit control session was terminated.
Requested-Service-Unit	-	Not used in 3GPP, see Multiple-Services-Credit-Control.
CC-Time	-	Not used in 3GPP.
CC-Money	-	Not used in 3GPP.
Unit-Value	-	Not used in 3GPP.
Value-Digits	-	Not used in 3GPP.
Exponent	-	Not used in 3GPP.
Currency-Code	-	Not used in 3GPP.
CC-Total-Octets	-	Not used in 3GPP.
CC-Input-Octets	-	Not used in 3GPP.
CC-Output-Octets	-	Not used in 3GPP.
CC-Service-Specific-Units	-	Not used in 3GPP.
AVP	-	Not used in 3GPP.
Requested-Action	O_C	The field defines the type of action if the CC-Request-Type indicates EVENT.
AoC-Request-Type	Oc	This field denotes if AoC Information is requested and what type of information is needed.
Used-Service-Unit	-	Not used in 3GPP, see Multiple-Services-Credit-Control.
Tariff-Change-Usage	-	Not used in 3GPP.
CC-Time	-	Not used in 3GPP.
CC-Money	-	Not used in 3GPP.
Unit-Value	-	Not used in 3GPP.
Value-Digits	-	Not used in 3GPP.
Exponent	-	Not used in 3GPP.
Currency-Code	-	Not used in 3GPP.
CC-Total-Octets	-	Not used in 3GPP.
CC-Input-Octets	-	Not used in 3GPP.
CC-Output-Octets	-	Not used in 3GPP.
CC-Service-Specific-Units	-	Not used in 3GPP.
AVP	-	Not used in 3GPP.
Multiple-Services-Indicator	O_M	This field indicates whether the CTF is capable of handling multiple services independently.

Multiple-Services-Credit Control	O_C	This field contains all parameters for the CTF quota management and defines the quotas to allow traffic to flow.
Granted-Service-Unit	-	Not used in CCR.
Tariff-Change-Usage	-	Not used in CCR.
CC-Time	-	Not used in CCR.
CC-Money	-	Not used in CCR.
Unit-Value	-	Not used in CCR.
Value-Digits	-	Not used in CCR.
Exponent	-	Not used in CCR.
Currency-Code	-	Not used in CCR.
CC-Total-Octets	-	Not used in CCR.
CC-Input-Octets	-	Not used in CCR.
CC-Output-Octets	-	Not used in CCR.
CC-Service-Specific-Units	-	Not used in CCR.
AVP	-	Not used in 3GPP.
Requested-Service-Unit	O_C	This field contains the amount of requested service units for a particular category or an indication that units are needed for a particular category, as defined in DCCA [402].
CC-Time	O_C	This field contains the amount of requested time.
CC-Money	-	Not used in 3GPP.
Unit-Value	-	Not used in 3GPP.
Value-Digits	-	Not used in 3GPP.
Exponent	-	Not used in 3GPP.
Currency-Code	-	Not used in 3GPP.
CC-Total-Octets	O_C	This field contains the requested amount of octets to be sent and received.
CC-Input-Octets	O_C	This field contains the requested amount of octets to be received.
CC-Output-Octets	O_C	This field contains the requested amount of octets to be sent.
CC-Service-Specific-Units	O_C	This field contains the requested amount of service specific units, e.g. number of events.
AVP	-	Not used in 3GPP.
Used-Service-Unit	O_C	This field contains the amount of used non-monetary service units measured for a particular category to a particular quota type.
Reporting-Reason	O_C	Used as defined in clause 7.2.
Tariff-Change-Usage	O_C	This field identifies the reporting period for the used service unit, i.e. before, after or during tariff change.
CC-Time	O_C	This field contains the amount of used time.
CC-Money	-	Not used in 3GPP.
Unit-Value	-	Not used in 3GPP.
Value-Digits	-	Not used in 3GPP.
Exponent	-	Not used in 3GPP.
Currency-Code	-	Not used in 3GPP.
CC-Total-Octets	O_C	This field contains the amount of sent and received octets.
CC-Input-Octets	O_C	This field contains the amount of received octets.
CC-Output-Octets	O_C	This field contains the amount of sent octets.
CC-Service-Specific-Units	O_C	This field contains the amount of service specific units, e.g. number of events.
Event-Charging-TimeStamp	Oc	Used as defined in clause 7.2.
AVP	-	Not used in 3GPP.
Tariff-Change-Usage	-	Not used in 3GPP.
Service-Identifier	O_C	This field contains identity of the used service. This ID with the Service-Context-ID together forms an unique identification of the service.
Rating-Group	O_C	This field contains the identifier of a rating group.
G-S-U-Pool-Reference	-	Not used in CCR.
G-S-U-Pool-Identifier	-	Not used in CCR.
CC-Unit-Type	-	Not used in CCR.
Unit-Value	-	Not used in CCR.
Value-Digits	-	Not used in CCR.
Exponent	-	Not used in CCR.
Validity-Time	-	Not used in CCR.
Result-Code	-	Not used in CCR.
Final-Unit-Indication	-	Not used in CCR.
Final-Unit-Action	-	Not used in CCR.
Restriction-Filter-Rule	-	Not used in CCR.
Filter-Id	-	Not used in CCR.

Redirect-Server	-	Not used in CCR.
Redirect-Address-Type	-	Not used in CCR.
Redirect-Server-Address	-	Not used in CCR.
Time-Quota-Threshold	-	Not used in CCR.
Volume-Quota-Threshold	-	Not used in CCR.
Quota-Holding-Time	-	Not used in CCR.
Quota-Consumption-Time	-	Not used in CCR.
Reporting-Reason	O_C	Used as defined in clause 7.2.
Trigger	O_C	Used as defined in clause 7.2.
Trigger-Type	O_C	Used as defined in clause 7.2.
Refund-Information	O_C	Used as defined in clause 7.2.
Envelope	O_C	Used as defined in clause 7.2.
Envelope-Start-Time	M	Used as defined in clause 7.2.
Envelope-End-Time	O_C	Used as defined in clause 7.2.
CC-Total-Octets	O_C	Used as defined in clause 7.2.
CC-Input-Octets	O_C	Used as defined in clause 7.2.
CC-Output-Octets	O_C	Used as defined in clause 7.2.
CC-Service-Specific-Units	O_C	Used as defined in clause 7.2
AVP	O_C	
AF-Correlation-Information	O_C	Used as defined in clause 7.2.
Service-Specific-Info	O_C	Used as defined in clause 7.2.
Service-Specific-Type	O_C	Used as defined in clause 7.2.
Service-Specific-Data	O_C	Used as defined in clause 7.2.
QoS-Information	O_C	This field contains authorized QoS applicable for service data flow, which initially triggers the activation of this MSCC instance. Included in first quota request to rating group if service data flow specific QoS control is in use, see TS 29.212 [215] for more information. For IP-CAN bearer specific Rating Group/Service Identifier this field is not included.
QoS-Class-Identifier	M	See TS 29.212 [215] for more information.
Max-Requested-Bandwidth-UL	O_C	See TS 29.212 [215] for more information.
Max-Requested-Bandwidth-DL	O_C	See TS 29.212 [215] for more information.
Guaranteed-Bitrate-UL	O_C	See TS 29.212 [215] for more information.
Guaranteed-Bitrate-DL	O_C	See TS 29.212 [215] for more information.
Bearer-Identifier	O_C	See TS 29.212 [215] for more information.
Allocation-Retention-Priority	O_C	See TS 29.212 [215] for more information.
Priority-Level	O_C	See TS 29.212 [215] for more information.
Pre-emption-Capability	O_C	See TS 29.212 [215] for more information.
Pre-emption-Vulnerability	O_C	See TS 29.212 [215] for more information.
APN-Aggregate-Max-Bitrate-UL	O_C	See TS 29.212 [215] for more information.
APN-Aggregate-Max-Bitrate-DL	O_C	See TS 29.212 [215] for more information.
AVP	-	Not used in 3GPP.
Service-Parameter-Info	-	Not used in 3GPP.
Service-Parameter-Type	-	Not used in 3GPP.
Service-Parameter-Value	-	Not used in 3GPP.
CC-Correlation-Id	O_C	This field contains information to correlate credit-control requests generated for different components of the service, e.g., transport and service level.
User-Equipment-Info	O_C	This field contains the identification of the identity and terminal capability the subscriber is using for the connection to mobile network if available.
User-Equipment-Info-Type	M	This field determines the type of the identifier. The used value is 0 for the international mobile equipment identifier and software version according to TS 23.003[224].
User-Equipment-Info-Value	M	This field contains the user IMEISV.
Proxy-Info	O_C	This field contains information of the host.
Proxy-Host	M	This field contains the identity of the host that added the Proxy-Info field.
Proxy-State	M	This field contains state local information.
Route-Record	O_C	This field contains an identifier inserted by a relaying or proxying node to identify the node it received the message from.
Service-Information	O_M	This parameter holds the individual service specific parameters as defined in the corresponding ‘middle tier’ TS.
AVP	O_C	

6.4.3 Credit-Control-Answer Message

The Credit-Control-Answer (CCA) messages, indicated by the Command-Code field set to 272 is sent by the OCF to the CTF in order to reply to the CCR.

The CCA message format is defined according to RFC 4006 [402] as follows:

```
<CCA> ::=  < Diameter Header: 272, PXY >

           < Session-Id >
           { Result-Code }
           { Origin-Host }
           { Origin-Realm }
           { Auth-Application-Id }
           { CC-Request-Type }
           { CC-Request-Number }
           [ User-Name ]
           [ CC-Session-Failover ]
           [ CC-Sub-Session-Id ]
           [ Acct-Multi-Session-Id ]
           [ Origin-State-Id ]
           [ Event-Timestamp ]
           [ Granted-Service-Unit ]
          *[ Multiple-Services-Credit-Control ]
           [ Cost-Information]
           [ Low-Balance-Indication ]
           [ Remaining-Balance ]
           [ Final-Unit-Indication ]
           [ Check-Balance-Result ]
           [ Credit-Control-Failure-Handling ]
           [ Direct-Debiting-Failure-Handling ]
           [ Validity-Time]
          *[ Redirect-Host]
           [ Redirect-Host-Usage ]
           [ Redirect-Max-Cache-Time ]
          *[ Proxy-Info ]
          *[ Route-Record ]
          *[ Failed-AVP ]
           [ Service-Information ]
          *[ AVP ]
```

Table 6.4.3 illustrates the basic structure of a 3GPP Diameter Credit-Control *Credit-Control-Answer* message as used for online charging. This message is always used by the OCF as specified below, independent of the receiving CTF and the CCR record type that is being replied to.

Table 6.4.3: 3GPP Credit-Control-Answer Message Content

AVP	Category	Description
Session-Id	M	This field identifies the operation session.
Result-Code	M	This field contains the result of the specific query.
Origin-Host	M	This field contains the identification of the source point of the operation and the realm of the operation originator.
Origin-Realm	M	This field contains the realm of the operation originator.
Auth-Application-Id	M	The field corresponds to the application ID of the Diameter Credit Control Application and is defined with the value 4.
CC-Request-Type	M	This field defines the transfer type: initial, update, terminate for session based charging and event for event based charging.
CC-Request-Number	M	This field contains the sequence number of the transferred messages.
User-Name	-	Not used in 3GPP.
CC-Session Failover	O_C	This field contains an indication to the CTF whether or not a failover handling is to be used when necessary.
CC-Sub-session-Id	-	Not used in 3GPP.
Acct-Multi-Session-Id	-	Not used in 3GPP.
Origin-State-Id	-	Not used in 3GPP.
Event-Timestamp	-	Not used in 3GPP.
Granted-Service-Unit	-	Not used in 3GPP, see Multiple-Services-Credit-Control.
Tariff-Time-Change	-	Not used in 3GPP.
CC-Time	-	Not used in 3GPP.
CC-Money	-	Not used in 3GPP.
Unit-Value	-	Not used in 3GPP.
Value-Digits	-	Not used in 3GPP.
Exponent	-	Not used in 3GPP.
Currency-Code	-	Not used in 3GPP.
CC-Total-Octets	-	Not used in 3GPP.
CC-Input-Octets	-	Not used in 3GPP.
CC-Output-Octets	-	Not used in 3GPP.
CC-Service-Specific-Units	-	Not used in 3GPP.
AVP	-	Not used in 3GPP.
Multiple-Services-Credit-Control	O_C	This field contains all parameters for the CTF quota management and defines the quotas to allow traffic to flow.
Granted-Service-Unit	O_C	This field contains the amount of granted service units for a particular category.
Tariff-Time-Change	O_C	This field identifies the reporting period for the granted service units, i.e. before, after or during tariff change.
CC-Time	O_C	This field contains the amount of granted time.
CC-Money	-	Not used in 3GPP.
Unit-Value	-	Not used in 3GPP.
Value-Digits	-	Not used in 3GPP.
Exponent	-	Not used in 3GPP.
Currency-Code	-	Not used in 3GPP.
CC-Total-Octets	O_C	This field contains the amount for sent and received octets.
CC-Input-Octets	O_C	This field contains the amount for received octets.
CC-Output-Octets	O_C	This field contains the amount for sent octets.
CC-Service-Specific-Units	O_C	This field contains the amount for service specific units, e.g. number of events.
AVP	-	Not used in CCA.
Requested-Service-Unit	-	Not used in CCA.
Tariff-Time-Change	-	Not used in CCA.
CC-Time	-	Not used in CCA.
CC-Money	-	Not used in CCA.
Unit-Value	-	Not used in CCA.
Value-Digits	-	Not used in CCA.
Exponent	-	Not used in CCA.
Currency-Code	-	Not used in CCA.
CC-Total-Octets	-	Not used in CCA.
CC-Input-Octets	-	Not used in CCA.

AVP	Category	Description
CC-Output-Octets	-	Not used in CCA.
CC-Service-Specific-Units	-	Not used in CCA.
Used-Service-Unit	-	Not used in CCA.
Tariff-Time-Change	-	Not used in CCA.
CC-Time	-	Not used in CCA.
CC-Money	-	Not used in CCA.
Unit-Value	-	Not used in CCA.
Value-Digits	-	Not used in CCA.
Exponent	-	Not used in CCA.
Currency-Code	-	Not used in CCA.
CC-Total-Octets	-	Not used in CCA.
CC-Input-Octets	-	Not used in CCA.
CC-Output-Octets	-	Not used in CCA.
CC-Service-Specific-Units	-	Not used in CCA.
Tariff-Change-Usage	-	Not used in 3GPP.
Service-Identifier	O_C	This field contains identity of the used service. This ID with the Service-Context-ID together forms an unique identification of the service.
Rating-Group	O_C	This field contains the identifier of a rating group.
G-S-U-Pool-Reference	O_C	Only used in ECUR and SCUR.
G-S-U-Pool-Identifier	M	
CC-Unit-Type	M	
Unit-Value	M	
Value-Digits	M	
Exponent	O_C	
Validity-Time	O_C	This field defines the time in order to limit the validity of the granted quota for a given category instance.
Result-Code	O_C	This field contains the result of the query.
Final-Unit-Indication	O_C	This field indicates that the Granted-Service-Unit containing the final units for the service.
Final-Unit-Action	M	
Restriction-Filter-Rule	O_C	
Filter-Id	O_C	
Redirect-Server	O_C	
Redirect-Address-Type	M	
Redirect-Server-Address	M	
Time-Quota-Threshold	O_C	Used as defined in clause 7.2.
Volume-Quota-Threshold	O_C	Used as defined in clause 7.2.
Unit-Quota-Threshold	O_C	Used as defined in clause 7.2.
Quota-Holding-Time	O_C	Used as defined in clause 7.2.
Quota-Consumption-Time	O_C	Used as defined in clause 7.2.
Reporting-Reason	-	Not used in CCA.
Trigger	Oc	Used as defined in clause 7.2.
Trigger-Type	O_C	Used as defined in clause 7.2.
PS-Furnish-Charging-Information	O_C	Used as defined in clause 7.2.
Refund-Information	O_C	Used as defined in clause 7.2.
Envelope-Reporting	O_C	Used as defined in clause 7.2.
Time-Quota-Mechanism	O_C	Used as defined in clause 7.2.
Time-Quota-Type	M	Used as defined in clause 7.2.
Base-Time-Interval	M	Used as defined in clause 7.2.
AF-Correlation-Information	-	Not used in CCA.
AVP	-	Not used in 3GPP.
Cost-Information	O_C	Used as defined in DCCA [402].
Unit-Value	M	Used as defined in DCCA [402].
Value-Digits	M	Used as defined in DCCA [402].
Exponent	O_C	Used as defined in DCCA [402].
Currency-Code	M	Used as defined in DCCA [402].
Cost-Unit	O_C	Used as defined in DCCA [402].
Low-Balance-Indication	Oc	This field indicates whether the subscriber account balance went below a designated threshold set by his account.
Remaining-Balance	O_C	This field contains the remaining balance of the subscriber.
Unit-Value	M	Used as defined in DCCA [402].
Value-Digits	M	Used as defined in DCCA [402].
Exponent	O_C	Used as defined in DCCA [402].
Currency-Code	M	Used as defined in DCCA [402].

AVP	Category	Description
Final-Unit-Indication	-	Not used in 3GPP, see Multiple-Services-Credit-Control.
Final-Unit-Action	-	Not used in 3GPP.
Restriction-Filter-Rule	-	Not used in 3GPP.
Filter-Id	-	Not used in 3GPP.
Redirect-Server	-	Not used in 3GPP.
Redirect-Address-Type	-	Not used in 3GPP.
Redirect-Server-Address	-	Not used in 3GPP.
Check-Balance-Result	-	Not used in 3GPP.
Credit-Control-Failure-Handling	O_C	Used as defined in DCCA [402].
Direct-Debiting-Failure-Handling	O_C	Used as defined in DCCA [402].
Validity-Time	-	Not used in 3GPP.
Redirect-Host	O_C	
Redirect-Host-Usage	O_C	
Redirect-Max-Cache-Time	O_C	
Proxy-Info	O_C	This field contains information of the host.
Proxy-Host	M	This field contains the identity of the host that added the Proxy-Info field.
Proxy-State	M	This field contains state local information.
Route-Record	O_C	This field contains an identifier inserted by a relaying or proxying node to identify the node it received the message from.
Failed-AVP	O_C	
Service-Information	O_C	This parameter holds the individual service specific parameters as defined in the corresponding 'middle tier' TS.
AVP	O_C	

6.4.4 Re-Auth-Request Message

Table 6.4.4 illustrates the basic structure of a Diameter Credit Control *Re-Auth-Request* message as used for online charging.

Table 6.4.4: Re-Auth-Request (RAR) Message Contents for Online Charging

AVP	Category	Description
Session-Id	M	This field identifies the operation session.
Origin-Host	M	This field contains the identification of the source point of the operation and the realm of the operation originator.
Origin-Realm	M	This field contains the realm of the operation originator.
Destination-Realm	M	This field contains the realm of the operator domain. The realm will be addressed with the domain address of the corresponding public URI.
Destination-Host	M	This field contains the destination peer address of the OCS identity.
Auth-Application-Id	M	The field corresponds to the application ID of the Diameter Credit Control Application and is defined with the value 4.
Re-Auth-Request-Type	M	This field is used to inform the CTF of the action expected upon expiration of the Authorization-Lifetime
User-Name	O_C	This field contains the username.
Origin-State-Id	O_C	This field contains the state associated to the CTF.
Proxy-Info	O_C	This field contains information of the host.
Proxy-Host	M	This field contains the identity of the host that added the Proxy-Info field.
Proxy-State	M	This field contains state local information.
Route-Record	O_C	This field contains an identifier inserted by a relaying or proxying node to identify the node it received the message from.
CC-Sub-Session-Id	-	Not used in 3GPP.
G-S-U-Pool-Identifier	O_C	This field contains an identifier to indicate the credit pool.
Service-Identifier	O_C	
Rating-Group	O_C	
AVP	O_C	

6.4.5 Re-Auth-Answer Message

Table 6.4.5 illustrates the basic structure of a Diameter Credit Control *Re-Auth-Answer* message as used for online charging.

Table 6.4.5: Re-Auth-Answer (RAA) Message Contents for Online Charging

Diameter Credit Control Application AVPs	
AVP	**Used in 3GPP**
<Diameter Header: 258, PXY>	Yes
<Session-Id>	Yes
{Result-Code}	Yes
{Origin-Host}	Yes
{Origin-Realm}	Yes
[User-Name]	Yes
[Origin-State-Id]	Yes
[Error-Message]	Yes
[Error-Reporting-Host]	Yes
*[Failed-AVP]	Yes
*[Redirect-Host]	Yes
[Redirect-Host-Usage]	Yes
[Redirect-Max-Cache-Time]	Yes
* [Proxy-Info]	No
{ Proxy-Host }	No
{ Proxy-State }	No
*[AVP]	Yes

Editor's note: The rationale for "NO" above should be provided. If the message is identical to the definition in DCC the table may be replaced by a reference to DCC.

6.4.6. Capabilities-Exchange-Request Message

The Capabilities-Exchange-Request message structure is described in RFC 3588 [401].

6.4.7 Capabilities-Exchange-Answer Message

The Capabilities-Exchange-Answer message structure is described in RFC 3588 [401].

6.4.8 Device-Watchdog-Request Message

The Device-Watchdog-Request message structure is described in RFC 3588 [401].

6.4.9 Device-Watchdog-Answer Message

The Device-Watchdog-Answer message structure is described in RFC 3588 [401].

6.4.10 Disconnect-Peer-Request Message

The Disconnect-Peer-Request message structure is described in RFC 3588 [401].

6.4.11 Disconnect-Peer-Answer Message

The Disconnect-Peer-Answer message structure is described in RFC 3588 [401].

6.4.12 Abort-Session-Request Message

The Abort-Session-Request message structure is described in RFC 3588 [401].

6.4.13 Abort-Session -Answer Message

The Abort-Session-Answer message structure is described in RFC 3588 [401].

6.5 Other procedural description of the 3GPP charging applications

6.5.1 Re-authorization

6.5.1.1 Idle timeout

The server may specify an idle timeout associated with a granted quota using the Quota-Holding-Time AVP. If no traffic associated with the quota is observed for this time, the client shall understand that the traffic has stopped and the quota is returned to the server. The client shall start the quota holding timer when quota consumption ceases. This is always when traffic ceases, i.e. the timer is re-started at the end of each packet. It applies equally to the granted time quota and to the granted volume quota. The timer is stopped on sending a CCR and re-initialised on receiving a CCA with the previous used value or a new value of Quota-Holding-Time if received.

Alternatively, if this AVP is not present, a locally configurable default value in the client shall be used. A Quota-Holding-Time value of zero indicates that this mechanism shall not be used.

6.5.1.2 Change of charging conditions

There are a number of mid-session service events (re-authorisation triggers), which could affect the rating of the current service usage, e.g. end user QoS changes or location updates. When allocating resources, the server may instruct the credit control client to re-authorize the quota upon a number of different session related triggers that can affect the rating conditions. The server instruct the Network Element to monitor for such events by using the Trigger AVP containing one or more Trigger-Type AVPs in the CCA command. These events are in addition to the static triggers defined in the service specific document (middle tier TS).

Once the OCS has armed one or more triggers using the Trigger AVP at the Network Element, these triggers shall remain in effect until another Trigger AVP is received for the same Rating Group, where the Network Element shall arm all triggers present in the Trigger AVP and reset all other triggers. The presence of the Trigger AVP without any Trigger-Type AVPs in a CCA allows OCS to disable all the triggers that were armed in a previous Trigger AVP.

NOTE: This removes the need for the OCS to send trigger information in every CCA message when they have not changed.

When one of the armed triggers happen, a credit re-authorization shall be sent to the server including information related to the service event even if all the granted service units have not been used. The quota is also being reported.

For example, if the Trigger AVP is used, then the client shall only re-authorise the quota for the service usage associated with events which were included in the last received Trigger AVP.

If the server does not control the events for re-authorisation using the Trigger AVP, the Network Element shall only monitor for default events defined in the relevant service specific document (middle tier TS).

6.5.1.3 Reporting quota usage

The credit control client shall report the quota usage under a number of circumstances. When this happens, the reason for the quota being reported is notified to the server through the use of the Reporting-Reason AVP in the CCR. The reason for reporting credit usage can occur directly in the Multiple-Services-Credit-Control AVP, or in the Used-Service-Units AVP, depending on whether it applies for all quota types or a particular quota type respectively. It shall not be used at command level. It shall always and shall only be sent when usage is being reported.

When the reason is RATING_CONDITION_CHANGE, the Trigger AVP shall also be included to indicate the specific armed trigger events which caused the reporting and re-authorisation request.

6.5.1.4 Quota consumption

The consumption of quota is captured using mechanisms described in 6.5.1.3.

Volume quota is considered used or consumed in the normal way, corresponding to actual traffic.

The consumption of time quota may be controlled by Quota-Consumption-Time as described in clause 6.5.4, or by extended mechanisms as described in clause 6.5.7.

6.5.2 Threshold based re-authorization triggers

The server may optionally include as part of the Multiple-Services-Credit-Control AVP, when it is providing a quota, an indication to the client of the remaining quota threshold that shall trigger a quota re-authorization. The Time-Quota-Threshold AVP indicates the threshold in seconds when the granted quota is time, and the Volume-Quota-Threshold AVP indicates the threshold in octets when the granted quota is volume. The Unit-Quota-Threshold AVP indicates the threshold in service specific units, that are defined in the service specific documents, when the granted quota is service specific.

If the threshold triggers were included along with the quota granted, the Credit Control client, then, shall seek re-authorisation from the server for the quota when the quota contents fall below the supplied threshold. The client shall allow service to continue whilst the re-authorisation is progress, until the original quota had been consumed.

6.5.3 Termination action

The termination action is sent over the Ro reference point. Two different approaches are specified:

- The Final-Unit-Indication AVP with Final-Unit-Action TERMINATE does not include any other information. When the user has consumed the final granted units or zero quota has been granted by the OCS, the network element shall terminate the service. This is the default handling applicable whenever the client receives an unsupported Final-Unit-Action value. The network element shall send Credit Control Request message with CC-Request-Type AVP set to the value UPDATE_REQUEST and report the Used-Service-Unit AVP for the service that has terminated, as defined in RFC 4006 [402].

- Another termination action consists in re-directing packets corresponding to a terminated service (consumption of the final granted units or zero quota has been granted by the OCS) to an application server. This allows the client to redirect user originated requests to a top-up server so that network access can be re-instated. This functionality is achieved with the server returning a "REDIRECT" and redirect-to URL in the Final-Units-Action AVP of the Multiple-Services-Credit-Control AVP. Upon receiving this result code, the Network Element shall apply the redirection. The URL should be categorized so that the End-User's ability to reach it is guaranteed.

- NOTE: When zero quota has been granted by the OCS, the termination action must be enforced at the reception of the CCA message.

6.5.4 Quota consumption time

The server may optionally indicate to the client that the quota consumption must be stopped after a period equal to the Quota Consumption Time in which no packets are received or at session termination, whichever is sooner. This is indicated by including the Quota-Consumption-Time AVP in the CCA. The idle period equal to the Quota Consumption Time is included in the reported usage. The quota is consumed normally during gaps in traffic of duration less than or equal to the Quota-Consumption-Time. Quota consumption resumes on receipt of a further packet belonging to the service data flow.

If packets are allowed to flow during a Credit Control Request (Update)/Credit Control Answer exchange, and the Quota-Consumption-Time AVP value in the provided quota is the same as in the previously provided quota, then the Quota-Consumption-Time runs normally through this procedure. For example, if 5 seconds of a 10 second QCT timer have passed when a CCR[Update] is triggered, and the CCA[Update] returns 2 seconds later, then the QCT timer will expire 3 seconds after the receipt of the CCA and the remaining unaccounted 5 seconds of usage will be recorded against the new quota even though no packets were transmitted with the new quota.

In the case of a new quota with the Quota-Consumption-Time AVP, or when packets are blocked during the CCR[Update]/CCA procedure then the Quota-Consumption-Time stops running (if it was running) and quota consumption begins again when the next service data flow packet matching the Charging Rule is received.

If a Quota-Consumption-Time AVP value of zero is provided, or if no Quota-Consumption-Time AVP is present in the CCA, the quota is consumed continuously from the point at which it is granted.

6.5.5 Service Termination

The OCF may determine that a service requires termination. The OCF may perform this termination synchronously if it has a CCR pending processing by returning CCA with Result-Code AVP with value DIAMETER-AUTHORIZATION-REJECTED. If the OCF does not have a pending request (asynchronous), the OCF may trigger an ASR to terminate the Diameter session related to the service. On reception of an ASR, the CTF shall close the associated Credit-Control session by sending a CCR [TERMINATE]. The behaviour of the CTF, in relation to the user session, on reception of an ASR is detailed in the middle-tier TS. As an alternative to the ASR, the OCF may trigger a RAR to which the CTF behaves as described in RFC 4006 [402] and the OCF shall return a CCA with Result-Code AVP with value DIAMETER-AUTHORIZATION-REJECTED for the resulting CCR.

6.5.6 Envelope reporting

The OCF may determine the need for additional detailed reports identifying start time and end times of specific activity in addition to the standard quota management provided in RFC 4006 [402]. The OCF controls this by sending a CCA with Envelope-Report AVP with the appropriate values. The CTF, on receiving the command, will monitor for traffic for a period of time controlled by the Quota-Consumption-Time AVP and report each period as a single envelope for each Quota-Consumption-Time expiry where there was traffic. The OCF may request envelope reports for just time, time and volume, time and number of events, or time and volume and number of events.

NOTE: Envelope reporting is independent of quota management (i.e. there is no interaction).

6.5.7 Combinational quota

The Quota-Consumption-Time mechanism, described in clause 6.5.4, may be extended (and replaced) when granting time based quota to provide potentially more efficient use of the online charging interface, i.e. reduced traffic and the algorithms in the OCF are potentially simpler. The alternative handling mechanisms that are defined in this clause are:

1) Continuous Time Period (CTP)

2) Discrete Time Period (DTP)

Both DTP and CTP define time-envelopes in their own manner. The method of forming a time-envelope is controlled by the Time-Quota-Mechanism AVP, which selects the algorithm and the length of the base time interval.

The base time interval, specified by the Base-Time-Interval AVP, is a basic unit for consuming quota. Quota is deemed to be consumed at the start of each base time interval. The CTF shall allow traffic to pass for the duration of the base time interval.

For DTP, the base time interval defines the length of the discrete time period. A time envelope corresponds to exactly one DTP (and therefore to one base time interval). Quota consumption resumes only on the first traffic following the expiry of the DTP (or the closure of the envelope).

For CTP, the mechanism constructs a time-envelope out of consecutive base time intervals in which traffic has occurred up to and including the first base time interval which contains no traffic. Therefore quota consumption continues within the time envelope, if there was traffic in the previous base time interval. After an envelope has closed, then the quota consumption resumes only on the first traffic following the closure of the envelope. The envelope for CTP includes the last base time interval, i.e. the one which contained no traffic. The end of an envelope can only be determined "retrospectively".

If the CTF receives a Multiple-Services-Credit-Control AVP with both the Quota-Consumption-Time AVP and Time-Quota-Mechanism AVP, then the Time-Quota-Mechanism AVP takes precedence and the CTF shall behave accordingly.

If the server requires details of when the DTPs and CTPs occurred then it shall request the reporting of the corresponding time envelopes, by including the Envelope-Reporting AVP when granting quota in the CCA (INITIAL) to indicate whether the client shall report the start and end of each time envelope, in those cases in which quota is consumed in envelopes. The CTF generates envelopes according to the rules described above and carry each envelope in a separate instance of the Envelope AVP in the CCR.

6.5.8 Online control of offline charging information

The Offline-Charging AVP is used on the Ro interface by the OCS to control the CTF in relation to the mechanism by which the CTF generates offline charging information, e.g. for flow based charging controls the formation of service data containers. The information contained, within the Offline-Charging AVP, takes precedence over the default configuration at the CTF. If the Offline-Charging AVP is not sent in the CCA, the OCS does not control the offline charging mechanisms and therefore the default configuration at the CTF is employed.

Controls over time usage, defined in clause 6.5.6 and 6.5.7, are included.

6.5.9 Support of Multiple Service

The support of multiple services within a single Diameter session in 3GPP is limited to services that are grouped in one of the middle tier TSs specified through the *Service-Context-Id* AVP.

6.6 Bindings of the operation to protocol application

This clause aims to describe the mapping between the protocol independent messages and parameter with the Diameter messages and AVP utilized on the 3GPP Offline and Online Charging.

6.6.1 Bindings of Charging Data Transfer to Accounting

Table 6.6.1 describes the bindings of the *Charging Data Transfer* operation parameter to the DBPA AVP for 3GPP Offline Charging.

Table 6.6.1: Bindings to Accounting

Charging Data Transfer parameter	Diameter Accounting AVP
Operation Number	Accounting-Record-Number
Operation Type	Accounting-Record-Type
Operation Identifier	Acct-Application-Id
Operation Interval	Acct-Interim-Interval
Destination Domain	Destination-Realm
Origination Timestamp	Event-Timestamp
Originator Host	Origin-Host
Originator Domain	Origin-Realm
Origination State	Origin-State-Id
Proxy Information	Proxy-Info
Operation Result	Result-Code
Route Information	Route-Record
Service Information	Service-Information
Session Identifier	Session-Id
Operation Token	Service-Context-Id
User Name	User-Name

6.6.2 Bindings of Debit / Reserve Units to Credit-Control

Table 6.6.2 describes the bindings of the *Debit / Reserve Units* operation parameter to the DCCA AVP for 3GPP Online Charging.

Table 6.6.2: Bindings to Credit-Control

Debit / Reserve Units parameter	DCCA AVP
Destination Domain	Destination-Realm
Destination Host	Destination-Host
Failed parameter	Failed-AVP
Multiple Operation	Multiple-Services-Indicator
Multiple Unit Operation	Multiple-Services-Credit Control
Operation Failover	CC-Session-Failover
Operation Failure Action	Credit-Control-Failure-Handling
Operation Identifier	Auth-Application-Id
Operation Number	CC-Request-Number
Operation Result	Result-Code
Operation Token	Service-Context-Id
Operation Type	CC-Request-Type
Origination State	Origin-State-Id
Origination Timestamp	Event-Timestamp
Originator Domain	Origin-Realm
Originator Host	Origin-Host
Proxy Information	Proxy-Info
Redirection Cache Time	Redirect-Max-Cache-Time
Redirection Host	Redirect-Host
Redirection Host Usage	Redirect-Host-Usage
Requested Action	Requested-Action
Route Information	Route-Record
Service Information	Service-Information
Session Identifier	Session-Id
Subscriber Equipment Number	User-Equipment-Info
Subscriber Identifier	Subscription-Id
Termination Cause	Termination-Cause
User Name	User-Name

7 Summary of used Attribute Value Pairs

7.1 Diameter AVPs

The use of the Attribute Value Pairs (AVPs) that are defined in the Diameter Protocol is specified in clause 6.2 for offline charging and in clause 6.4 for online charging. The information is summarized in the table 7.1 in alphabetical order. Detailed specification of some of these AVPs is available after the table and for the others can be found from RFC 3588 [401], RFC 4006 [402] and and RFC 4005 [407].

Those Diameter AVPs that are used are marked "M", "O_M"or "Oc" in the following table. This implies that their content can be used by the CDF for offline and by the OCF for online charging purposes. Those Diameter AVPs that are not used are marked "-" in the following table.

Table 7.1: Use Of IETF Diameter AVPs

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
Accounting-Input-Octets	363	O_C	-	-	-	Unsigned64	M	P	-	V	Y
Accounting-Output-Octets	364	O_C	-	-	-	Unsigned64	M	P	-	V	Y
Accounting-Realtime-Required	483	-	-	-	-	Enumerated	-	-	-	-	-
Accounting-Record-Number	485	M	M	-	-	Unsigned32	M	P	-	V	Y
Accounting-Record-Type	480	M	M	-	-	Enumerated	M	P	-	V	Y
Accounting-Sub-Session-Id	287	-	-	-	-	Unsigned64	-	-	-	-	-
Acct-Application-Id	259	O_C	O_C	-	-	Unsigned32	M	P	-	V	N
Acct-Interim-Interval	85	O_C	O_C	-	-	Unsigned32	M	P	-	V	Y
Acct-Multi-Session-Id	50	-	-	-	-	Unsigned32	-	-	-	-	-
Acct-Session-Id	44	-	-	-	-	OctetString	-	-	-	-	-
Auth-Application-Id	258	-	-	M	M	Unsigned32	M	P	-	V	N
AVP	*	-	-	-	-	Grouped	-	-	-	-	-
Called-Station-Id	30	O_C	-	O_C	-	UTF8String	M	P	-	V	N
CC-Correlation-Id	411	-	-	O_C	-	OctetString	-	P,M	-	V	Y
CC-Input-Octets	412	-	-	O_C	O_C	Unsigned64	M	P	-	V	Y
CC-Money	413	-	-	-	-	Grouped	-	-	-	-	-
CC-Output-Octets	414	-	-	O_C	O_C	Unsigned64	M	P	-	V	Y
CC-Request-Number	415	-	-	M	M	Unsigned32	M	P	-	V	Y
CC-Request-Type	416	-	-	M	M	Enumerated	M	P	-	V	Y
CC-Service-Specific-Units	417	-	-	O_C	O_C	Unsigned64	M	P	-	V	Y
CC-Session-Failover	418	-	-	-	O_C	Enumerated	M	P	-	V	Y
CC-Sub-Session-Id	419	-	-	-	-	Unsigned64	-	-	-	-	-
CC-Time	420	-	-	O_C	O_C	Unsigned32	M	P	-	V	Y
CC-Total-Octets	421	-	-	O_C	O_C	Unsigned64	M	P	-	V	Y
CC-Unit-Type	454	-	-	-	M	Enumerated	M	P	-	V	Y
Check-Balance-Result	422	-	-	-	-	Enumerated	-	-	-	-	-
Cost-Information	423	-	-	-	O_C	Grouped	M	P	-	V	Y
Cost-Unit	424	-	-	-	O_C	UTF8String	M	P	-	V	Y
Credit-Control	426	-	-	-	-	Enumerated	-	-	-	-	-
Credit-Control-Failure-Handling	427	-	-	-	O_C	Enumerated	M	P	-	V	Y
Currency-Code	425	-	-	-	M	Unsigned32	M	P	-	V	Y
Destination-Host	293	O_C	-	O_C	-	DiamIdent	M	P	-	V	N
Destination-Realm	283	M	-	M	-	DiamIdent	M	P	-	V	N
Direct-Debiting-Failure-Handling	428	-	-	-	O_C	Enumerated	M	P	-	V	Y
Error-Message	281	-	-	-	-	UTF8String	-	-	-	-	-
Error-Reporting-Host	294	-	O_C	-	-	DiamIdent	-	P	-	V,M	N
Event-Timestamp	55	O_C	O_C	O_C	-	Time	M	P	-	V	N
Exponent	429	-	-	-	O_C	Integer32	M	P	-	V	Y
Failed-AVP	279	-	-	-	O_C	Grouped	M	P	-	V	N
Filter-Id	11	-	-	-	O_C	UTF8String	M	P	-	V	Y
Final-Unit-Action	449	-	-	-	O_C	Enumerated	M	P	-	V	Y
Final-Unit-Indication	430	-	-	-	O_C	Grouped	M	P	-	V	Y
Granted-Service-Unit	431	-	-	-	O_C	Grouped	M	P	-	V	Y

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
G-S-U-Pool-Identifier	453	-	-	-	O_C	Unsigned32	M	P	-	V	Y
G-S-U-Pool-Reference	457	-	-	-	O_C	Grouped	M	P	-	V	Y
Location-Type	IANA	O_C	-	O_C	-	refer [403]					
Location-Information	IANA	O_C	-	O_C	-	refer [403]					
Multiple-Services-Credit-Control	456	-	-	O_C	O_C	Grouped	M	P	-	V	Y
Multiple-Services-Indicator	455	-	-	O_M	-	Enumerated	M	P	-	V	Y
Operator-Name	IANA	O_C	-	O_C	-	refer [403]					
Origin-Host	264	M	M	M	M	DiamIdent	M	P	-	V	N
Origin-Realm	296	M	M	M	M	DiamIdent	M	P	-	V	N
Origin-State-Id	278	O_C	O_C	O_C	-	Unsigned32	M	P	-	V	N
Proxy-Info	284	O_C	O_C	O_C	O_C	Grouped	M	-	-	P,V	N
Proxy-Host	280	M	M	M	M	DiamIdent	M	-	-	P,V	N
Proxy-State	33	M	M	M	M	OctetString	M	-	-	P,V	N
Rating-Group	432	O_C	-	O_C	O_C	Unsigned32	M	P	-	V	Y
Redirect-Address-Type	433	-	-	M	M	Enumerated	M	P	-	V	Y
Redirect-Host	292	-	-	-	O_C	DiamURI	M	P	-	V	N
Redirect-Host-Usage	261	-	-	-	O_C	Enumerated	M	P	-	V	N
Redirect-Max-Cache-Time	262	-	-	-	O_C	Unsigned32	M	P	-	V	N
Redirect-Server	434	-	-	-	O_C	Grouped	M	P	-	V	Y
Redirect-Server-Address	435	-	-	-	M	UTF8String	M	P	-	V	Y
Requested-Action	436	-	-	O_C	-	Enumerated	M	P	-	V	Y
Requested-Service-Unit	437	-	-	O_C	-	Grouped	M	P	-	V	Y
Restriction-Filter-Rule	438	-	-	-	O_C	IPFilterRule	M	P	-	V	Y
Result-Code	268	-	M	-	M	Unsigned32	M	P	-	V	N
Route-Record	282	O_C	-	O_C	O_C	DiamIdent	M	-	-	P,V	N
Service-Context-Id	461	O_M	-	M	-	UTF8String	M	P	-	V	Y
Service-Identifier	439	O_C	-	O_C	O_C	Unsigned32	M	P	-	V	Y
Service-Parameter-Info	440	-	-	-	-	Grouped	-	-	-	-	-
Service-Parameter-Type	441	-	-	-	-	Unsigned32	-	-	-	-	-
Service-Parameter-Value	442	-	-	-	-	OctetString	-	-	-	-	-
Session-Id	263	M	M	M	M	UTF8String	M	P	-	V	Y
Subscription-Id	443	O_C	-	O_M	-	Grouped	M	P	-	V	Y
Subscription-Id-Data	444	M	-	M	-	UTF8String	M	P	-	V	Y
Subscription-Id-Type	450	M	-	M	-	Enumerated	M	P	-	V	Y
Tariff-Change-Usage	452	-	-	O_C	-	Enumerated	M	P	-	V	Y
Tariff-Time-Change	451	-		-	O_C	Time	M	P	-	V	Y
Termination-Cause	295		-	O_C	-	Enumerated	M	P	-	V	Y
Unit-Value	445	-	-	-	M	Grouped	M	P	-	V	Y
Used-Service-Unit	446	-	-	O_C	-	Grouped	M	P	-	V	Y
User-Equipment-Info	458	O_C	-	O_C	-	Grouped	-	P,M	-	V	Y
User-Equipment-Info-Type	459	O_M	-	M	-	Enumerated	-	P,M	-	V	Y
User-Equipment-Info-Value	460	O_M	-	M	-	OctetString	-	P,M	-	V	Y
User-Name	1	O_C	O_C	O_C	-	UTF8String	M	P	-	V	Y
Value-Digits	447	-	-	-	M	Integer64	M	P	-	V	Y
Validity-Time	448	-	-	-	O_C	Unsigned32	M	P	-	V	Y
Vendor-Id	266	-	-	-	-	Unsigned32	-	-	-	-	-
Vendor-Specific-Application-Id	260	-	-	-	-	Grouped	-	-	-	-	-

NOTE: *Result-Code* AVP is defined in Diameter Base Protocol in RFC 3588 [401]. However, new values are used in offline and online charging applications. These additional values are defined below.

7.1.1 Accounting-Input-Octets

The *Accounting-Input-Octets* AVP (AVP code 363) contains the number of octets transmitted during the data container recording interval, reflecting the volume counts for uplink traffic for a data flow.

7.1.2 void

7.1.3 Accounting-Output-Octets

The *Accounting-Output-Octets* AVP (AVP code 364) contains the number of octets transmitted during the data container recording interval, reflecting the volume count for downlink traffic for a data flow.

7.1.4 void

7.1.5 Acct-Application-Id AVP

The *Acct-Application-Id* AVP (AVP code 259) shall contain the value of 3 as defined in RFC 3588 [401] according TS 29.230 [206].

7.1.6 Auth-Application-Id AVP

The *Auth-Application-Id* AVP (AVP code 258) shall contain the value of 4 as defined in RFC 4006 [402] according TS 29.230 [206].

7.1.7 Called-Station-Id

The *Called-Station-Id* AVP (AVP code 30) shall contain the Access Point Name (APN) the user is connected to.

7.1.8 Event-Timestamp AVP

The *Event-Timestamp* AVP (AVP code 55) shall contain the time when the chargeable event is received in the CTF.

7.1.9 Multiple-Services-Credit-Control

The *Multiple-Services-Credit-Control* AVP (AVP code 456) is of type grouped as specified in RFC 4006 [402]. It contains additional 3GPP specific charging parameters.

It has the following ABNF grammar:

```
<Multiple-Services-Credit-Control> ::=      < AVP Header: 456 >

                                              [ Granted-Service-Unit ]
                                              [ Requested-Service-Unit ]
                                            * [ Used-Service-Unit ]
                                              [ Tariff-Change-Usage ]
                                            * [ Service-Identifier ]
                                              [ Rating-Group ]
                                            * [ G-S-U-Pool-Reference ]
                                              [ Validity-Time ]
                                              [ Result-Code ]
                                              [ Final-Unit-Indication ]
                                              [ Time-Quota-Threshold ]
                                              [ Volume-Quota-Threshold ]
                                              [ Unit-Quota-Threshold ]
                                              [ Quota-Holding-Time ]
                                              [ Quota-Consumption-Time ]
                                            * [ Reporting-Reason ]
                                              [ Trigger ]
                                              [ PS-Furnish-Charging-Information ]
                                              [ Refund-Information ]
                                            * [ AF-Correlation-Information]
                                            * [ Envelope ]
                                              [ Envelope-Reporting ]
                                              [ Time-Quota-Mechanism ]
                                            * [ Service-Specific-Info ]
```

[QoS-Information]
~~* [AVP]~~

7.1.10 Rating-Group AVP

The *Rating-Group* AVP (AVP code 432), is defined in RFC 4006 [402]. It contains the charging key (defined in TS 23.203 [218]). Each quota allocated to a Diameter CC session has a unique Rating Group value as specified in RFC 4006 [402].

7.1.11 Result-Code AVP

This subclause defines new *Result-Code* AVP (AVP code 268) values that must be supported by all Diameter implementations that conform to the present document. The Result-Code AVP operates as described in RFC 3588 [401] and RFC 4006 [402].

The following result code descriptions are examples of the possible uses for the code:

Transient Failures (4xxx):

DIAMETER_END_USER_SERVICE_DENIED 4010

The OCF denies the service request due to service restrictions (e.g. terminate rating group) or limitations related to the end-user, for example the end-user's account could not cover the requested service.

DIAMETER_CREDIT_CONTROL_NOT_APPLICABLE 4011

The OCF determines that the service can be granted to the end user but no further credit control needed for the service (e.g. service is free of charge or is treated for offline charging).
DIAMETER_CREDIT_LIMIT_REACHED 4012

The OCF denies the service request since the end- user's account could not cover the requested service. If the CCR contained used-service-units they are deducted, if possible.

Permanent Failures (5xxx):

DIAMETER_AUTHORIZATION_REJECTED 5003

The OCF denies the service request in order to terminate the service for which credit is requested. For example this error code is used to inform IP CAN bearer has to be terminated in the CCR message or to inform blacklist the rating group in the Multiple-Service-Credit-Control AVP.

DIAMETER_USER_UNKNOWN 5030

The specified end user could not be found in the OCF.

DIAMETER_RATING_FAILED 5031

This error code is used to inform the CTF that the OCF cannot rate the service request due to insufficient rating input, incorrect AVP combination or due to an AVP or an AVP value that is not recognized or supported in the rating. For Flow Based Charging this error code is used if the Rating group is not recognized. The Failed-AVP AVP MUST be included and contain a copy of the entire AVP(s) that could not be processed successfully or an example of the missing AVP complete with the Vendor-Id if applicable. The value field of the missing AVP should be of correct minimum length and contain zeroes.

7.1.12 Service-Context-Id AVP

The *Service-Context-Id* AVP is defined in RFC 4006 [402]. It is of type UTF8String and contains a unique identifier of the Diameter Credit Control service specific document that applies to the request. This is an identifier allocated by the service provider/operator, by the service element manufacturer or by a standardization body and MUST uniquely identify a given Diameter Credit Control service specific document. For offline charging, this identifies the service specific document ('middle tier' TS) on which associated CDRs should based. The format of the Service-Context-Id is:

"extensions".MNC.MCC."Release"."service-context" "@" "domain"

The 3GPP specific values for "service-context" "@" "domain" are:

- For PS charging: 32251@3gpp.org
- For WLAN charging: 32252@3gpp.org
- For IMS charging: 32260@3gpp.org
- For MMS service charging: 32270@3gpp.org
- For LCS service charging: 32271@3gpp.org
- For PoC service charging: 32272@3gpp.org
- For MBMS service charging: 32273@3gpp.org
- For SMS service charging: 32274@3gpp.org
- For MMTel service charging: 32275@3gpp.org
- For AoC Service Information: 32280@3gpp.org
- For ABMF Rc information: 32296@3gpp.org

The "Release" indicates the 3GPP Release the service specific document is based upon e.g. 6 for Release 6.

As a minimum, Release "service-context" "@" "domain" shall be used. If the minimum is used all operator provisionable parameters (Oc and Om) are optional.

The MNC.MCC identifies the operator implementing the service specific document, which is used to determine the specific requirements for the operator configurable parameters.

The "extensions" is operator specific information to any extensions in a service specific document.

7.1.13 Service-Identifier AVP

The *Service-Identifier* AVP (AVP code 439), is defined in RFC 4006 [402]. For further details, please refer the middle-tier specification.

7.1.14 Used-Service-Unit AVP

The *Used-Service-Unit* AVP (AVP code 446) is of type grouped as specified in RFC 4006 [402]. It contains additional 3GPP specific charging parameters.

It has the following ABNF grammar:

```
<Used-Service-Unit> ::=     < AVP Header: 446 >

                            [ Reporting-Reason ]
                            [ Tariff-Change-Usage ]
                            [ CC-Time ]
                            [ CC-Money ]
                            [ CC-Total-Octets ]
                            [ CC-Input-Octets ]
```

[CC-Output-Octets]
[CC-Service-Specific-Units]
*[Event-Charging-TimeStamp]
*[AVP]

7.1.15 User-Name AVP

The *User-Name* AVP (AVP code 1) contains the user name in the format of a NAI according to RFC 3588 [401].

7.1.16 Vendor-Id AVP

The *Vendor-Id* AVP (AVP code 266), as part of the *Vendor-Specific-Application-Id* grouped AVP, shall contain the value of 10415, which is the IANA registered value for '3GPP' in TS 29.230 [206].

7.1.17 User-Equipment-Info AVP

The *User-Equipment-Info* AVP (AVP code 458) is of type grouped and contains the identity and capability of the terminal the subscriber is using for the connection to network according to IETF RFC 4006 [402] with the following ABNF grammar:

User-Equipment-Info ::= < AVP Header: 458 >

{ User-Equipment-Info-Type }

{ User-Equipment-Info-Value }.

When the User-Equipment-Info-Type AVP (AVP code 459) is set to IMEISV (0), the value within the User-Equipment-Info-Value AVP (AVP code 460) is of type OctetString and shall be a UTF-8 encoded decimal.

The composition of the IMEISV follows the IMEI definition in TS 23.003 [224].

7.2 3GPP specific AVPs

For the purpose of offline charging additional AVPs are used in ACR / ACA and for online charging additional AVPs are used in CCR / CCA. All 3GPP specific AVPs mentioned are relevant for both offline and online charging unless specifically excluded. The information is summarized in the following table along with the AVP flag rules.

The 3GPP Charging Application uses the value 10415 (3GPP) as *Vendor-Id*.

Detailed descriptions of AVPs that are used specifically for 3GPP charging are provided in the subclauses below the table. However, for AVPs that are just borrowed from other applications only the reference (e.g. TS 29.229 [204]), is provided in the following table and the detailed description is not repeated.

Where 3GPP RADIUS VSAs are re-used, they shall be translated to Diameter AVPs as described in RFC 4005 [407] with the exception that the 'M' flag shall be set and the "P' flag may be set.

Table 7.2: 3GPP specific AVPs

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
3GPP-Charging-Characteristics	13	X	-	X	-	refer [207]					
3GPP-Charging-Id	2	X	-	X	-	refer [207]					
3GPP-GGSN-MCC-MNC	9	X	-	X	-	refer [207]					
3GPP-IMSI	1	-	-	X	-	refer [207]					
3GPP-IMSI-MCC-MNC	8	X	-	X	-	refer [207]					
3GPP-MS-TimeZone	23	X	-	X	-	refer [207]					
3GPP-NSAPI	10	X	-	X	-	refer [207]					
3GPP-PDP-Type	3	X	-	X	-	refer [207]					
3GPP-RAT-Type	21	X	-	X	-	refer [207]					
3GPP-Selection-Mode	12	X	-	X	-	refer [207]					
3GPP-Session-Stop-Indicator	11	-	-	X	-	refer [207]					
3GPP-SGSN-MCC-MNC	18	X	-	X	-	refer [207]					
3GPP-User-Location-Info	22	X	-	X	-	refer [207]					
Access-Network-Charging-Identifier-Value	503	X	-	X	-	refer [214]					
Access-Network-Information	1263	X	-	X	-	OctetString	V,M	P			N
Access-Transfer-Information	2709	X	-	-	-	Grouped	V,M	P			N
Access-Transfer-Type	2710	X	-	-	-	Enumerated	V,M	P			N
Account-Expiration	2309	-	-	-	X	Time	V,M	P			N
Accumulated-Cost	2052	-	-	-	X	Grouped	V,M	P			N
Adaptations	1217	-	-	X	-	Enumerated	V,M	P			N
Additional-Content-Information	1207	-	-	X	-	Grouped	V,M	P			N
Additional-Type-Information	1205	-	-	X	-	UTF8String	V,M	P			N
Address-Data	897	-	-	X	-	UTF8String	V,M	P			N
Address-Domain	898	-	-	X	-	Grouped	V,M	P			N
Addressee-Type	1208	-	-	X	-	Enumerated	V,M	P			N
Address-Type	899	-	-	X	-	Enumerated	V,M	P			N
AF-Charging-Identifier	505	X	-	X	-	refer [214]					
AF-Correlation-Information	1276	X	-	X	-	Grouped	V,M	P			N
Allocation-Retention-Priority	1034	X	-	X	-	refer [215]					
Alternate-Charged-Party-Address	1280	X	-	-	-	UTF8string	V.M	P			N
AoC-Cost-Information	2053	-	-	X	X	Grouped	V,M	P			N
AoC-Format	2310	-	-	X	-	Enumerated	V,M	P			N
AoC-Information	2054	-	-	X	X	Grouped	V.M	P			N
AoC-Request-Type	2055	-	-	X	-	Enumerated	V.M	P			N
AoC-Service	2311	-	-	X	-	Grouped	V,M	P			N
AoC-Service-Obligatory-Type	2312	-	-	X	-	Enumerated	V,M	P			N
AoC-Service-Type	2313	-	-	X	-	Enumerated	V,M	P			N
AoC-Subscription-Information	2314	-	-	X	-	Grouped	V,M	P			N
Application-provided-called-party-address	837	X	-	X	-	UTF8String	V,M	P			N
Application-Server	836	X	-	X	-	UTF8String	V,M	P			N
Application-Server-ID	2101	X	-	X	-	refer[223]					
Application-Service-Provider-Identity	532	X	-	-	-	refer[214]					
Application-Server-Information	850	X	-	X	-	Grouped	V,M	P			N
Application-Service-Type	2102	X	-	X	-	refer[223]					
Application-Session-ID	2103	X	-	X	-	refer[223]					
Applic-ID	1218	-	-	X	-	UTF8String	V,M	P			N
Associated-Party-Address	2035	X	-	X	-	UTF8String	V,M	P			N
Associated-URI	856	X	-	X	-	UTF8String	V,M	P			N
Authorised-QoS	849	-	-	-	-	UTF8String	V,M	P			N
Aux-Applic-Info	1219	-	-	X	-	UTF8String	V,M	P			N
Base-Time-Interval	1265	-	-	-	X	Unsigned32	V,M	P			N
Bearer-Service	854	X	-	-	-	OctetString	V,M	P			N
BSSID	2716	X	-	X	-	UTF8String	V,M	P			N
Called-Asserted-Identity	1250	X	-	X	-	UTF8String	V,M	P			N
Called-Party-Address	832	X	-	X	-	UTF8String	V,M	P			N
Calling-Party-Address	831	X	-	X	-	UTF8String	V,M	P			N
Carrier-Select-Routing-Information	2023	X	-	X	-	UTF8String	V,M	P			N
Cause-Code	861	X	-	X	-	Integer32	V,M	P			N
CG-Address	846	X	-	X	-	Address	V,M	P			Y
Change-Condition	2037	X	-	-	-	Integer32	V,M	P			N
Change-Time	2038	X	-	-	-	Time	V,M	P			N
Charge-Reason-Code	2118	-	-	X	X	Enumerated	V,M	P			N
Charged-Party	857	X	-	-	-	UTF8String	V,M	P			N
Charging-Characteristics-	2066	X	-	X	-	Enumerated	V,M	P			N

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
Selection-Mode											
Charging-Rule-Base-Name	1004	X	-	X	-	refer [215]					
Class-Identifier	1214	-	-	X	-	Enumerated	V,M	P			N
Client-Address	2018	-	-	X	-	Address	V,M	P			N
CN-IP-Multicast-Distribution	921	X	-	-	-	refer [207]					
Content-Class	1220	-	-	X	-	Enumerated	V,M	P			N
Content-Disposition	828	X	-	X	-	UTF8String	V,M	P			N
Content-ID	2116	X	-	X	-	refer[223]					
Content-Provider-ID	2117	X	-	X	-	refer[223]					
Content-Length	827	X	-	X	-	Unsigned32	V,M	P			N
Content-Size	1206	-	-	X	-	Unsigned32	V,M	P			N
CSG-Access-Mode	2317	X	-	X	-	Enumerated	V,M	P			N
CSG-Id	1437	X	-	X	-	refer[219]					
CSG-Membership-Indication	2318	X	-	X	-	Enumerated	V,M	P			N
Content-Type	826	X	-	X	-	UTF8String	V,M	P			N
Current-Tariff	2056	-	-	X	X	Grouped	V,M	P			N
CUG-Information	2304	X	-	X	-	OctetString	V,M	P			N
Data-Coding-Scheme	2001	-	-	X	-	Integer32	V,M	P			N
DCD-Information	2115	X	-	X	-	refer[223]					
Deferred-Location-Event-Type	1230	-	-	X	-	UTF8String	V,M	P			N
Delivery-Report-Requested	1216	-	-	X	-	Enumerated	V,M	P			N
Delivery-Status	2104	X	-	X	-	refer[223]					
Destination-Interface	2002	-	-	X	-	Grouped	V,M	P			N
Diagnostics	2039	X	-	X	-	Integer32	V,M	P			N
Domain-Name	1200	-	-	X	-	UTF8String	V,M	P			N
DRM-Content	1221	-	-	X	-	Enumerated	V,M	P			N
Dynamic-Address-Flag	2051	X	-	X	-	Enumerated	V,M	P			N
Dynamic-Address-Flag-Extension	2068	X	-	X	-	Enumerated	V,M	P			N
Early-Media-Description	1272	X	-	-	-	Grouped	V,M	P			N
Envelope	1266	-	-	X	-	Grouped	V,M	P			N
Envelope-End-Time	1267	-	-	X	-	Time	V,M	P			N
Envelope-Reporting	1268	-	-	-	X	Enumerated	V,M	P			N
Envelope-Start-Time	1269	-	-	X	-	Time	V,M	P			N
Event	825	X	-	X	-	UTF8String	V,M	P			N
Event-Charging-TimeStamp	1258	-	-	X	-	Time	V,M	P			N
Event-Type	823	X	-	X	-	Grouped	V,M	P			N
Expires	888	X	-	X	-	Unsigned32	V,M	P			N
File-Repair-Supported	1224	X	-	X	-	Enumerated	V,M	P			Y
Flows	510	-	-	X	-	refer [214]					
From-Address	2708	X	-	X	-	UTF8String	V,M	P			N
GGSN-Address	847	X	-	X	-	Address	V,M	P			N
Guaranteed-Bitrate-UL	1026	X	-	X	-	refer[215]					
IM-Information	2110	X	-	X	-	refer[223]					
IMS-Application-Reference-Identifier	2601	X	-	-	-	UTF8String	V,M	P			N
IMS-Charging-Identifier	841	X	-	X	-	UTF8String	V,M	P			N
IMS-Communication-Service-Identifier	1281	X	-	X	-	UTF8String	V,M	P			N
IMS-Emergency-Indicator	2322	X	-	-	-	Enumerated	V,M	P			N
IMS-Information	876	X	-	X	-	Grouped	V,M	P			N
IMS-Visited-Network-Identifier	2713	X	-	X	-	UTF8String	V,M	P			N
IMSI-Unauthenticated-Flag	2308	X	-	X	-	Enumerated	V,M	P			N
Incoming-Trunk-Group-Id	852	X	-	-	-	UTF8String	V,M	P			N
Incremental-Cost	2062	-	-	X	X	Grouped	V,M	P			N
Initial-IMS-Charging-Identifier	2321	X	-	X	-	UTF8String	V,M	P			N
Interface-Id	2003	-	-	X	-	UTF8String	V,M	P			N
Interface-Port	2004	-	-	X	-	UTF8String	V,M	P			N
Interface-Text	2005	-	-	X	-	UTF8String	V,M	P			N
Interface-Type	2006	-	-	X	-	Enumerated	V,M	P			N
Inter-Operator-Identifier	838	X	-	X	-	Grouped	V,M	P			N
IP-Realm-Default-Indication	2603	X	-	-	-	Enumerated	V,M	P			N
LCS-APN	1231	-	-	X	-	UTF8String	V,M	P			N
LCS-Client-Dialed-By-MS	1233	-	-	X	-	UTF8String	V,M	P			N
LCS-Client-External-ID	1234	-	-	X	-	UTF8String	V,M	P			N
LCS-Client-Id	1232	-	-	X	-	Grouped	V,M	P			N
LCS-Client-Name	1235	-	-	X	-	Grouped	V,M	P			N
LCS-Client-Type	1241	-	-	X	-	Enumerated	V,M	P			N
LCS-Data-Coding-Scheme	1236	-	-	X	-	UTF8String	V,M	P			N
LCS-Format-Indicator	1237	-	-	X	-	Enumerated	V,M	P			N

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
LCS-Information	878	-	-	X	-	Grouped	V,M	P			N
LCS-Name-String	1238	-	-	X	-	UTF8String	V,M	P			N
LCS-Requestor-ID	1239	-	-	X	-	Grouped	V,M	P			N
LCS-Requestor-ID-String	1240	-	-	X	-	UTF8String	V,M	P			N
Local-GW-Inserted-Indication	2604	X	-	-	-	Enumerated	V,M	P			N
Local-Sequence-Number	2063	X	-	-	-	Unsigned32	V,M	P			N
Location-Estimate	1242	-	-	X	-	OctetString	V,M	P			N
Location-Estimate-Type	1243	-	-	X	-	Enumerated	V,M	P			N
Location-Type	1244	-	-	X	-	Grouped	V,M	P			N
Low-Balance-Indication	2020	-	-	-	X	Enumerated	V,M	P			N
Low-Priority-Indicator	2602	X	-	-	-	Enumerated	V,M	P			N
Mandatory-Capability	604	X	-	-	-	refer [204]					
Max-Requested-Bandwidth-DL	515	X	-	X	-	refer [214]					
Max-Requested-Bandwidth-UL	516	X	-	X	-	refer [214]					
MBMS-2G-3G-Indicator	907	X	-	X	-	refer [207]					
MBMS-GW-Address	2307	X	-	-	-	Address	V,M	P			N
MBMS-Information	880	X	-	X	-	Grouped	V,M	P			N
MBMS-Service-Area	903	X	-	X	-	refer [207]					
MBMS-Service-Type	906	X	-	X	-	refer [207]					
MBMS-Session-Identity	908	X	-	X	-	refer [207]					
MBMS-User-Service-Type	1225	X	-	X	-	Enumerated	V,M	P			Y
Media-Initiator-Flag	882	X	-	X	-	Enumerated	V,M	P			N
Media-Initiator-Party	1288	X	-	X	-	UTF8String	V,M	P			N
Message-Body	889	X	-	X	-	Grouped	V,M	P			N
Message-Class	1213	-	-	X	-	Grouped	V,M	P			N
Message-ID	1210	X	-	X	-	UTF8String	V,M	P			N
Message-Size	1212	-	-	X	-	Unsigned32	V,M	P			N
Message-Type	1211	-	-	X	-	Enumerated	V,M	P			N
MMBox-Storage-Requested	1248	-	-	X	-	Enumerated	V,M	P			N
MM-Content-Type	1203	-	-	X	-	Grouped	V,M	P			N
MME-Name	2402	X	-	-	-	refer [229]					
MME-Number-for-MT-SMS	1645	X	-	-	-	refer [230]					
MME-Realm	2408	X	-	-	-	refer [229]					
MMS-Information	877	-	-	X	-	Grouped	V,M	P			N
MMTel-Information	2030	X	-	X	-	Grouped	V,M	P			N
MMTel-SService-Type	2031	X	-	X	-	Unsigned32	V,M	P			N
MSISDN	701	-	-	X	-	refer [221]					
Neighbour-Node-Address	2705	X	-	-	-	Address	V,M	P			N
Next-Tariff	2057			X	X	Grouped	V/M	P			N
NNI-Information	2703	X	-	-	-	Grouped	V,M	P			N
NNI-Type	2704	X	-	-	-	Enumerated	V,M	P			N
Node-Functionality	862	X	-.	X	-	Enumerated	V,M	P			N
Node-Id	2064	X	-	X	-	UTF8String	V,M	P			N
Number-Of-Diversions	2034	X	-	X	-	Unsigned32	V,M	P			N
Number-Of-Messages-Sent	2019	X	-	X	-	Unsigned32	V,M	P			N
Number-Of-Messages-Successfully-Exploded	2111	X	-	X	-	refer[223]					
Number-Of-Messages-Successfully-Sent	2112	X	-	X	-	refer[223]					
Number-Of-Participants	885	X	-	X	-	Unsigned32	V,M	P			N
Number-Of-Received-Talk-Bursts	1282	X	-	-	-	Unsigned32	V,M	P			N
Number-Of-Talk-Bursts	1283	X	-	-	-	Unsigned32	V,M	P			N
Number-Portability-Routing-Information	2024	X	-	X	-	UTF8String	V,M	P			N
Offline-Charging	1278	-	-	-	X	Grouped	V,M	P			N
Online-Charging-Flag	2303	X	-	-	-	Enumerated	V,M	P			N
Optional-Capability	605	X	-	-	-	refer [204]					
Originating-IOI	839	X	-	X	-	UTF8String	V,M	P			N
Originator-SCCP-Address	2008	-	-	X	-	Address	V,M	P			N
Originator	864	X	-	X	-	Enumerated	V,M	P			N
Originator-Address	886	X	-	X	-	Grouped	V,M	P			N
Originator-Received-Address	2027	-	-	X	-	Grouped	V,M	P			N
Originator-Interface	2009	-	-	X	-	Grouped	V,M	P			N
Outgoing-Session-Id	2320	X	-	X	-	UTF8String	V,M	P			N
Outgoing-Trunk-Group-Id	853	X	-	-	-	UTF8String	V,M	P			N
Participant-Access-Priority	1259	X	-	X	-	Enumerated	V,M	P			N
Participant-Action-Type	2049	X	-	X	-	Enumerated	V,M	P			N
Participant-Group	1260	X	-	X	-	Grouped	V,M	P			N
Participants-Involved	887	X	-	X	-	UTF8String	V,M	P			N
PDG-Address	895	X	-	X	-	Address	V,M	P			N

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
PDG-Charging-Id	896	X	-	X	-	Unsigned32	V,M	P			N
PDN-Connection-Charging-ID	2050	X	-	X	-	Unsigned32	V,M	P			N
PDP-Address	1227	X	-	X	-	Address	V,M	P			Y
PDP-Context-Type	1247	X	-	X	-	Enumerated	V,M	P			N
PDP-Address-Prefix-Length	2606	X	-	X	-	Unsigned32	V,M	P			Y
PoC-Change-Condition	1261	X	-	-	-	Enumerated	V,M	P			N
PoC-Change-Time	1262	X	-	-	-	Time	V,M	P			N
PoC-Controlling-Address	858	X	-	X	-	UTF8String	V,M	P			N
PoC-Event-Type	2025	X	-	X	-	Enumerated	V,M	P			N
PoC-Group-Name	859	X	-	X	-	UTF8String	V,M	P			N
PoC-Information	879	X	-	X	-	Grouped	V,M	P			N
PoC-Server-Role	883	X	-	X	-	Enumerated	V,M	P			N
PoC-Session-Id	1229	X	-	X	-	UTF8String	V,M	P			N
PoC-Session-Initiation-type	1277	X	-	X	-	Enumerated	V,M	P			N
PoC-Session-Type	884	X	-	X	-	Enumerated	V,M	P			N
PoC-User-Role	1252	X	-	X	-	Grouped	V,M	P			N
PoC-User-Role-IDs	1253	X	-	X	-	UTF8String	V,M	P			N
PoC-User-Role-info-Units	1254	X	-	X	-	Enumerated	V,M	P			N
Positioning-Data	1245	-	-	X	-	UTF8String	V,M	P			N
Preferred-AoC-Currency	2315	-	-	X	-	Unsigned32	V,M	P			N
Priority	1209	-	-	X	-	Enumerated	V,M	P			N
Priority-Level	1046	X	-	X	-	refer [215]					
PS-Append-Free-Format-Data	867	X	-	-	X	Enumerated	V,M	P			N
PS-Free-Format-Data	866	X	-	-	X	OctetString	V,M	P			N
PS-Furnish-Charging-Information	865	X	-	-	X	Grouped	V,M	P			N
PS-Information	874	X	-	X	X	Grouped	V,M	P			N
QoS-Information	1016	X	-	X	-	refer [215]					
QoS-Class-Identifier	1028	X	-	X	-	refer [215]					
Quota-Consumption-Time	881	-	-	-	X	Unsigned32	V,M	P			N
Quota-Holding-Time	871	-	-	-	X	Unsigned32	V,M	P			N
RAI	909	X	-	X	-	refer [207]					
Rate-Element	2058	-	-	X	X	Grouped	V,M	P			N
RAT-Type	1032	X	-	X	-	refer [215]					
Read-Reply-Report-Requested	1222	-	-	X	-	Enumerated	V,M	P			N
Real-Time-Tariff-Information	2305	X	-	-	-	Grouped	V,M	P			N
Received-Talk-Burst-Time	1284	X	-	-	-	Unsigned32	V,M	P			N
Received-Talk-Burst-Volume	1285	X	-	-	-	Unsigned32	V,M	P			N
Recipient-Address	1201	X	-	X	-	Grouped	V,M	P			N
Recipient-Info	2026	-	-	X	-	Grouped	V,M	P			N
Recipient-Received-Address	2028	-	-	X	-	Grouped	V,M	P			N
Recipient-SCCP-Address	2010	-	-	X	-	Address	V,M	P			N
Refund-Information	2022	-	-	X	X	OctetString	V,M	P			N
Relationship-Mode	2706	X	-	-	-	Enumerated	V,M	P			N
Related-IMS-Charging-Identifier	2711	X	-	-	-	UTF8String	V,M	P			N
Related-IMS-Charging-Identifier-Node	2712	X	-	-	-	Address	V,M	P			N
Remaining-Balance	2021	-	-	-	X	Grouped	V,M	P			N
Reply-Applic-ID	1223	-	-	X	-	UTF8String	V,M	P			N
Reply-Path-Requested	2011	-	-	X	-	Enumerated	V,M	P			N
Reporting-Reason	872	-	-	X	-	Enumerated	V,M	P			N
Requested-Party-Address	1251	X	-	X	-	UTF8String	V,M	P			N
Required-MBMS-Bearer-Capabilities	901	X	-	X	-	refer [207]					
Role-Of-Node	829	X	-	X	-	Enumerated	V,M	P			N
Route-Header-Received	3403	X	-	-	-	UTF8String	V,M	P			N
Route-Header-Transmitted	3404	X	-	-	-	UTF8String	V,M	P			N
Scale-Factor	2059	-	-	X	X	Grouped	V,M	P			N
SDP-Answer-Timestamp	1275	X	-	-	-	Time	V,M	P			N
SDP-Media-Component	843	X	-	X	-	Grouped	V,M	P			N
SDP-Media-Description	845	X	-	X	-	UTF8String	V,M	P			N
SDP-Media-Name	844	X	-	X	-	UTF8String	V,M	P			N
SDP-Offer-Timestamp	1274	X	-	-	-	Time	V,M	P			N
SDP-Session-Description	842	X	-	X	-	UTF8String	V,M	P			N
SDP-TimeStamps	1273	X	-	-	-	Grouped	V,M	P			N
SDP-Type	2036	X	-	X	-	Enumerated	V,M	P			N
Session-Direction	2707	X	-	-	-	Enumerated	V,M	P			N

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
Served-Party-IP-Address	848	X	-	-	-	Address	V,M	P			N
Server-Capabilities	603	X	-	-	-	refer [204]					
Server-Name	602	X	-	-	-	refer [204]					
Service-Data-Container	2040	X	-	-	-	Grouped	V,M	P			N
Service-Generic-Information	1256	X	-	X	-	Refer[223]					
Service-Id	855	X	-	X	-	UTF8String	V,M	P			N
Service-Information	873	X	-	X	X	Grouped	V,M	P			N
Service-Mode	2032	X	-	X	-	Unsigned32	V,M	P			N
Service-Specific-Data	863	X	-	X	-	UTF8String	V,M	P			N
Service-Specific-Info	1249	X	-	X	-	Grouped	V,M	P			N
Service-Specific-Type	1257	X	-	X	-	Unsigned32	V,M	P			N
Serving-Node-Type	2047	X	-	X	-	Enumerated	V,M	P			N
Session-Priority	650	X	-	X	-	Refer [204]					
SGSN-Address	1228	X	-	X	-	Address	V,M	P			N
SGW-Address	2067	X	-	-	-	Address	V,M	P			N
SGW-Change	2065	X	-	-	-	Enumerated	V,M	P			N
SIP-Method	824	X	-	X	-	UTF8String	V,M	P			N
SIP-Request-Timestamp-Fraction	2301	X	-	X	-	Unsigned32	V,M	P			N
SIP-Request-Timestamp	834	X	-	X	-	Time	V,M	P			N
SIP-Response-Timestamp-Fraction	2302	X	-	X	-	Unsigned32	V,M	P			N
SIP-Response-Timestamp	835	X	-	X	-	Time	V,M	P			N
SM-Discharge-Time	2012	-	-	X	-	Time	V,M	P			N
SM-Message-Type	2007	-	-	X	-	Enumerated	V,M	P			N
SM-Protocol-ID	2013	-	-	X	-	OctetString	V,M	P			N
SMSC-Address	2017	X	-	X	-	Address	V,M	P			N
SMS-Information	2000	-	-	X	-	Grouped	V,M	P			N
SMS-Node	2016	-	-	X	-	Enumerated	V,M	P			N
SM-Service-Type	2029	-	-	X	-	Enumerated	V,M	P			N
SM-Status	2014	-	-	X	-	OctetString	V,M	P			N
SM-User-Data-Header	2015	-	-	X	-	OctetString	V,M	P			N
Sponsor-Identity	531	X	-	-	-	refer [214]					
SSID	1524	X	-	X	-	refer [237]					
Start-Time	2041	X	-	-	-	Time	V,M	P			N
Status-Code	2702	X	-	-	-	Enumerated	V,M	P			N
Stop-Time	2042	X	-	-	-	Time	V,M	P			N
Submission-Time	1202	X	-	X	-	Time	V,M	P			N
Subscriber-Role	2033	X	-	X	-	Enumerated	V,M	P			N
Supplementary-Service	2048	X	-	X	-	Grouped	V,M	P			N
TAD-Identifier	2717	X	-	-	-	Enumerated	V,M	P			N
Talk-Burst-Exchange	1255	X	-	-	-	Grouped	V,M	P			N
Talk-Burst-Time	1286	X	-	-	-	Unsigned32	V,M	P			N
Talk-Burst-Volume	1287	X	-	-	-	Unsigned32	V,M	P			N
Tariff-Information	2060	X	-	X	X	Grouped	V,M	P			N
Tariff-XML	2306	X	-	-	-	UTF8String	V,M	P			N
Terminal-Information	1401	X	-	X	-	refer [219]					
Terminating-IOI	840	X	-	X	-	UTF8String	V,M	P			N
Time-First-Usage	2043	X	-	-	-	Time	V,M	P			N
Time-Last-Usage	2044	X	-	-	-	Time	V,M	P			N
Time-Quota-Mechanism	1270	-	-	-	X	Grouped	V,M	P			N
Time-Quota-Threshold	868	-	-	-	X	Unsigned32	V,M	P			N
Time-Quota-Type	1271	-	-	-	X	Enumerated	V,M	P			N
Time-Stamps	833	X	-	X	-	Grouped	V,M	P			N
Time-Usage	2045	X	-	-	-	Unsigned32	V,M	P			N
TMGI	900	X	-	X	-	refer [207]					
Token-Text	1215	-	-	X	-	UTF8String	V,M	P			N
Total-Number-Of-Messages-Exploded	2113	X	-	X	-	refer[223]					
Total-Number-Of-Messages-Sent	2114	X	-	X	-	refer[223]					
Traffic-Data-Volumes	2046	X	-	-	-	Grouped	V,M	P			N

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
Transcoder-Inserted-Indication	2605	X	-	-	-	Enumerated	V,M	P			N
Transit-IOI-List	2701	X	-	-	-	UTF8String	V,M	P			N
Trigger	1264	-	-	X	X	Grouped	V,M	P			N
Trigger-Type	870	-	-	X	X	Enumerated	V,M	P			N
Trunk-Group-Id	851	X	-	-	-	Grouped	V,M	P			N
TWAN-User-Location-Info	2714	X	-	X	-	Grouped	V,M	P			N
Type-Number	1204	-	-	X	-	Enumerated	V,M	P			N
Unit-Cost	2061	-	-	X	X	Grouped	V,M	P			N
Unit-Quota-Threshold	1226	-	-	-	X	Unsigned32	V,M	P			N
User-CSG-Information	2319	X	-	X	X	Grouped	V,M	P			N
User-Data	606	X	-	-	-	refer [204]	V,M	P			N
User-Location-Info-Time	2812	X	-	X	-	refer [207]					
User-Participating-Type	1279	X	-	X	-	Enumerated	V,M	P			N
User–Session-Id	830	X	-	X	-	UTF8String	V,M	P			N
VAS-Id	1102	-	-	X	-	refer [213]					
VASP-Id	1101	-	-	X	-	refer [213]					
Volume-Quota-Threshold	869	-	-	-	X	Unsigned32	V,M	P			N
WAG-Address	890	X	-	X	-	Address	V,M	P			N
WAG-PLMN-Id	891	X	-	X	-	OctetString	V,M	P			N
WLAN-Information	875	X	-	X	-	Grouped	V,M	P			N
WLAN-Radio-Container	892	X	-	X	-	Grouped	V,M	P			N
WLAN-Session-Id	1246	X	-	X	-	UTF8String	V,M	P			N
WLAN-Technology	893	X	-	X	-	Unsigned32	V,M	P			N
WLAN-UE-Local-IPAddress	894	X	-	X	-	Address	V,M	P			N

7.2.1 Access-Network-Information AVP

The *Access-Network-Information* AVP (AVP code 1263) is of type OctetString and indicates the SIP P-header "P-Access-Network-Information".

7.2.1A Access-Transfer-Information AVP

The *Access-Transfer-Information* AVP (AVP code 2709) is of type Grouped and provides information on access transfer for IMS service continuity.

It has the following ABNF grammar:

Access-Transfer-Information :: = < AVP Header: 2709>

[Access-Transfer-Type]
[Access-Network-Information]

7.2.1B Access-Transfer-Type AVP

The *Access-Transfer-Type* AVP (AVP code 2710) is of type Enumerated and indicates which type of transfer occurred for IMS service continuity.

The following values are defined:

PS to CS Transfer (0)

CS to PS Transfer (1)

7.2.2 Account-Expiration AVP

The *Account-Expiration* AVP (AVP code 2309) is of type Time and indicates the subscriber account expiration date and time of day.

7.2.3 Accumulated-Cost AVP

The *Accumulated-Cost* AVP (AVP code 2052) is of type Grouped and holds the accumulated cost for the ongoing session.

It has the following ABNF grammar:

```
Accumulated-Cost:: = < AVP Header: 2052 >

                     { Value-Digits }
                     [ Exponent ]
```

7.2.4 Adaptations AVP

The *Adaptations* AVP (AVP code 1217) is of type Enumerated and indicates whether the originator allows adaptation of the content (default Yes).

The values indicating whether adaptations are allowed are:

0 Yes

1 No

7.2.5 Additional-Content-Information AVP

The *Additional-Content-Information* AVP (AVPcode 1207) is of type Grouped and identifies any subsequent content types. It is used to identify each content (including re-occurences) within an MM when the Type-Number AVP or Additional-Type-Information AVP from the Content-Type AVP indicate a multi-part content.

It has the following ABNF grammar:

```
Additional-Content-Information:: = < AVP Header: 1207 >

                                   [ Type-Number ]
                                   [ Additional-Type-Information ]
                                   [ Content-Size ]
```

7.2.6 Additional-Type-Information AVP

The *Additional-Type-Information* AVP (AVP code 1205) is of type UTF8String and identifies any additional information beyond well-known media types or non-well-known media types.

7.2.7 Address-Data AVP

The *Address-Data* AVP (AVP code 897) is of type UTF8String and indicates the address information and formatted according type of address indicated in the Address-Type AVP and according to MMS encapsulation [209].

7.2.8 Address-Domain AVP

The *Address-Domain* AVP (AVP code 898) is of type Grouped and indicates the domain/network to which the associated address resides. If this AVP is present, at least one of the AVPs described within the grouping must be included.

It has the following ABNF:

```
Address-Domain :: =  < AVP Header: 898 >

                     [ Domain-Name ]
                     [ 3GPP-IMSI-MCC-MNC ]
```

7.2.9 Address-Type AVP

The *Address-Type* AVP (AVP code 899) is of type Enumerated and indicates the type of address carried within the Address-Information AVP.

It has the following values:

0 e-mail address

1 MSISDN

2 IPv4 Address

3 IPv6 Address

4 Numeric Shortcode

5 Alphanumeric Shortcode

6 Other

7 IMSI

7.2.10 Addressee-Type AVP

The Addressee-Type AVP (AVP code 1208) is of type Enumerated and identifies the how the recipient is addressed in the header of an MM.

The following values are defined:

0 TO ;

1 CC ;

2 BCC.

7.2.11 AF-Correlation-Information AVP

The *AF-Correlation-Information* AVP (AVPcode 1276) is of type Grouped and includes the "AF Charging Identifier" (ICID for IMS) and associated flow identifiers generated by the AF and received by P-GW over Rx/Gx as defined in TS 29.214 [214] and TS 29.212 [215]. The AF-Correlation-Information is defined per Rating Group or per Rating Group and Service Identifier when Service Identifier level reporting applies.

When several AF sessions (refer to TS 29.214 [214]) are conveyed over the same bearer, this AVP may appear several times per MSCC instance.

It has the following ABNF grammar:

AF-Correlation-Information:: = < AVP Header: 1276 >

{ AF-Charging-Identifier }
* [Flows]

7.2.12 Alternate-Charged-Party-Address AVP

The *Alternate-Charged-Party-Address* AVP (AVP code 1280) is of type UTF8String and holds the address of the alternate charged party determined by an AS at IMS session initiation.

7.2.13 AoC-Cost-Information AVP

The *AoC-Cost-Information* AVP (AVP code 2053) is of type Grouped and holds accumulated and incremental cost infromation for the AoC service

It has the following ABNF grammar:

AoC-Cost-Information:: = < AVP Header: 2053 >

[Accumulated-Cost]
* [Incremental-Cost]
[Currency-Code]

7.2.14 AoC-Format AVP

The *AoC-Format* AVP (AVP code 2310) is of type Enumerated and holds the format on how the AoC information shall be sent to the UE.

It can be one of the following values:

MONETARY	0
NON_MONETARY	1
CAI	2

7.2.15 AoC-Information AVP

The *AoC-Information* AVP (AVP code 2054) is of type Grouped that includes the information required for advice of charge.

It has the following ABNF grammar:

AoC-Information:: = < AVP Header: 2054 >

[AoC-Cost-Information]
[Tariff-Information]
[AoC-Subscription-Information]

7.2.16 AoC-Request-Type AVP

The *AoC-Request-Type* AVP (AVP code 2055) is of type enumerated and tags if the client is looking for AoCI in conjunction to the Request-Type and Request-Action AVPs.

It can be one of the following values:

AoC_NOT_REQUESTED	0
AoC_FULL	1
AoC_COST_ONLY	2
AoC_TARIFF_ONLY	3

7.2.17 AoC-Service AVP

The *AoC-Service* AVP (AVP code 2311) is of type Grouped and holds the pair of AoC Service type and AoC Service obligatory type.

It has the following ABNF grammar:

AoC-Service :: = < AVP Header: 2311 >

[AoC-Service-Obligatory-Type]
[AoC-Service-Type]

7.2.18 AoC-Service-Obligatory-Type AVP

The *AoC-Service-Obligatory-Type* AVP (AVP code 2312) is of type Enumerated and holds the information if the AoC information is binding or not.

It can be one of the following values:

NON_BINDING	0
BINDING	1

7.2.19 AoC-Service-Type AVP

The *AoC-Service-Type* AVP (AVP code 2313) is of type Enumerated and defines the type of AoC information to be provided to the subscriber.

It can be one of the following values:

NONE	0
AOC-S	1
AOC-D	2
AOC-E	3

7.2.20 AoC-Subscription-Information AVP

The *AoC-Subscription-Information* AVP (AVP code 2314) is of type Grouped and holds the subscription and formatting parameters received from HSS.

It has the following ABNF grammar:

```
AoC-Subscription-Information:: =    < AVP Header: 2314 >

                                   * [ AoC-Service ]
                                     [ AoC-Format ]
                                     [ Preferred-AoC-Currency ]
```

7.2.21 Applic-ID AVP

The *Applic-ID* AVP (AVP code 1218) is of type UTF8String and holds the identification of the destination application that the underlying MMS abstract message was addressed to.

7.2.22 Application-provided-Called-Party-Address AVP

The *Application-Provided-Called-Party-Address* AVP (AVP code 837) is of type UTF8String and holds the called party number (SIP URI, E.164), if it is determined by an application server.

7.2.23 Application-Server AVP

The *Application-Server* AVP (AVP code 836) is of type UTF8String and holds the SIP URL(s) of the AS(s) addressed during the session.

7.2.24 Application-Server-Information AVP

The *Application-Server-Information* AVP (AVP code 850) is of type Grouped and contains information about application servers visited through ISC interface.

It has the following ABNF grammar:

```
<Application-Server-Information>::=  <AVP Header: 850 >
```

[Application-Server]
* [Application-Provided-Called-Party-Address]
[Status-Code]

7.2.25 Associated-Party-Address AVP

The *Associated-Party-Address* AVP (AVP code 2035) is of type UTF8String and is used for MMTel supplementary service. It holds the address (SIP URI or TEL URI) of the user, the MMTel supplementary service is provided to : the "forwarding party" for CDIV, the "transferor" for ECT, the "Pilot Identity" for Flexible Alerting (FA), the "Initiator party" for 3PTY.

7.2.26 Associated-URI AVP

The Associated-URI AVP (AVP code 856) is of type UTF8String and holds a non-barred public user identity (SIP URI or TEL URI) associated to the the public user identity under registration. This identity is obtained from the P-Associated-URI header of a 200 OK SIP response to a REGISTER request. This AVP may appear several times when the P-Associated-URI header contains more than one public user identity.

7.2.27 Authorised-QoS AVP

The *Authorised-QoS* AVP (AVP code 849) is of type UTF8String and holds the Authorised QoS as defined in TS 23.207 [200] / TS 29.207 [203] and applied via the Go reference point.

This AVP is not used.

7.2.28 Aux-Applic-Info AVP

The *Aux-Applic-Info* AVP (AVP code 1219) is of type UTF8String and holds additional application/implementation specific control information.

7.2.29 Base-Time-Interval AVP

The *Base-Time-Interval* AVP (AVP code 1265) is of type Unsigned32. It contains the length of the base time interval, for controlling the consumption of time quota, in seconds.

7.2.30 Bearer-Service AVP

The *Bearer-Service* AVP (AVP code 854) is of type OctetString and holds the used bearer service for the PSTN leg.

7.2.30A BSSID AVP

The *BSSID* AVP (AVP code 2716) is of type UTF8String and contains the BSSID of the access point where UE is located in a WLAN Access Network. The format used for BSSID is described in IEEE Std 802.11-2012 [409].

7.2.31 Called-Asserted-Identity AVP

The *Called-Asserted-Identity* AVP (AVP code 1250) is of type UTF8String and holds the address (Public User ID: SIP URI, E.164, etc.) of the finally asserted called party.

The address is obtained from the P-Asserted-Identity SIP header field of the 2xx responses corresponding to a SIP request either initiating a dialog or a standalone transaction. This field may appear several times in the request when the P-Asserted-Identity contains both a SIP URI and a TEL URI.

This field shall be present when the P-Asserted-Identity SIP header field is available in the SIP 2xx response.

7.2.32 Called-Party-Address AVP

The *Called-Party-Address* AVP (AVP code 832) is of type UTF8String. In IMS charging (except for SIP Register and SIP Subscription transactions), it holds the address (SIP URI, TEL URI or URN) of the party (Public User ID or Public Service ID) to whom the SIP transaction is posted. The Called Party Address shall be populated with the SIP URI or TEL URI contained in the Request-URI of the outgoing request.

The URN format is used for emergency services.

For a registration procedure, this field holds the party (Public User ID) to be registered. In this case, the Called Party Address field is obtained from the "To" SIP header of the SIP Request. For a subscription procedure this field holds the address of the resource for which the originator wants to receive notifications of change of states. In this case, the Called Party Address field is obtained from the outgoing Request-URI of the SIP Request.

7.2.33 Calling-Party-Address AVP

The *Calling-Party-Address* AVP (AVP code 831) is of type UTF8String and holds the address (SIP URI or TEL URI) which identifies the party (Public User Identity or Public Service Identity) initiating a SIP transaction. . It is obtained from the P-Asserted-Identity header of any non-REGISTER SIP Request, either initiating a dialog or a standalone transaction. This AVP may appear several times when the P-Asserted-Identity header contains both a SIP URI and a TEL URI. In case no P-Asserted-Identity is known, this AVP list shall include one item with the value "unknown".

7.2.34 Carrier-Select-Routing-Information AVP

The *Carrier-Select-Routing-Information* AVP (AVP code 2023) is of type UTF8String. This AVP holds information on carrier selection performed by S-CSCF/AS. This information is sent over SIP in the Requested URI header.

7.2.35 Cause-Code AVP

The *Cause-Code* AVP (AVP code 861) is of type Integer32 and includes the cause code value from IMS node. It is used in ACR [Stop] and/or ACR [Event] messages. It is also used in the CCR [Terminate] and/or CCR [Event] messages.

Within the cause codes, values ≤ 0 are reserved for successful causes while values ≥ 1 are used for failure causes. In case of errors where the session has been terminated as a result of a specific known SIP error code, then the SIP error code is also used as the cause code.

Successful cause code values.

"Normal end of session" 0

The cause "Normal end of session" is used in Accounting-request[stop] message to indicate that an ongoing SIP session has been normally released either by the user or by the network (SIP BYE message initiated by the user or initiated by the network has been received by the IMS node after the reception of the SIP ACK message).

"Successful transaction" -1

The cause "Successful transaction" is used in Accounting-request[event] message to indicate a successful SIP transaction (e.g. REGISTER, MESSAGE, NOTIFY, SUBSCRIBE). It may also be used by an Application Server to indicate successful service event execution.

"End of SUBSCRIBE dialog" -2

The cause "End of SUBSCRIBE dialog" is used to indicate the closure of a SIP SUBSCRIBE dialog . For instance a successful SIP SUBSCRIBE transaction terminating the dialog has been detected by the IMS node (i.e. SUBSCRIBE with expire time set to 0).

"2xx Final Response" -2xx

The cause-code "2xx Final Response"(except 200) is used when the SIP transaction is terminated due to an IMS node receiving/initiating a 2xx Final response as described in RFC 3261 [405].

"3xx Redirection" -3xx

The cause "3xx Redirection" is used when the SIP transaction is terminated due to an IMS node receiving/initiating a 3xx response as described in RFC 3261 [405].

"End of REGISTER dialog" -3

The cause "End of REGISTER dialog" is used to indicate the closure of a SIP REGISTER dialog. For instance a successful SIP REGISTER transaction terminating the dialog has been detected by the IMS node (i.e. REGISTER with expire time set to 0).

Failure cause code values.

"Unspecified error" 1

The cause "Unspecified error" is used when the SIP transaction is terminated due to an unknown error.

" 4xx Request failure" 4xx

The cause "4xx Request failure" is used when the SIP transaction is terminated due to an IMS node receiving/initiating a 4xx error response as described in RFC 3261 [405].

"5xx Server failure" 5xx

The cause "5xx Server failure" is used when the SIP transaction is terminated due to an IMS node receiving/initiating a 5xx error response as described in RFC 3261 [405].

"6xx Global failure" 6xx

The cause "6xx Global failure" is used when the SIP transaction is terminated due to an IMS node receiving/initiating a 6xx error response as described in RFC 3261 [405].

"Unsuccessful session setup" 2

The cause "Unsuccessful session setup" is used in the Accounting-request[stop] when the SIP session has not been successfully established (i.e. Timer H expires and SIP ACK is not received or SIP BYE is received after reception of the 200OK final response and SIP ACK is not received) as described in TS 24.229 [202] and in RFC 3261 [405].

"Internal error" 3

The cause "Internal error" is used when the SIP transaction is terminated due to an IMS node internal error (e.g. error in processing a request/response).

7.2.36 CG-Address AVP

The *CG-Address* AVP (AVP code 846) is of type Address and holds the IP-address of the charging gateway.

7.2.37 Change-Condition AVP

The *Change-Condition* AVP (AVP code 2037) is of type Integer32, and indicates the change in charging condition: (Qos change, tariff time change …) which causes:

- sending of Accounting-request from PCN node
- volume counts container closing for an IP-CAN bearer.
- service data container closing.
- record closing.

The following values are defined :

"Normal Release" 0

The "Normal Release" value is used to indicate IP-CAN session termination , IP-CAN bearer release or Service Data Flow Termination

" Abnormal Release " 1

" Qos Change " 2

"Volume Limit" 3

"Time Limit 4

"Serving Node Change" 5

"Serving Node PLMN Change" 6

"User Location Change" 7

"RAT Change" 8

"UE TimeZone Change" 9

"Tariff Time Change" 10

"Service Idled Out" 11

"serviceSpecificUnitLimit" 12

"Max Number of Changes in Charging conditions" 13

" CGI-SAI Change " 14

" RAI Change " 15

" ECGI Change " 16

" TAI Change " 17

" Service Data Volume Limit " 18

" Service Data Time Limit " 19

"Management Intervention" 20

"Service Stop" 21

"User CSG Information Change" 22

"S-GW Change"	23

7.2.38 Change-Time AVP

The *Change-Time* AVP (AVP code 2038) is of type Time.

In EPC Charging, it holds the time in UTC format when the volume counts associated to the IP-CAN bearer, or the service data container, is closed and reported due to Charging condition change.

For MMTel Charging, it holds the time in UTC format and it is a time stamp that defines the moment when the conference participant has an action (e.g. creating the conference, joining in the conference, being invited into the conference and quiting the conference) triggering the Accounting Request message to CDF

7.2.38A Charge-Reason-Code AVP

The *Charge-Reason-Code* AVP (AVP code 2118) is of type Enumerated and identifies if the Rate-Element corresponds to a specific charge type.

It can be one of the following values:

UNKNOWN	0
USAGE	1
COMMUNICATION-ATTEMPT-CHARGE	2
SETUP-CHARGE	3
ADD-ON-CHARGE	4

7.2.39 Charged-Party AVP

The Charged-Party AVP (AVP code 857) is of type UTF8String and holds the address (Public User ID: SIP URI, TEL URI, etc.) of the party to be charged.

7.2.39A Charging-Characteristics-Selection-Mode AVP

The *Charging-Characteristics-Selection-Mode* AVP (AVP code 2066) is of type Enumerated and indicates how the applied Charging-Characteristics was selected.

It may take following values:

0 Serving-Node-Supplied

1 Subscription-specific

2 APN-specific

3 Home-Default

4 Roaming-Default

5 Visiting-Default

7.2.40 Class-Identifier AVP

The *Class-Identifier* AVP (AVP code 1214) is of type Enumerated and

The values are:

0 Personal

1 Advertisement

2 Informational

3 Auto

7.2.41 Client-Address

The *Client-Address* AVP (AVP code 2018) is of type Address and is the address of the messaging Node which the OCS is connected to.

7.2.42 Content-Class AVP

The *Content-Class* AVP (AVP code 1220) is of type Enumerated and classifies the content of the MM to the highest content class to which the MM belongs, as defined in MMS Encapsulation [209].

The classes can be one of the following:

0 text

1 image-basic

2 image-rich

3 video-basic

4 video-rich

5 megapixel

6 content-basic

7 content-rich

7.2.43 Content-Disposition AVP

The *Content-Disposition* AVP (AVP code 828) is of type UTF8String and indicates how the message body or a message body part is to be interpreted (e.g. session, render), as described in RFC 3261 [405].

7.2.44 Content-Length AVP

The *Content-Length* AVP (AVP code 827) is of type Unsigned32 and holds the size of the message-body, as described in RFC 3261 [405].

7.2.45 Content-Size AVP

The *Content-Size* AVP (AVP code 1206) is of type Unsigned32 and indicates the size in bytes of the specified content type.

7.2.46 Content-Type AVP

The *Content-Type* AVP (AVP code 826) is of type UTF8String and holds the media type (e.g. application/sdp, text/html) of the message-body, as described in RFC 3261 [405].

7.2.46A CSG-Access-Mode AVP

The *CSG-Access-Mode* AVP (AVP code 2317) is of type Enumerated and holds the mode in which the CSG cell User is accessing to, operates.

It has the following values:

0 Closed mode

1 Hybrid Mode

7.2.46B CSG-Membership-Indication AVP

The *CSG-Membership-Indication* AVP (AVP code 2318) is of type Enumerated, and indicates the UE is a member of the accessing CSG cell, if the access mode is Hybrid, as described in TS 29.060 [225], and in TS 29.274 [226]. If this indication is not present, this means the UE is a Not member of the CSG cell for hybrid access mode.

The following values are defined:

0 Not CSG member

1 CSG Member

7.2.47 Current-Tariff AVP

The *Current-Tariff* AVP (AVP code 2056) is of type Grouped and holds tariff information. The Tariff is a formula for cost calculation given the *Used-Service-Unit* AVP. The calculated cost is given in the *Currency-Code* AVP. The formula sums all the rating elements and multiplies the sum by the *Scale-Factor* AVP.

It has the following ABNF grammar:

```
Current-Tariff:: =  < AVP Header: 2056 >

                      [ Currency-Code ]
                      [ Scale-Factor ]
                    * [ Rate-Element ]
```

7.2.48 CUG-Information

The *CUG-Information* AVP (AVP code 2304) is of type OctetString and holds the "CUG Interlock Code" which identifies CUG membership within the Network for "Closed User Group" MMTel supplementary service.

7.2.49 Data-Coding-Scheme AVP

The *Data-Coding-Scheme* AVP (AVP code 2001) is of type Integer 32 and contains the data coding scheme of the message. For SM applications the specific coding is as described in TS 23.040 [216].

7.2.50 DCD-Information AVP

The *DCD-Information* AVP (AVP code 2115) is of type Grouped. Its purpose is to allow the transmission of service information elements used for DCD services.

The AVP is defined in OMA-DDS-Charging_Data [223].

7.2.51 Deferred-Location-Event-Type AVP

The *Deferred-Location-Even-Type* AVP (AVP code 1230) is of type UTF8String and holds information related to a deferred location request.

7.2.52 Delivery-Report-Requested AVP

The *Delivery-Report-Requested* AVP (AVP code 1216) is of type Enumerated and indicates whether a delivery report has been requested by the originator or not.

The values for whether a report was requested are:

0 No

1 Yes

7.2.53 Destination-Interface AVP

The *Destination-Interface* AVP (AVP code 2002) is type Grouped, which contains information related to the Interface on which the message is to be delivered.

Destination-Interface ::= < AVP Header: 2002 >

[Interface-Id]
[Interface-Text]
[Interface-Port]
[Interface-Type]

7.2.54 Diagnostics AVP

The *Diagnostics* AVP (AVP code 2039) is of type Integer32 and provides a more detailed cause value from PCN node. It complements the *Change-Condition* AVP for Offline Charging.

7.2.55 Domain-Name AVP

The *Domain-Name* AVP (AVP code 1200) is of type UTF8String and represents a fully qualified domain name (FQDN).

7.2.56 DRM-Content AVP

The *DRM-Content* AVP (AVP code 1221) is of type Enumerated and indicates if the MM contains DRM-protected content.

The values are:

0 No

1 Yes

7.2.57 Dynamic-Address-Flag AVP

The *Dynamic-Address-Flag* AVP(AVP code 2051) is of type Enumerated, and indicates whether the PDP context/PDN address is statically or dynamically allocated. If this AVP is not present, this means that the address is statically allocated. The following values are defined:

0 Static

1 Dynamic

7.2.57A Dynamic-Address-Flag-Extension AVP

The *Dynamic-Address-Flag-Extension* AVP (AVP code 2068) is of type Enumerated, and indicates that the IPv4 PDN address has been dynamically allocated for that particular IP CAN bearer (PDN connection) of PDN type IPv4v6, and the dynamic IPv6 address is indicated in Dynamic Address Flag. This field if IPv4 address is static.The following values are defined:

0 Static

1 Dynamic

7.2.58 Early-Media-Description AVP

The *Early-Media-Description* AVP (AVP code 1272) is of type grouped and describes the SDP session, media parameters and timestamps related to media components set to active according to SDP signalling exchanged during a SIP session establishment before the final successful or unsuccessful SIP answer to the initial SIP INVITE message is received. Once a media component has been set to active, subsequent status changes shall also be registered.

It has the following ABNF grammar:

<Early-Media-Description>:: = <AVP Header: 1272>

[SDP-TimeStamps]
* [SDP-Media-Component]
* [SDP-Session-Description]

Media can be considered as inactive in range of situations, such as the listed below according to RFC 3264 [408]:

- Media marked with "a=inactive" attribute.
- Media offered with zero bandwith.

In contrast, media with directionality marked as "a=recvonly", "a=sendonly", "a=sendrecv" shall be considered in state "active" and thus, it may be exchanged in one or both directions.

7.2.59 Envelope AVP

The *Envelope* AVP (AVP code 1266) is a grouped AVP which reports the start and end time of one time envelope using the Envelope-Start-Time and Envelope-End-Time AVPs. Further details of its usage are described in clause 6.5.6 and 6.5.7.

Envelope :: = < AVP Header: 1266>

{ Envelope-Start-Time }
[Envelope-End-Time]
[CC-Total-Octets]
[CC-Input-Octets]
[CC-Output-Octets]
[CC-Service-Specific-Units]
* [AVP]

If an envelope has not been closed at the time of the usage report, then the Envelope-End-Time AVP shall be absent. If an envelope was started before the reporting interval then the Envelope-Start-Time is nevertheless present and contains the same time as previously reported, i.e. the actual time of the start of the envelope. The client shall include the volume reports (the CC-xxxxx-Octets AVPs) or events (CC-Service-Specific-Units) if these were requested in the corresponding Envelope-Reporting AVP. The reported volume is always the volume from the beginning of the time envelope.

In circumstances, in which an envelope is retrospectively deemed to have been closed, e.g. with Quota-Consumption-Time changes in a CCA, then the client shall include the Envelope-AVP for the envelope in the next usage report.

Multiple occurrences of this AVP shall be in chronological order, i.e. the first envelope is listed first in CCR.

7.2.60 Envelope-End-Time AVP

This *Envelope-End-Time* AVP (AVP code 1267) is of type Time. It is set to the time of the end of the time envelope.

7.2.61 Envelope-Reporting AVP

This *Envelope-Reporting* AVP (AVP code 1268) is of type Enumerated and is used in the CCA (INITIAL) to indicate whether the client shall report the start and end of each time envelope, in those cases in which quota is consumed in envelopes.

It can take the values:

DO_NOT_REPORT_ENVELOPES	(0)
REPORT_ENVELOPES	(1)
REPORT_ENVELOPES_WITH_VOLUME	(2)
REPORT_ENVELOPES_WITH_EVENTS	(3)
REPORT_ENVELOPES_WITH_VOLUME_AND_EVENTS	(4)

If this AVP is not included in the CCA (INITIAL) then the client shall not report the individual envelopes. If this AVP is included within the Offline-Charging AVP, the value shall dictate the mechanism by which offline charging information is generated.

7.2.62 Envelope-Start-Time AVP

The *Envelope-Start-Time* AVP (AVP code 1269) is of type Time. It is set to the time of the packet of user data which caused the time envelope to start.

7.2.63 Event AVP

The *Event* AVP (AVP code 825) is of type UTF8String and holds the content of the "Event" header.

7.2.64 Event-Charging-TimeStamp AVP

The *Event-Charging-TimeStamp* AVP (AVP code 1258) is of type Time, and it holds the timestamp of the event reported in the CC-Service-Specific-Units AVP when event based charging applies.

Editor's Note: The SIP parameter from which the IMS Application Reference ID (IARI) is to be extracted requires further investigation in CT1. A mechanism to identify the IARI in use is ffs.

7.2.65 Event-Type AVP

The *Event-Type* AVP (AVP code 823) is of type Grouped and contains information about the type of chargeable telecommunication service/event for which the accounting-request and/or credit control request message(s) is generated.

It has the following ABNF grammar:

```
<Event-Type>::  =  <AVP Header: 823 >

                   [ SIP-Method ]
                   [ Event ]
                   [ Expires ]
```

7.2.66 Expires AVP

The *Expires* AVP (AVP code 888) is of type Unsigned32 and holds the content of the "Expires" header.

Editor's note: to be clarified.

7.2.67 File-Repair-Supported AVP

The File-Repair-Supported AVP (AVP code 1224) is of type Enumerated and indicates whether the MBMS user service supports point-to-point file repair. The following values are supported:

SUPPORTED (1)

The MBMS user service does support point-to-point file repair.

NOT_SUPPORTED (2)

The MBMS user service does not support point-to-point file repair.

7.2.67A From-Address AVP

The *From-Address* AVP (AVP code 2708) is of type UTF8String and includes the information from the SIP From header.

7.2.68 GGSN-Address AVP

The *GGSN-Address* AVP (AVP code 847) is of type Address and holds the IP-address of the P-GW that generated the GPRS/EPC Charging ID, as described in [1].

7.2.69 IM-Information AVP

The *IM-Information* AVP (AVP code 2110) is of type Grouped. Its purpose is to allow the transmission of service information elements used for IM services.

The AVP is defined in OMA-DDS-Charging_Data [223].

7.2.70 Incremental-Cost AVP

The *Incremental-Cost* AVP (AVP code 2062) is of type Grouped and holds the incremental cost since last AoC interaction for the ongoing session.

It has the following ABNF grammar:

Incremental-Cost:: = < AVP Header: 2062 >

{ Value-Digits }
[Exponent]

7.2.71 Interface-Id AVP

The *Interface-Id* AVP (AVP code 2003) is of type UTF8String and holds the interface identification provided by the messaging node (originator/destination).

7.2.72 Interface-Port AVP

The *Interface-Port* AVP (AVP code 2004) is of type UTF8String and holds the port-identification or contains information about the transport layer port used by the application associated with the charging event.

7.2.73 Interface-Text AVP

The *Interface-Text* AVP (AVP code 2005) is of type UTF8String and is the consolidation information about the application associated with the charging event.

7.2.74 Interface-Type AVP

The *Interface-Type* AVP (AVP code 2006) is of type Enumerated and contains information about type of interface / nature of the transaction in the messaging node for which the charging event occurs. The AVP can take the following values:

0 Unknown

1 MOBILE_ORIGINATING

2 MOBILE_TERMINATING

3 APPLICATION_ORIGINATING

4 APPLICATION_TERMINATION

7.2.74A IMS-Application Reference-Identifier AVP

The *IMS-Application-Reference-Identifier* AVP (AVP code 2601) is of type UTF8String and holds the IMS Application Reference Identifier (IARI) as contained in a SIP request to identify an IMS Application as defined in TS 24.229 [202].

Editor's Note: The SIP parameter from which the IMS Application Reference ID (IARI) is to be extracted requires further investigation in CT1. A mechanism to identify the IARI in use is ffs.

7.2.75 IMS-Charging-Identifier AVP

The *IMS-Charging-Identifier* AVP (AVP code 841) is of type UTF8String and holds the IMS Charging Identifier (ICID) as generated by a IMS node for a SIP session and described in TS 24.229 [204].

7.2.76 IMS-Communication-Service-Identifier AVP

The *IMS-Communication-Service-Identifier* AVP (AVP code 1281) is of type UTF8String and holds the IMS Communication Service Identifier (ICSI) as contained in the P-Asserted-Service header of a SIP request to identify an IMS Communication Service as defined in TS 24.229 [202].

7.2.76A IMS-Emergency-Indicator AVP

The *IMS-Emergency-Indicator* AVP (AVP code 2322) is of type Enumerated, and indicates the IMS session is an IMS emergency session or IMS registration. If this AVP is not present, this means the IMS session or registration is not detected as an emergency session or registration. The following values are defined:

0 Non Emergency

1 Emergency

7.2.77 IMS-Information AVP

The *IMS-Information* AVP (AVP code 876) is of type Grouped. Its purpose is to allow the transmission of additional IMS service specific information elements.

It has the following ABNF grammar:

```
IMS-Information :: =      < AVP Header: 876>

                          [ Event-Type ]
                          [ Role-Of-Node ]
                          { Node-Functionality }
                          [ User-Session-Id ]
                          [ Outgoing-Session-Id ]
                          [ Session-Priority ]
                        * [ Calling-Party-Address ]
```

[Called-Party-Address]
* [Called-Asserted-Identity]
[Number-Portability-Routing-Information]
[Carrier-Select-Routing-Information]
[Alternate-Charged-Party-Address]
*[Requested-Party-Address]
* [Associated-URI]
[Time-Stamps]
* [Application-Server-Information]
* [Inter-Operator-Identifier]
* [Transit-IOI-List]
[IMS-Charging-Identifier]
* [SDP-Session-Description]
* [SDP-Media-Component]
[Served-Party-IP-Address]
[Server-Capabilities]
[Trunk-Group-ID]
[Bearer-Service]
[Service-Id]
* [Service-Specific-Info]
* [Message-Body]
[Cause-Code]
[Access-Network-Information]
* [Early-Media-Description]
[IMS-Communication-Service-Identifier]
[IMS-Application-Reference-Identifier]
[Online-Charging-Flag]
[Real-Time-Tariff-Information]
[Account-Expiration]
[Initial-IMS-Charging-Identifier]
* [NNI-Information]
[From-Address]
[IMS-Emergency-Indicator]
[IMS-Visited-Network-Identifier]
* [Access-Transfer-Information]
[Related-IMS-Charging-Identifier]
[Related-IMS-Charging-Identifier-Node]
[Route-Header-Received]
[Route-Header-Transmitted]
[TAD-Identifier]

7.2.77A IMS-Visited-Network-Identifier AVP

The *IMS-Visited-Network-Identifier* AVP (AVP code 2713) is of type UTF8String and contains the contents of the SIP P-header "P-Visited-Network-ID".

7.2.78 IMSI-Unauthenticated-Flag AVP

The *IMSI-Unauthenticated-Flag* AVP (AVP code 2308) is of type Enumerated, and indicates the served IMSI is not authenticated. This may occur when emergency bearer service is provided (refer to TS 23.060 [74] and TS 29.274 [91]). If this flag is not present, this means the served IMSI is authenticated.

The following values are defined:

0 Authenticated

1 Unauthenticated

7.2.79 Incoming-Trunk-Group-ID AVP

The *Incoming-Trunk-Group-ID* AVP (AVP code 852) is of type UTF8String and identifies the incoming PSTN leg.

7.2.79A Initial-IMS-Charging-Identifier AVP

The *Initial-IMS-Charging-Identifier* AVP (AVP code 2321) is of type UTF8String and holds the Initial IMS Charging Identifier (ICID) as generated by a IMS node for the initial SIP session created for IMS service continuity.

7.2.80 Inter-Operator-Identifier AVP

The *Inter-Operator-Identifier* AVP (AVP code 838) is of type Grouped and holds the identification of the network neighbours (originating and terminating) as exchanged via SIP signalling and described in [404].

It has the following ABNF grammar:

<Inter-Operator-Identifier>:: = < AVP Header: 838 >

[Originating-IOI]
[Terminating-IOI]

7.2.80A IP-Realm-Default-Indication AVP

The *IP-Realm-Default-Indication-Indication* AVP (AVP code 2603) is of type Enumerated and indicates whether the IP realm used for the SDP media component is the Default IP realm or not.

The following values are defined:

0 Default IP Realm Not used

1 Default IP realm used

7.2.81 LCS-APN AVP

The *LCS-APN* AVP (AVP code 1231) is of type UTF8String and contains the APN of the LCS Client.

7.2.82 LCS-Client-Dialed-By-MS AVP

The *LCS-Client-Dialed-By-MS* AVP (AVP code 1233) is of type UTF8String and holds the number of the LCS Client dialled by the UE.

7.2.83 LCS-Client-External-ID AVP

The *LCS-Client-External-ID* AVP (AVP code 1234) is of type UTF8String and holds the identification of the external LCS Client.

7.2.84 LCS-Client-ID AVP

The *LCS-Client-Id* AVP (AVP code 1232) is of type Grouped and holds information related to the identity of an LCS client.

It has the following ABNF grammar:

<LCS-Client-ID>:: = < AVP Header: 1232 >

[LCS-Client-Type]
[LCS-Client-External-ID]

[LCS-Client-Dialed-By-MS]
[LCS-Client-Name]
[LCS-APN]
[LCS-Requestor-ID]

7.2.85 LCS-Client-Name AVP

The *LCS-Client-Name* AVP (AVP code 1235) is of type Grouped and contains the information related to the name of the LCS Client.

It has the following ABNF grammar:

<LCS-Client-Name>:: = < AVP Header: 1235>

[LCS-Data-Coding-Scheme]
[LCS-Name-String]
[LCS-Format-Indicator]

7.2.86 LCS-Client-Type AVP

The *LCS-Client-Type* AVP (AVP code 1241) is of type Enumerated and contains the type of services requested by the LCS Client.

It can be one of the following values:

EMERGENCY_SERVICES	0
VALUE_ADDED_SERVICES	1
PLMN_OPERATOR_SERVICES	2
LAWFUL_INTERCEPT_SERVICES	3

7.2.87 LCS-Data-Coding-Scheme AVP

The *LCS-Data-Coding-Scheme* AVP (AVP code 1236) is of type UTF8String and contains the information of the alphabet and the language used.

7.2.88 LCS-Format-Indicator AVP

The *LCS-Format-Indicator* AVP (AVP code 1237) is of type Enumerated and contains the format of the LCS Client name.

It can be one of the following values:

LOGICAL_NAME	0
EMAIL_ADDRESS	1
MSISDN	2
URL	3
SIP_URL	4

7.2.89 LCS-Information AVP

The LC*S-Information* AVP (AVP code 878) is of type Grouped. Its purpose is to allow the transmission of additional LCS service specific information elements.

It has the following ABNF grammar:

LCS-Information :: = < AVP Header: 878>

[LCS-Client-ID]
[Location-Type]
[Location-Estimate]

[Positioning-Data]
[3GPP-IMSI]
[MSISDN]

7.2.90 LCS-Name-String AVP

The *LCS-Name-String* AVP (AVP code 1238) is of type UTF8String and contains the LCS Client name.

7.2.91 LCS-Requestor-ID AVP

The LCS-Requestor-ID AVP (AVP code 1239) is of type Grouped and contains information related to the identification of the Requestor.

It has the following ABNF grammar:

<LCS-Requestor-ID>:: = < AVP Header: 1239 >

[LCS-Data-Coding-Scheme]
[LCS-Requestor-ID-String]

7.2.92 LCS-Requestor-ID-String AVP

The *LCS-Requestor-ID-String* AVP (AVP code 1240) is of type UTF8String and contains the identification of the Requestor and can be e.g. MSISDN or logical name.

7.2.92A Local-GW-Inserted-Indication AVP

The *Local-GW-Inserted-Indication* AVP (AVP code 2604) is of type Enumerated and indicates if the local GW (TrGW, IMS-AGW) is inserted or not for the SDP media component.

The following values are defined:

0 Local GW Not Inserted

1 Local GW Inserted

7.2.93 Local-Sequence-Number AVP

The *Local-Sequence-Number* AVP (AVP code 2063) is of type Unsigned32 and holds the service data container sequence number : increased by 1 for each service data container closed.

7.2.94 Location-Estimate AVP

The *Location-Estimate* AVP (AVP code 1242) is of type OctetString and contains an estimate of the location of an MS in universal coordinates and the accuracy of the estimate. Refers to geographical area descriptions in 3GPP TS 23.032 [227] for the internal structure and encoding of this AVP.

7.2.95 Location-Estimate-Type AVP

The *Location-Estimate-Type* AVP (AVP code 1243) is of type Enumerated and contains one of the following values:

CURRENT_LOCATION	0
CURRENT_LAST_KNOWN_LOCATION	1
INITIAL_LOCATION	2
ACTIVATE_DEFERRED_LOCATION	3
CANCEL_DEFERRED_LOCATION	4

7.2.96 Location-Type AVP

The *Location-Type* AVP (AVP code 1244) is of type Grouped and indicates the type of location estimate required by the LCS client.

It has the following ABNF grammar:

```
Location-Type:: =       < AVP Header: 1244>

                        [ Location-Estimate-Type ]
                        [ Deferred-Location-Event-Type ]
```

7.2.97 Low-Balance-Indication AVP

The *Low-Balance-Indication* AVP (AVP code 2020) is of type Enumerated and indicates if the subscriber balance went below a designated threshold by its account.
This indication can be used to advise the end user about the need to replenish his balance.

It can be one of the following values:

NOT-APPLICABLE	0
YES	1

7.2.97A Low-Priority-Indicator AVP

The *Low-Priority-Indicator* AVP (AVP code 2602) is of type Enumerated and indicates if the PDN connection has a low priority, i.e. for Machine Type Communications.

It can be one of the following values:

NO	0
YES	1

7.2.98 MBMS-GW-Address AVP

The *MBMS-GW-Address* AVP (AVP code 2307) is of type Address and holds the IP-address . This AVP of the MBMS GW that generated the MBMS Charging ID when MBMS GW is stand-alone.

7.2.99 MBMS-Information AVP

The *MBMS-Information* AVP (AVP code 880) is of type Grouped. Its purpose is to allow the transmission of additional MBMS service specific information elements.

It has the following ABNF grammar:

```
MBMS-Information :: =   < AVP Header: 880>

                        [ TMGI ]
                        [ MBMS-Service-Type ]
                        [ MBMS-User-Service-Type ]
                        [ File-Repair-Supported ]
                        [ Required-MBMS-Bearer-Capabilities ]
                        [ MBMS-2G-3G-Indicator ]
                        [ RAI ]
                      * [ MBMS-Service-Area ]
                        [ MBMS-Session-Identity ]
                        [ CN-IP-Multicast-Distribution ]
                        [ MBMS GW-Address ]
```

7.2.100 MBMS-User-Service-Type AVP

The *MBMS-User-Service-Type* AVP (AVP code 1225) is of type Enumerated indicates type of service the the MBMS user service that is being delivered. The following values are supported:

DOWNLOAD (1)

The MBMS user service of type: download.

STREAMING (2)

The MBMS user service is of type: streaming.

7.2.101 Media-Initiator-Flag AVP

The *Media-Initiator-Flag* AVP (AVP code 882) is of type Enumerated and indicates which party has requested the session modification. The default value is ‘0’ indicating the called party initiated the modification.

[0] called party

[1] calling party

[2] unknown

7.2.102 Media-Initiator-Party AVP

The *Media-Initiator-Party* AVP (AVP code 1288) is of type UTF8String. Enumerated in IMS charging, it holds the address (SIP URI or TEL URI) of the party (Public User ID or Public Service ID) who initiates the media action, like adding/removing, connecting/disconnecting the media. The Media Initiator Party shall be populated with the SIP URI or TEL URI contained in the Request-URI of the outgoing request. It is use for PoC charging.

7.2.103 Message-Body AVP

The *Message-Body* AVP (AVP Code 889) is of type Grouped AVP and holds information about the message bodies including user-to-user data.

It has the following ABNF grammar:

```
<Message-Body>::=     < AVP Header: 889 >

                      { Content-Type }
                      { Content-Length }
                      [ Content-Disposition ]
                      [ Originator ]
```

The message bodies shall not include the bodies' of Content-Type = "application-sdp" as these are captured in other AVPs.

7.2.104 Message-Class AVP

The *Message-Class* AVP (AVP code 1213) is of type Grouped.

It has the following ABNF grammar:

```
Message-Class :: = < AVP Header: 1213 >

                      [ Class-Identifier ]
                      [ Token-Text ]
```

7.2.105 Message-ID AVP

The *Message-ID* AVP (AVP code 1210) is of type UTF8String and holds the identification of the message being charged.

7.2.106 Message-Size AVP

The *Message-Size* AVP (AVP code 1212) is of type Unsigned32. For MMS, it holds the total size in bytes of the MM calculated according to TS 23.140 [208]. For SMS, it holds the total size in octets of SM including any user data header.

7.2.107 Message-Type AVP

The *Message-Type* AVP (AVP code 1211) is of type Enumerated and holds the type of the message according to the MMS transactions e.g. submission, delivery.

The following values are defined and are as specified in MMS Encapsulation [209]:

1 m-send-req

2 m-send-conf

3 m-notification-ind

4 m-notifyresp-ind

5 m-retrieve-conf

6 m-acknowledge-ind

7 m-delivery-ind

8 m-read-rec-ind

9 m-read-orig-ind

10 m-forward-req

11 m-forward-conf

12 m-mbox-store-conf

13 m-mbox-view-conf

14 m-mbox-upload-conf

15 m-mbox-delete-conf

7.2.108 MM-Content-Type AVP

The *MM-Content-Type* AVP (AVP code 1203) is of type Grouped and indicates the overall content type of the MM content and includes information about all the contents of an MM.

It has the following ABNF grammar:

```
MM-Content-Type :: =        < AVP Header: 1203 >

                            [ Type-Number ]
                            [ Additional-Type-Information ]
                            [ Content-Size ]
                          * [ Additional-Content-Information ]
```

7.2.109 MMBox-Storage-Requested AVP

The *MMBox-Storage-Requested* AVP (AVP code 1248) is of type Enumerated and indicates whether an MMBoxstorage has been requested by the originator MMS User Agent or not. The values for whether an MMBox Storage was requested are:

0 No

1 Yes

7.2.110 MMS-Information AVP

The MMS*-Information* AVP (AVP code 877) is of type Grouped. Its purpose is to allow the transmission of additional MMS service specific information elements.

It has the following ABNF grammar:

```
MMS-Information :: =        < AVP Header: 877>

                              [ Originator-Address ]
                            * [ Recipient-Address ]
                              [ Submission-Time ]
                              [ MM-Content-Type ]
                              [ Priority ]
                              [ Message-ID ]
                              [ Message-Type ]
                              [ Message-Size ]
                              [ Message-Class ]
                              [ Delivery-Report-Requested ]
                              [ Read-Reply-Report-Requested ]
                              [ MMBox-Storage-Requested ]
                              [ Applic-ID ]
                              [ Reply-Applic-ID ]
                              [ Aux-Applic-Info ]
                              [ Content-Class ]
                              [ DRM-Content ]
                              [ Adaptations ]
                              [ VASP-Id ]
                              [ VAS-Id ]
```

7.2.111 MMTel-Information AVP

The MMTel-*Information* AVP (AVP code 2030) is of type Grouped. Its purpose is to allow the transmission of additional MMtel service specific information elements. It holds MMTel supplementary services invoked during MMTel service.

It has the following ABNF grammar:

```
MMTel-Information :: =  < AVP Header: 2030>

                              * [ Supplementary-Service]
```

7.2.111aA MMTel-SService-Type AVP

The *MMTel-SService-Type* AVP (AVP Code 2031) is of type Unsigned32 and identifies the type of MMTel supplementary service.

The following values are defined:

"Originating Identification Presentation (OIP)"	0
"Originating Identification Restriction (OIR)"	1

"Terminating Identification Presentation (TIP)" 2

"Terminating Identification Restriction (TIR)" 3

"Communication HOLD (HOLD)" 4

"Communications Barring (CB)" 5

"Communication Diversion (CDIV)" 6

"Communication Diversion Notification (CDIVN)" 7

"Communication Waiting (CW)" 8

"Message Waiting Indication (MWI)" 9

"Conference (CONF)" 10

"Flexible Alerting (FA)" 11

"Completion of Communication to Busy Subscriber (CCBS)" 12

"Completion of Communications on No Reply (CCNR)" 13

"Malicious Communication Identification (MCID) 14

"Customized Alerting Tone" (CAT) 15

"Closed User Group" (CUG) 16

"Personal Network management" (PNM) 17

"Customized Ringing Signal" (CRS) 18

"Advice of Charge (AoC)" 19

"Explicit Communication Transfer (ECT)" 20

Values ≥ 1024 are reserved for specific Network/Manufacturer supplementary services variants

7.2.111A Neighbour-Node-Address AVP

The *Neighbour-Node-Address* AVP (AVP code 2705) is of type Address and holds the control plane IP address of the neighboring network contact point that handles the service request in case of interconnection and roaming.

7.2.112 Next-Tariff AVP

The *Next-Tariff* AVP (AVP code 2057) is of type Grouped and holds tariff information. The Tariff is a formula for cost calculation given the *Used-Service-Unit* AVP. The calculated cost is given in the *Currency-Code* AVP. The formula sums all the rating elements and multiplies the sum by the *Scale-Factor* AVP.

It has the following ABNF grammar:

```
Next-Tariff :: =  < AVP Header: 2057 >

                    [ Currency-Code ]
                    [ Scale-Factor ]
                  * [ Rate-Element ]
```

7.2.112A NNI-Information AVP

The *NNI-Information* AVP (AVP code 2703) is of type Grouped and holds information about the NNI used for interconnection and roaming.

It has the following ABNF grammar:

NNI-Information :: = < AVP Header: 2703>

[Session-Direction]
[NNI-Type]
[Relationship-Mode]
[Neighbour-Node-Address]

7.2.112B NNI-Type AVP

The *NNI-Type* AVP (AVP code 2704) is of type Enumerated and indicates whether the type of used NNI is non-roaming, roaming without loopback routing or roaming with loopback routing,

It has the following values:

0 non-roaming

1 roaming without loopback

2 roaming with loopback

7.2.113 Node-Functionality AVP

The *Node-Functionality* AVP (AVP code 862) is of type Enumerated and includes the *functionality* identifier of the *node*.

The functionality identifier can be one of the following:

S-CSCF	0
P-CSCF	1
I-CSCF	2
MRFC	3
MGCF	4
BGCF	5
AS	6
IBCF	7
S-GW	8
P-GW	9
HSGW	10
E-CSCF	11
MME	12
TRF	13
TF	14
ATCF	15

7.2.114 Node-Id AVP

The *Node-Id* AVP (AVP code 2064) is of type UTF8String and includes an optional, operator configurable identifier string for the node.

7.2.115 Number-Of-Diversions AVP

The *Number-of-Diversions* AVP (AVP Code 2034) is of type Unsigned32 and holds the number of diversions related to a CDIV service. When counting the number of diversions, all types of diversion are included.

7.2.116 Number-Of-Messages-Sent AVP

The *Number-Of-Messages-Sent* AVP (AVP code 2019) is of type Unsigned32 and indicates the number of SMSs sent by the IMS application if applicable.

7.2.117 Number-Of-Participants AVP

The *Number-Of-Participants* AVP (AVP code 885) is of type Unsigned32 and holds the number of invited parties of the multi-party session when included in the initial charging request message, e.g. in PoC, CONFerence and SIMPLE IM. When included in interim / update charging messages, it indicates the number of parties who are currently attached in the session at the time the interim / update messages are sent.

NOTE: The information to populate this field may be obtained from the TBCP-Talk-Burst-Grant message in PoC case. The information to populate this field may be obtained from the Diameter Accounting Request message in MMTel CONF Charging.

7.2.118 Number-Of-Received-Talk-Bursts AVP

The *Number-Of-Received-Talk-Bursts* AVP (AVP code 1282) is of type Unsigned32 and holds the number of the received talk bursts.

7.2.119 Number-Of-Talk-Bursts AVP

The *Number-Of-Talk-Bursts* AVP (AVP code 1283) is of type Unsigned32 and holds the number of the sent talk bursts.

7.2.120 Number-Portability-Routing-Information AVP

The *Number-Portability-Routing-Information* AVP (AVP code 2024) is of type UTF8String and holds information on routing number received by S-CSCF during number portability look-up (ENUM/DNS). This information is sent over SIP in the Requested URI header.

7.2.121 Offline-Charging AVP

The *Offline-Charging* AVP (AVP code 1278) is a grouped AVP, which is used to set the parameters required to control offline charging.

It has the following ABNF grammar:

```
Offline-Charging ::=    < AVP Header:1278 >

                          [ Quota-Consumption-Time ]
                          [ Time-Quota-Mechanism ]
                          [ Envelope-Reporting ]
                        * [ Multiple-Services-Credit-Control ]
                        * [ AVP ]
```

At most one of Quota-Consumption-Time AVP or Time-Quota-Mechanism AVP shall be present, if individual instances are not included within the Multiple-Services-Credit-Control AVP.

The Multiple-Services-Credit-Control AVPs, if present, shall contain the Rating-Group AVP to identify the category, optionally one of Quota-Consumption-Time AVP and Time-Quota-Mechanism AVP, and optionally the Envelope-Reporting AVP.

Any values specified in the Offline-Charging AVP take precedence over the configured defaults. The values of the parameters specified at Multiple-Services-Credit-Control level take precedence over the values specified directly at Offline-Charging level. If neither Quota-Consumption-Time AVP nor Time-Quota-Mechanism AVP is included in the Multiple-Services-Credit-Control AVP, then the general reporting requirements dictated by the Quota-Consumption-Time AVP or Time-Quota-Mechanism AVP and Envelope-Reporting AVP directly within the Offline-Charging AVP shall apply.

7.2.122 Online-Charging-Flag AVP

The *Online-Charging-Flag* AVP (AVP code 2303) is of type Enumerated and indicates the Online Charging Request was sent based on the provided ECF address from the SIP P-header "P-Charging-Function-Addresses".

It has the following values:

0 ECF address not provided

1 ECF address provided

7.2.123 Originating-IOI AVP

The *Originating-IOI* AVP (AVP code 839) is of type UTF8String (alphanumeric string) and holds the Inter Operator Identifier (IOI) for the originating network as generated by the IMS network element which takes responsibility for populating this parameter [404] in a SIP request as described in TS 24.229 [202].

The Originating IOI contains the following values:

- Type 1 IOI:
  - IOI of the visited network where the P-CSCF is located for SIP requests directed to the S-CSCF when initiated by the served user.
  - IOI of the home network where the S-CSCF is located for SIP requests directed to the TRF in the visited network when "VPLMN routing" is applied in a Roaming Architecture for Voice over IMS with Local breakout.
  - IOI of the home network where the S-CSCF is located for SIP requests directed to the visited network P-CSCF when terminated at the served user.
- Type 2 IOI:
  - IOI of the home network of the originating end user where the S-CSCF is located in case a session is initiated from the IMS. In case of redirection by the S-CSCF, *Originating-IOI* AVP indicates the terminating party's network operator from which the session is redirected.
  - IOI of the visited network when "VPLMN routing" is applied in a Roaming Architecture for Voice over IMS with Local breakout.
  - IOI of the originating network where the MGCF is located in case a session is initiated from the PSTN toward the IMS.
- Type 3 IOI:
  - IOI of the home network (originating side or terminating side) where the S-CSCF is located when forwarding a SIP request as described in TS 24.229 [202] to an AS (proxy, terminating UA or redirect server or B2BUA).
  - IOI of the service provider network where the AS is located when an AS (originating UA or B2BUA) initiates a SIP request as described in TS 24.229 [202].

For further details on the Type 1, Type 2 and Type 3 IOIs, please refer to TS 32.240 [1].

7.2.124 Originator AVP

The *Originator* AVP (AVP code 864) is of type Enumerated and indicates the originating party of the message body. The following values are defined:

Calling Party 0

Called Party 1

7.2.125 Originator-Address AVP

The *Originator-Address* AVP (AVP code 886) is of type Grouped. Its purpose is to identify the originator of a message.

It has the following ABNF grammar:

Originator-Address :: = < AVP Header: 886 >

[Address-Type]
[Address-Data]
[Address-Domain]

7.2.126 Originator-Interface AVP

The *Originator-Interface* AVP (AVP code 2009) is the group AVP which contains information related to the Interface on which the message originated.

Originator-Interface ::= < AVP Header: 2009 >

[Interface-Id]
[Interface-Text]
[Interface-Port]
[Interface-Type]

7.2.127 Originator-Received-Address AVP

The *Originator-Received-Address* AVP (AVP code 2027) is of type Grouped. Its purpose is to identify the originator of a message with the original, unmodified address information as received before any address manipulations has taken place in the entity generating the charging information. This field allows correlation of address information with information generated by other nodes in the message flow.

It has the following ABNF grammar:

Originator-Received-Address :: = < AVP Header: 2027>

[Address-Type]
[Address-Data]
[Address-Domain]

7.2.128 Originator-SCCP-Address

The *Originator-SCCP-Address* AVP (AVP code 2008) is of type Address. It is the "SCCP calling address" used by the messaging node when receiving a message. This is usually the address of the MSC or SGSN/Serving Node that was serving the UE when it submitted the message. It contains either a Point Code (ISPC) or a Global Title, where Global Title represents an E.164 number. The Address Type discriminator in RFC 3588 [401] is set to value 8, E.164, and the address information is UTF8 encoded.

7.2.128AOutgoing-Session-Id AVP

The *Outgoing-Session-Id* AVP (AVP code 2320) is of type UTF8String and holds the outgoing session identifier for an AS acting as B2BUA. For a SIP session the Outgoing-Session-Id AVP contains the SIP Call ID of the outgoing leg, as defined in RFC 3261 [405].

7.2.129 Outgoing-Trunk-Group-ID AVP

The *Outgoing-Trunk-Group-ID* AVP (AVP code 853) is of type UTF8String and identifies the outgoing PSTN leg.

7.2.130 Participants-Involved AVP

The *Participants-Involved* AVP (AVP code 887) is of type UTF8String and holds the list of address (Public User ID: SIP URI, TEL URI, MSISDN) of the parties who are involved into the PoC session.

7.2.131 Participant-Group AVP

The *Participant-Group* AVP (AVP code 1260) is of type Grouped and holds detailed information, e.g. the address (Public User ID: SIP URI, TEL URI, MSISDN), the access priority parameters, etc, of the party who is involved into the PoC session.

It has the following ABNF grammar:

< Participant-Group > :: = < AVP Header: 1260>

[Called-Party-Address]
[Participant-Access-Priority]
[User-Participating-Type]

7.2.132 Participant-Access-Priority AVP

Participant-Access-Priority AVP (AVP code 1259) is of type Enumerated. It is a subfield of Participants-Group AVP to indicate the priority level for users when initiating a new PoC session or participating in a PoC session.

The AVP may take the values as follows:

1 Pre-emptive priority: The highest level priority. A request with pre-emptive priority SHALL cause the current other requests to be revoked immediately, unless they are also with pre-emptive priority.

2 High priority: Lower than Pre-emptive priority.

3 Normal priority: Normal level. Lower than High priority.

4 Low priority: Lowest level priority.

7.2.133 Participant-Action-Type AVP

The *Participant-Action-Type* AVP (AVP code 2049) is of type Enumerated and holds the participant's action type during the conference for Billing Domain's information.

The following values are defined according to TS 24.605 [219]:

CREATE_CONF	0
JOIN_CONF	1
INVITE_INTO_CONF	2
QUIT_CONF	3

7.2.134 PDG-Address AVP

The *PDG-Address* AVP (AVP code 895) is of type Address and contains the PDG IP address.

7.2.135 PDG-Charging-Id AVP

The *PDG-Charging-Id* AVP (AVP code 896) is of type Unsigned32 and contains the charging identifier generated by the PDG for the tunnel. Charging identifier is generated at tunnel establishment and transferred to 3GPP AAA Server.

Different PDGs allocate the charging identifier independently of each other and may allocate the same numbers. PDG-Charging-Id together with PDG-Address constitutes a unique identifier for the tunnel.

Coding of this AVP is same as 3GPP-Charging-Id coding described in TS 29.061 [207].

7.2.136 PDN-Connection-Charging-ID AVP

The *PDN-Connection-Charging-ID* AVP (AVP code 2050) is of type Unsigned32 and contains the charging identifier to identify different records belonging to same PDN connection. This field includes Charging Id of first IP-CAN bearer activated within the PDN connection. Together with P-GW address this uniquely identifies the PDN connection for charging.

Coding of this AVP is same as 3GPP-Charging-Id coding described in TS 29.061 [207].

7.2.137 PDP-Address AVP

The *PDP-Address* AVP (AVP code 1227) is of type Address and holds the IP-address associated with the IP CAN bearer session (PDP context / PDN connection). The PDP-Address-Prefix-Length AVP needs not be available for IPv6 typed IP-address prefix length of 64 bits.

7.2.137a PDP-Address-Prefix-Length AVP

The *PDP-Address-Prefix-Length* AVP (AVP code 2606) is of type Unsigned32 and contains the prefix length of an IPv6 typed PDP-Address AVP. The omission of this AVP for an IPv6 typed IP address implicitly means prefix length of 64 bits, as in this case the 64 bit prefix length default shall be assumed.

7.2.138 PDP-Context-Type AVP

The *PDP-Context-Type* AVP (AVP code 1247) is of type Enumerated and indicates the type of a PDP context.

The values for requested are:

0 PRIMARY

1 SECONDARY

This AVP shall only be present in the CCR Initial.

7.2.139 PoC-Change-Condition AVP

The *PoC-Change-Condition* AVP (AVP code 1261) is of type Enumerated and contains the reason for closing a container and the addition of a new container. The AVP may take the following values:

serviceChange	(0)
volumeLimit	(1)
timeLimit	(2)
numberofTalkBurstLimit	(3)
numberofActiveParticipants	(4)
tariffTime	(5)

7.2.140 PoC-Change-Time AVP

The *PoC-Change-Time* AVP (AVP code 1262) is of type Time and is a time stamp that defines the moment when a container is closed or the CDR is closed.

7.2.141 PoC-Controlling-Address AVP

The *PoC-Controlling-Address* AVP (AVP code 858) is of type UTF8String and identifies the PoC server performing the controlling function for the associated PoC session.

7.2.142 PoC-Event-Type AVP

The *PoC-Event-Type* AVP (AVP code 2025) is of type Enumerated and indicates PoC session unrelated charging event.

The AVP may take the values as follows:

0 Normal;

1 Instant Ppersonal Aalert event;

2 PoC Group Advertisement event;

3 Early Ssession Setting-up event;

4 PoC Talk Burst

7.2.143 PoC-Group-Name AVP

The *PoC-Group-Name* AVP (AVP code 859) is of type UTF8String and identifies a group. Included if the session is a pre-arranged group session or a chat group session. It can be used for PoC and OMA SIMPE IM Charging, or other applications.

7.2.144 PoC-Information AVP

The PoC-*Information* AVP (AVP code 879) is of type Grouped. Its purpose is to allow the transmission of additional PoC service specific information elements.

It has the following ABNF grammar:

```
PoC-Information :: =        < AVP Header: 879>

                              [ PoC-Server-Role ]
                              [ PoC-Session-Type ]
                              [ PoC-User-Role ]
                              [ PoC-Session-Initiation-type ]
                              [ PoC-Event-Type ]
                              [ Number-Of-Participants ]
                            * [ Participants-Involved ]
                            * [ Participant-Group ]
                            * [ Talk-Burst-Exchange ]
                              [ PoC-Controlling-Address ]
                              [ PoC-Group-Name ]
                              [ PoC-Session-Id ]
                              [ Charged-Party ]
```

NOTE: In the ABNF definition of PoC-Information AVP, the Participants-Involved AVP is kept only for backward compatibility with Releases before the 3GPP Release 7.

7.2.145 PoC-Server-Role AVP

The *PoC-Server-Role* AVP (AVP code 883) is of type Enumerated and specifies the role of the PoC server.

The identifier can be one of the following:

0 Participating PoC Server

1 Controlling PoC Server

7.2.146 PoC-Session-Id AVP

The *PoC-Session-Id* AVP (AVP code 1229) is of type UTF8String. It uniquely identifies an end-to-end PoC session and may be used for correlation between charging information generated by participating and controlling PoC functions. This information is obtained from the "Contact" header of the SIP message received from the controlling PoC function.

NOTE: The PoC-Session-Id may not be available in the initial charging interactions for the PoC session.

7.2.147 PoC-Session-Initiation-Type AVP

The PoC-Session-Initiation-Type AVP (AVP code 1277) is of type Enumerated and specifies the type of the PoC session initiation.

The identifier can be one of the following:

0 Pre-established

1 On-demand

7.2.148 PoC-Session-Type AVP

The *PoC-Session-Type* AVP (AVP code 884) is of type Enumerated and specifies the type of the PoC session.

The identifier can be one of the following, refer Appendix C.5.1 in OMA PoC Control Plane specification [211]:

0 1 to 1 PoC session

1 chat PoC group session

2 pre-arranged PoC group session

3 ad-hoc PoC group session

7.2.149 PoC-User-Role AVP

The *PoC-User-Role* AVP (AVP code 1252) is of type Grouped. It specifies the role(s) related information of the PoC User that participating in the PoC Session.

It has the following grammar:

PoC-User-Role :: = <AVP header: 1252>

[PoC-User-Role-Ids]
[PoC-User-Role-info-Units]

7.2.150 PoC-User-Role-IDs AVP

The *PoC-User-Role-IDs* AVP (AVP code 1253) is of type UTF8String and identifies the PoC user role.

7.2.151 PoC-User-Role-info-Units AVP

The *Poc-User-Role-info-Units* (AVP code 1254) is of type Enumerated and specify the role type details of PoC users.

The identifier can be one of the following:

1. Moderator
2. Dispatcher
3. Session-Owner
4. Session-Participant

7.2.152 Positioning-Data AVP

The *Positioning-Data* AVP (AVP code 1245) is of type UTF8String and indicates the usage of each positioning method that was attempted to determine the location estimate either successfully or unsuccessfully.

7.2.153 Preferred-AoC-Currency AVP

The *Preferred-AoC-Currency* AVP (AVP code 2315) is of type Unsigned32 and indicates the preferred currency code that the AoC function would like to get the AoC information. It is specified by using the numeric values defined in the ISO 4217 standard, refer RFC 4006 [402].

7.2.154 Priority AVP

The *Priority* AVP (AVP code 1209) is of type Enumerated and the priority (importance) of the message if specified. For SMS Charging the value "low" is not applicable.

The values are:

0 Low

1 Normal

2 High

7.2.155 PS-Append-Free-Format-Data AVP

The *PS-Append-Free-Format-Data* AVP (AVP code 867) is of type enumerated and indicates if the information sent in the PS-Free-Format-Data AVP must be appended to the PS-free-format-data stored for the online-session.

The following values are defined:

0 'Append': If this AVP is present and indicates 'Append', the P-GW shall append the received PS free format data to the PS free format data stored for the online charging session.

1 'Overwrite': If this AVP is absent or in value 'Overwrite', the P-GW shall overwrite all PS free format data already stored for the online charging session.

The P-GW shall ignore this AVP if no PS free format data is stored for the online charging session.

7.2.156 PS-Free-Format-Data AVP

The *PS-Free-Format-Data* AVP (AVP code 866) is of type OctectString and holds online charging session specific data.

7.2.157 PS-Furnish-Charging-Information AVP

The *PS-Furnish-Charging-Information* AVP (AVP code 865) is of type Grouped. Its purpose is to add online charging session specific information, received via the Ro reference point, onto the Rf reference point in order to facilitate its inclusion in CDRs. This information element may be received in a CCA message via the Ro reference point. In situations where online and offline charging are active in parallel, the information element is transparently copied into an ACR to be sent on the Rf reference point.

It has the following ABNF grammar:

```
PS-Furnish-Charging-Information :: = < AVP Header: 865>
                                     { 3GPP-Charging-Id }
                                     { PS-Free-Format-Data }
                                     [ PS-Append-Free-Format-Data ]
```

7.2.158 PS-Information AVP

The *PS-Information* AVP (AVP code 874) is of type Grouped. Its purpose is to allow the transmission of additional PS service specific information elements.

It has the following ABNF grammar:

```
PS-Information :: =  < AVP Header: 874>

                      [ 3GPP-Charging-Id ]
                      [ PDN-Connection-Charging-ID ]
                      [ Node-Id ]
                      [ 3GPP-PDP-Type ]
                    * [ PDP-Address ]
                      [ PDP-Address-Prefix-Length ]
                      [ Dynamic-Address-Flag ]
                      [ Dynamic-Address-Flag-Extension ]
                      [ QoS-Information ]
                    * [ SGSN-Address ]
                    * [ GGSN-Address ]
                    * [ SGW-Address ]
                      [ CG-Address ]
                      [ Serving-Node-Type ]
                      [ SGW-Change ]
                      [ 3GPP-IMSI-MCC-MNC ]
                      [ IMSI-Unauthenticated-Flag ]
                      [ 3GPP-GGSN-MCC-MNC ]
                      [ 3GPP-NSAPI ]
                      [ Called-Station-Id ]
                      [ 3GPP-Session-Stop-Indicator ]
                      [ 3GPP-Selection-Mode ]
                      [ 3GPP-Charging-Characteristics ]
                      [ Charging-Characteristics-Selection-Mode ]
                      [ 3GPP-SGSN-MCC-MNC ]
                      [ 3GPP-MS-TimeZone ]
                      [ Charging-Rule-Base-Name ]
                      [ 3GPP-User-Location-Info ]
                      [ User-Location-Info-Time ]
                      [ User-CSG-Information ]
                      [ 3GPP2-BSID ]
                      [ TWAN-User-Location-Info ]
                      [ 3GPP-RAT-Type ]
                      [ PS-Furnish-Charging-Information ]
                      [ PDP-Context-Type ]
                      [ Offline-Charging ]
                    * [ Traffic-Data-Volumes ]
                    * [ Service-Data-Container ]
                      [ User-Equipment-Info ]
                      [ Terminal-Information ]
                      [ Start-Time ]
                      [ Stop-Time ]
                      [ Change-Condition ]
                      [ Diagnostics ]
                      [ Low-Priority-Indicator ]
                      [ MME-Number-for-MT-SMS ]
                      [ MME-Name ]
                      [ MME-Realm ]
```

7.2.159 Quota-Consumption-Time AVP

The *Quota-Consumption-Time* AVP (AVP code 881) is of type Unsigned32 and contains an idle traffic threshold time in seconds. This AVP may be included within the Multiple-Services-Credit-Control AVP when this AVP also contains a Granted-Service-Units AVP containing a CC-Time AVP (i.e. when the granted quota is a time quota).

7.2.160 Quota-Holding-Time AVP

The *Quota-Holding-Time* AVP (AVP code 871) is of type Unsigned32 and contains the quota holding time in seconds. The client shall start the quota holding timer when quota consumption ceases. This is always when traffic ceases, i.e. the timer is re-started at the end of each packet. The Credit Control Client shall deem a quota to have expired when no traffic associated with the quota is observed for the value indicated by this AVP. The timer is stopped on sending a CCR and re-initialised on receiving a CCA with the previous used value or a new value of Quota-Holding-Time if received.

This optional AVP may only occur in a CCA command. It is contained in the Multiple-Services-Credit-Control AVP. It applies equally to the granted time quota and to the granted volume quota.

A Quota-Holding-Time value of zero indicates that this mechanism shall not be used. If the Quota-Holding-Time AVP is not present, then a locally configurable default value in the client shall be used.

7.2.161 Rate-Element AVP

The *Rate-Element* AVP (AVP code 2058) is of type Grouped and holds simple rate element of one dimension.

Possible dimentions are the CC-Unit-Type.

Example: *CC-Unit-Type* AVP TIME, *Unit-Value* AVP 6 and *Unit-Cost* AVP 10 with *Exponent* AVP 2 should read:

10 cents per 6 seconds time. The currency is context dependent.

IF *CC-Unit-Type* AVP is MONEY, this is a fixed fee and Unit-Value is ignored.

It has the following ABNF grammar:

```
Rate-Element :: =  < AVP Header: 2058 >

                  { CC-Unit-Type }
                  [Charge- Reason-Code ]
                  [ Unit-Value ]
                  [ Unit-Cost ]
                  [ Unit-Quota-Threshold ]
```

7.2.162 Read-Reply-Report-Requested AVP

The *Read-Reply-Report-Requested* AVP (AVP code 1222) is of type Enumerated and indicates whether a read reply report has been requested by the originator MMS User Agent or not.

The values for whether a report was requested are:

0 No

1 Yes

7.2.163 Void

7.2.164 Real-Time-Tariff-Information AVP

The *Real-Time-Tariff-Information* AVP (AVP code 2305) is of type Grouped and holds the tariff information received in real time according to TS 29.658 [222] in the SIP signalling.

It has the following ABNF grammar:

< Real-Time-Tariff-Information > :: = < AVP Header: 2305 >

[Tariff-Information]
[Tariff-XML]

7.2.165 Received-Talk-Burst-Time AVP

The *Received-Talk-Burst-Time* AVP (AVP code 1284) is of type Unsigned32 and holds the duration in seconds of the received talk bursts.

7.2.166 Received-Talk-Burst-Volume AVP

The *Received-Talk-Burst-Volume* AVP (AVP code 1285) is of type Unsigned32 and holds the volume in bytes of the received talk bursts.

7.2.167 Recipient-Address AVP

The *Recipient-Address* AVP (AVP code 1201) is of type Grouped. Its purpose is to identify the recipient of a message.

It has the following ABNF grammar:

Recipient-Address :: = < AVP Header: 1201 >

[Address-Type]
[Address-Data]
[Address-Domain]
[Addressee-Type]

7.2.168 Recipient-Info AVP

The *Recipient-Info* AVP (AVP code 2026) is of type Grouped. Its purpose is to group information associated with a recipient. and contains the list of Recipient addresses of the message.

It has the following ABNF grammar:

Recipient-Info :: = < AVP Header: 2026 >

[Destination-Interface]
* [Recipient-Address]
* [Recipient-Received-Address]
[Recipient-SCCP-Address]
[SM-Protocol-ID]

NOTE 1: This Recipient-Info AVP allows charging for messages with multiple recipients by repeating this AVP for every recipient. The Recipient-Info AVP unambigiously associates the grouped information to one specific recipient.

NOTE 2: The SM-Protocol-ID AVP only relates to the recipient when charging MT SMS messages as specified in TS 23.040 [216].

7.2.169 Recipient-Received-Address AVP

The *Recipient-Received-Address* AVP (AVP code 2028) is of type Grouped. Its purpose is to identify the recipient of a message with the original, unmodified address information as received before any address manipulations has taken place in the entity generating the charging information. This field allows correlation of address information with information generated by other nodes in the message flow.

It has the following ABNF grammar:

Recipient-Received-Address :: = < AVP Header: 2028>

[Address-Type]
[Address-Data]
[Address-Domain]

7.2.170 Recipient-SCCP-Address

The *Recipient-SCCP-Address* AVP (AVP code 2010) is of type Address. It is the "SCCP called address" used by the messaging node when delivering the message. This is usually the address of the MSC or SGSN/Serving Node that is serving the UE when it delivers the message. It contains a Global Title, where Global Title represents an E.164 number, and possibly a Point Code (ISPC). The AddressType discriminator in RFC 3588 [401] is set to value 8, E.164, and the address information is UTF8 encoded.

7.2.171 Refund-Information AVP

The *Refund-Information* AVP (AVP code 2022) is of type OctetString and it conveys relevant information for the OCS application relative to refund mechanism. When refund mechanism is implemented in the OCS this AVP may be included in the CCA of the previous IEC. This AVP must be used by the CTF in case of a refund scenario and thus must be included in the CCR for refund if previously received in CCA for IEC.

7.2.171A Relationship-Mode AVP

The *Relationship-Mode* AVP (AVP code 2706) is of type Enumerated and indicates whether the other functional entity (e.g. contact point of the neighbouring network) is regarded as part of the same trust domain.

It has the following values:

0 trusted

1 non-trusted

7.2.171B Related-IMS-Charging-Identifier AVP

The *Related-IMS-Charging-Identifier* AVP (AVP code 2711) is of type UTF8String and holds the Related IMS Charging Identifier (ICID) as generated by the Enhanced MSC Server or the P-CSCF for the target access leg of an SRVCC access transfer.

7.2.171C Related-IMS-Charging-Identifier-Node AVP

The *Related-IMS-Charging-Identifier-Node* AVP (AVP code 2712) is of type Address and holds the identifier of the Enhanced MSC Server or the P-CSCF that generated the Related IMS Charging Identifier (ICID).

7.2.172 Remaining-Balance AVP

The *Remaining-Balance* AVP (AVP code 2021) is of type Grouped and provides information about the remaining account balance of the subscriber.

It has the following ABNF grammar:

Remaining-Balance :: = < AVP Header: 2021 >

{ Unit-Value }
{ Currency-Code }

7.2.173 Reply-Applic-ID AVP

The *Reply-Applic-ID* AVP (AVP code 1223) is of type UTF8String and holds the identifier of a "reply path", i.e. the identifier of the application to which delivery reports, read-reply reports and reply-MMs are addressed.

7.2.174 Reply-Path-Requested AVP

The *Reply-Path-Requested* AVP (AVP code 2011) is of type Enumerated. The possible values are:

0 No Reply Path Set

1 Reply path Set

7.2.175 Reporting-Reason AVP

The *Reporting-Reason* AVP (AVP code 872) is of type Enumerated and specifies the reason for usage reporting for one or more types of quota for a particular category. It can occur directly in the Multiple-Services-Credit-Control AVP, or in the Used-Service-Units AVP within a Credit Control Request command reporting credit usage. It shall not be used at command level. It shall always and shall only be sent when usage is being reported.

The following values are defined for the Reporting-Reason AVP:

THRESHOLD (0)

- This value is used to indicate that the reason for usage reporting of the particular quota type indicated in the Used-Service-Units AVP where it appears is that the threshold has been reached.

QHT (1)

- This value is used to indicate that the reason for usage reporting of all quota types of the Multiple-Service-Credit-Control AVP where its appears is that the quota holding time specified in a previous CCA command has been hit (i.e. the quota has been unused for that period of time).

FINAL (2)

- This value is used to indicate that the reason for usage reporting of all quota types of the Multiple-Service-Credit-Control AVP where its appears is that a service termination has happened, e.g. PDP context, IP CAN bearer termination or service data flow termination.

QUOTA_EXHAUSTED (3)

- This value is used to indicate that the reason for usage reporting of the particular quota type indicated in the Used-Service-Units AVP where it appears is that the quota has been exhausted.

VALIDITY_TIME (4)

- This value is used to indicate that the reason for usage reporting of all quota types of the Multiple-Service-Credit-Control AVP where its appears is that the credit authorization lifetime provided in the Validity-Time AVP has expired.

OTHER_QUOTA_TYPE (5)

- This value is used to indicate that the reason for usage reporting of the particular quota type indicated in the Used-Service-Units AVP where it appears is that, for a multi-dimensional quota, one reached a trigger condition and the other quota is being reported.

RATING_CONDITION_CHANGE (6)

- This value is used to indicate that the reason for usage reporting of all quota types of the Multiple-Service-Credit-Control AVP where its appears is that a change has happened in some of the rating conditions that were previously armed (through the Trigger AVP, e.g. QoS, Radio Access Technology,…). The specific conditions that have changed are indicated in an associated Trigger AVP.

FORCED_REAUTHORISATION (7)

- This value is used to indicate that the reason for usage reporting of all quota types of the Multiple-Service-Credit-Control AVP where its appears is that it is there has been a Server initiated re-authorisation procedure, i.e. receipt of RAR command

POOL_EXHAUSTED (8)

- This value is used to indicate that the reason for usage reporting of the particular quota type indicated in the Used-Service-Units AVP where it appears is that granted units are still available in the pool but are not sufficient for a rating group using the pool.

The values QHT, FINAL, VALIDITY_TIME, FORCED_REAUTHORISATION, RATING_CONDITION_CHANGE apply for all quota types and are used directly in the Multiple-Services-Credit-Control AVP, whereas the values THRESHOLD, QUOTA_EXHAUSTED and OTHER_QUOTA_TYPE apply to one particular quota type and shall occur only in the Used-Service-Units AVP. The value POOL_EXHAUSTED apply to all quota types using the credit pool and occurs in the Used-Service-Units AVP. It may optionally occur in the Multiple-Services-Credit-Control AVP if all quota types use the same pool.

When the value RATING_CONDITION_CHANGE is used, the Trigger AVP shall also be included to indicate the specific events which caused the re-authorisation request.

7.2.176 Requested-Party-Address AVP

The *Requested-Party-Address* AVP (AVP code 1251) is of type UTF8 String. In IMS it holds the address (SIP URI or TEL URI) of the party (Public User ID or Public Service ID) to whom the SIP transaction was originally posted. The Requested Party Address shall be populated with the SIP URI or TEL URI contained in the Request-URI of the incoming request. This field is only present if different from the Called Party Address parameter.

7.2.177 Role-Of-Node AVP

The *Role-Of-Node* AVP (AVP code 829) is of type Enumerated and specifies whether the IMS node (except the MRFC) is serving the calling or the called party.

The identifier can be one of the following:

ORIGINATING_ROLE 0
The IMS node is applying an originating role, serving the calling party.

TERMINATING_ROLE 1
The IMS node is applying a terminating role, serving the called party.

7.2.177A Route-Header-Received AVP

The *Route-Header-Received* AVP (AVP code 3403) is of type UTF8String and includes the information in the topmost route header in a received initial SIP INVITE or non-session related SIP MESSAGE request.

7.2.177B Route-Header-Transmitted AVP

The *Route-Header-Transmitted* AVP (AVP code 3404) is of type UTF8String and includes the information in the route header representing the destination in a transmitted initial SIP INVITE or non-session related SIP MESSAGE request.

7.2.178 Scale-Factor AVP

The *Scale-Factor* AVP (AVP code 2059) is of type Grouped and holds simple multiplication factor in the same format as Unit-Value.

It has the following ABNF grammar:

Scale-Factor :: = < AVP Header: 2059 >

{ Value-Digits }
[Exponent]

7.2.179 SDP-Answer-Timestamp AVP

The *SDP-Answer-Timestamp* AVP (AVP code 1275) is of type Time and holds the time in UTC format of the response to the SDP offer.

7.2.180 SDP-Media-Component AVP

The *SDP-Media-Component* AVP (AVP code 843) is of type Grouped and contains information about media used for a IMS session.

It has the following ABNF grammar:

```
SDP-Media-Component ::= < AVP Header: 843 >

                          [ SDP-Media-Name ]
                        * [ SDP-Media-Description ]
                          [ Local-GW-Inserted-Indication ]
                          [ IP-Realm-Default-Indication ]
                          [ Transcoder-Inserted-Indication ]
                          [ Media-Initiator-Flag ]
                          [ Media-Initiator-Party ]
                          [ 3GPP-Charging-Id ]
                          [ Access-Network-Charging-Identifier-Value ]
                          [ SDP-Type ]
```

NOTE: When populating the SDP-Media-Component, either the 3GPP-Charging-ID or the Access-Network-Charging-Identifier-Value should be present but not both. The 3GPP-Charging-ID is expected to be used for 3GPP defined IP-CANS (e.g. GPRS) while the Access-Network-Charging-Identifier-Value is used for non-3GPP defined IP-CANs.

7.2.181 SDP-Media-Description AVP

The *SDP-Media-Description* AVP (AVP code 845) is of type UTF8String and holds the content of an "attribute-line" (i=, c=, b=, k=, a=, etc.) related to a media component, as described in RFC 4566 [406]. The attributes are specifying the media described in the SDP-Media-Name AVP.

7.2.182 SDP-Media-Name AVP

The *SDP-Media-Name* AVP (AVP code 844) is of type UTF8String and holds the content of a "m=" line in the SDP data.

7.2.183 SDP-Offer-Timestamp AVP

The *SDP-Offer-Timestamp* AVP (AVP code 1274) is of type Time and holds the time in UTC format of the SDP offer.

7.2.184 SDP-Session-Description AVP

The *SDP-Session-Description* AVP (AVP code 842) is of type UTF8String and holds the content of an "attribute-line" (i=, c=, b=, k=, a=, etc.) related to a session, as described in RFC 4566 [406].

7.2.185 SDP-TimeStamps AVP

The *SDP-TimeStamps* AVP (AVP code 1273) is of type Grouped and holds the time of the SDP offer and the SDP answer.

It has the following ABNF grammar:

```
SDP-TimeStamps :: = < AVP Header: 1273 >
```

[SDP-Offer-Timestamp]
[SDP-Answer-Timestamp]

7.2.186 SDP-Type AVP

The *SDP-Type* AVP (AVP code 2036) is of type Enumerated and holds information if the SDP media component was of type SDP offer or SDP answer.

The values are:

0 SDP Offer

1 SDP Answer

7.2.186A Session-Direction AVP

The *Session-Direction* AVP (AVP code 2707) is of type Enumerated and indicates whether the NNI is used for an inbound or outbound service request on the control plane in case of interconnection and roaming.

It has the following values:

0 inbound

1 outbound

7.2.187 Served-Party-IP-Address AVP

The *Served-Party-IP-Address* AVP (AVP code 848) is of type Address and holds the IP address of either the calling or called party, depending on whether the P-CSCF is in touch with the calling or the called party. This AVP is only provided by the P-CSCF.

7.2.188 Void

7.2.189 Service-Data-Container AVP

The *Service-Data-Container* AVP (AVP code 2040) is of type Grouped. Its purpose is to allow the transmission of the container to be reported for Flow based Charging. On encountering change on charging condition, this container identifies the volume count (separated for uplink and downlink), elapsed time or number of events, per service data flow identified per rating group or combination of the rating group and service id within an IP-CAN bearer.

It has the following ABNF grammar:

Service-Data-Container :: = < AVP Header: 2040>

[A F-Correlation-Information]
[Charging-Rule-Base-Name]
[Accounting-Input-Octets]
[Accounting-Output-Octets]
[Local-Sequence-Number]
[QoS-Information]
[Rating-Group]
[Change-Time]
[Service-Identifier]
[Service-Specific-Info]
[SGSN-Address]
[Time-First-Usage]
[Time-Last-Usage]
[Time-Usage]
*[Change-Condition]
[3GPP-User-Location-Info]
[3GPP2-BSID]

[Sponsor-Identity]
[Application-Service-Provider-Identity]

7.2.190 Service-ID AVP

The *Service-ID* AVP (AVP code 855) is of type UTF8String and identifies the service the MRFC is hosting or AoC service. For conferences the conference ID is used as the value of this parameter.

7.2.191 Service-Generic-Information AVP

The *Service-Generic-Information* AVP (AVP code 1256) is of type Grouped. Its purpose is to allow the transmission of service information elements used for all services.

The AVP is defined in OMA-DDS-Charging_Data [223].

7.2.192 Service-Information AVP

The *Service-Information* AVP (AVP code 873) is of type Grouped. Its purpose is to allow the transmission of additional 3GPP service specific information elements which are not described in this document.

It has the following ABNF grammar:

Service-Information :: = < AVP Header: 873>

* [Subscription-Id]
[AoC-Information]
[PS-Information]
[WLAN-Information]
[IMS-Information]
[MMS-Information]
[LCS-Information]
[PoC-Information]
[MBMS-Information]
[SMS-Information]
[MMTel-Information]
[Service-Generic-Information]
[IM-Information]
[DCD-Information]

The format and the contents of the fields inside the Service-Information AVP are specified in the middle-tier documents which are applicable for the specific service. Note that the formats of the fields are service-specific, i.e. the format will be different for the various services.

The Subscription-Id AVP in Service-Information AVP is only used on the Rf interface.

Further fields may be included in the Service-Information AVP when new services are introduced.

7.2.193 Service-Mode AVP

The *Service-Mode* AVP (AVP Code 2032) is of type Unsigned32 and provides the mode for CDIV, CB and ECT MMTel supplementary services.

The following values are defined:

"Communication Forwarding Unconditional (CFU)"	0
"Communication Forwarding Busy (CFB)"	1
"Communication Forwarding No Reply (CRNR)"	2
"Communication Forwarding on Not Logged-In (CFNL)"	3

"Communication Deflection (CD)" 4

"Communication Forwarding on Subscriber Not Reachable (CFNRc)" 5

"Incoming Call Barring (ICB)" 6

"Outgoing Call Barring (OCB)" 7

"Anonymous Communication Rejection (ACR)" 8

"Blind Transfer" 9

"Consultative Transfer" 10

"Three-Party (3PTY)" 11

"Advice of Charge -S (AoC-S)" 12

"Advice of Charge -D (AoC-D)" 13

"Advice of Charge -E (AoC-E)" 14

Values ≥ 1024 are reserved for specific Network/Manufacturer variants

7.2.194 Service-Specific-Data AVP

The *Service-Specific-Data* AVP (AVP Code 863) is of type UTF8String and holds the value of the Service-Specific-Data.

7.2.195 Service-Specific-Info AVP

The *Service-Specific-Info* AVP (AVP Code 1249) is of type Grouped and holds service specific data if and as provided by an Application Server or a PCEF only for pre-defined PCC rules.

It has the following ABNF grammar:

```
Service-Specific-Info ::=  < AVP Header: 1249 >
                           [ Service-Specific-Data ]
                           [ Service-Specific-Type ]
```

7.2.196 Service-Specific-Type AVP

The *Service-Specific-Type* AVP (AVP Code 1257) is of type Unsigned32 and holds the type of the Service-Specific-Data.

7.2.197 Void

7.2.198 Serving-Node-Type AVP

The *Serving-Node-Type* AVP (AVP Code 2047) is of type Enumerated and identifies the type of Serving Node.

It may take the following values:

0 SGSN
1 PMIPSGW
2 GTPSGW
3 ePDG
4 hSGW
5 MME
6 TWAN

7.2.199 SGSN-Address AVP

The *SGSN-Address* AVP (AVP code 1228) is of type Address and holds the IP-address of the SGSN/Serving Node (e.g. S-GW, AGW, ePDG, TWAG from the P-GW and S4-SGSN, MME from the S-GW) that was used during a report.

7.2.199A SGW-Address AVP

The *SGW-Address* AVP (AVP code 2067) is of type Address and holds the IP-address of the SGW Node.

7.2.200 SGW-Change AVP

The *SGW-Change* AVP (AVP Code 2065) is of type Enumerated, and indicates this is the first Accounting Request (ACR)[Start] due to S-GW change. If this AVP is not present, this means this ACR [Start] is not due to SGW change.

The following values are defined:

0 ACR_Start_NOT_due_to_SGW_Change

1 ACR_Start_due_to_SGW_Change

7.2.201 SIP-Method AVP

The *SIP-Method* AVP (AVP code 824) is of type UTF8String and holds the name of the SIP Method (INVITE, UPDATE etc.) causing a accounting request to be sent to the CDF or credit control request to be sent to the OCF.

7.2.202 SIP-Request-Timestamp AVP

The *SIP-Request-Timestamp* AVP (AVP code 834) is of type Time and holds the time in UTC format of the SIP request (e.g. Invite, Update).

7.2.203 SIP-Request-Timestamp-Fraction AVP

The *SIP-Request-Timestamp-Fraction* AVP (AVP code 2301) is of type Unsigned32 and holds the miliseconds fraction in relation to SIP-Request-Timestamp.

7.2.204 SIP-Response-Timestamp AVP

The *SIP-Response-Timestamp* AVP (AVP code 835) is of type Time and holds the time in UTC format of the response to the SIP request (e.g. 200 OK).

7.2.205 SIP-Response-Timestamp-Fraction AVP

The *SIP-Response-Timestamp-Fraction* AVP (AVP code 2302) is of type Unsigned32 and holds the miliseconds fraction in relation to SIP-Response-Timestamp.

7.2.206 SM-Discharge-Time AVP

The *SM-Discharge-Time* AVP (AVP code 2012) is of type Time. It indicates the time associated with the event being reported in the SM-Status AVP. It is only used in scenarios in which the delivery of the Delivery-Report (more properly the Status-Report) is being charged.

For example, if SM-Status has the value 0x00, then the SM-Discharge-Time indicates the time of the delivery of the original Short Message.

NOTE: The SMS Node must ensure the correct encoding of this, as the other AVPs using the type Time, since the SMS messages use different formats.

7.2.207 SM-Message-Type AVP

The *SM-Message-Type* AVP (AVP code 2007) is of type Enumerated and indicates the type of the message which caused the charging interaction. The values are given below:

0. SUBMISSION
1. DELIVERY_REPORT
2. SM Service Request

7.2.208 SM-Protocol-Id AVP

The *SM-Protocol-ID* AVP (AVP code 2013) is of type OctetString and holds an indication of the protocol used for the SM.

7.2.209 SM-Status AVP

The *SM-Status* AVP (AVP code 2014) is of type OctetString. The OctetString is of length 1 octet and contains status information about the delivery of an SM.

7.2.210 SM-User-Data-Header AVP

The *SM-User-Data-Header* AVP (AVP code 2015) is of type OctetString and contains any user data header extracted from the user data part of the SM. Encoding is as described in TS 23.040 [216]. Any padding bits are not considered part of the header and are omitted.

7.2.211 SMS-Information AVP

The *SMS-Information* AVP (AVP code 2000) is of type Grouped. Its purpose is to allow the transmission of additional SMS service specific information elements.

It has the following ABNF grammar:

```
SMS-Information :: = < AVP Header: 2000>

                     [ SMS-Node ]
                     [ Client-Address ]
                     [ Originator-SCCP-Address ]
                     [ SMSC-Address ]
                     [ Data-Coding-Scheme ]
                     [ SM-Discharge-Time ]
                     [ SM-Message-Type ]
                     [ Originator-Interface ]
                     [ SM-Protocol-ID ]
                     [ Reply-Path-Requested ]
                     [ SM-Status ]
                     [ SM-User-Data-Header ]
                     [ Number-Of-Messages-Sent ]
                   * [ Recipient-Info ]
                     [ Originator-Received-Address ]
                     [ SM-Service-Type ]
```

7.2.212 SMS-Node AVP

The *SMS-Node* AVP (AVP code 2016) is of type Enumerated and identifies the role which the SMS node performs in relation to the charging event. It takes the following values:

0 SMS Router

1 IP-SM-GW

2 SMS Router and IP-SM-GW

3 SMS-SC

7.2.213 SM-Service-Type AVP

The *SM-Service-Type* AVP (AVP code 2029) is of type Enumerated and indicates the type of SM service that caused the charging interaction. The values are given below:

0 VAS4SMS Short Message content processing (as defined in TS 22.142 [217]

1 VAS4SMS Short Message forwarding (as defined in TS 22.142 [217]

2 VAS4SMS Short Message Forwarding multiple subscriptions (as defined in TS 22.142 [217]

3 VAS4SMS Short Message filtering (as defined in TS 22.142 [217]

4 VAS4SMS Short Message receipt (as defined in TS 22.142 [217]

5 VAS4SMS Short Message Network Storage (as defined in TS 22.142 [217]

6 VAS4SMS Short Message to multiple destinations (as defined in TS 22.142 [217]

7 VAS4SMS Short Message Virtual Private Network (VPN) (as defined in TS 22.142 [217]

8 VAS4SMS Short Message Auto Reply (as defined in TS 22.142 [217]

9 VAS4SMS Short Message Personal Signature (as defined in TS 22.142 [217]

10 VAS4SMS Short Message Deferred Delivery (as defined in TS 22.142 [217]

11 .. 99 Reserved for 3GPP defined SM services

100 - 199 Vendor specific SM services

The SM-Service-Type AVP must be present if the SM-Message-Type AVP has value 2, SM Service Request.

7.2.214 SMSC-Address AVP

The *SMSC-Address* AVP (AVP code 2017) is of type Address and carries the address of the SMSC, as contained in the SM.

7.2.215 Start-Time AVP

The S*tart-Time* AVP (AVP Code 2041) is of type Time and holds the time in UTC format which represents the start of a user session at the S-GW/P-GW.

7.2.215A Status-Code AVP

The S*tatus-Code* AVP (AVP Code 2702) is of type Enumerated and only present to specify abnormal response code, e.g, 4xx, 5xx or Timeout, etc for specific AS when it responds abnormally to S-CSCF. If AS responds SIP_200ok, this AVP isn't present in Application-Server-Information.
The AVP may take the values as follows:

0 4xx;

1 5xx;

2 Timeout

7.2.216 Stop-Time AVP

The S*top-Time* AVP (AVP Code 2042) is of type Time and holds the time in UTC format which represents the termination of a user session at the S-GW/P-GW.

7.2.217 Submission-Time AVP

The *Submission-Time* AVP (AVP code 1202) is of type Time and indicates the time at which the message was submitted.

7.2.218 Subscriber-Role AVP

The *Subscriber-Role* AVP (AVP code 2033) is of type Enumerated and indicates the role of the subscriber (originating party or terminating party) in MMTel supplementary services.

The role can be one of the following:

0. ORIGINATING
1. TERMINATING

7.2.219 Supplementary-Service AVP

The *Supplementary-Service* AVP (AVP code 2048) is of type Grouped and holds the specific supplementary service details for one MMTel supplementary service.

It has the following ABNF grammar:

```
Supplementary-Service :: =   < AVP Header: 2048>

                             [MMTel-SService-Type ]
                             [ Service-Mode ]
                             [ Number-Of-Diversions ]
                             [ Associated-Party-Address ]
                             [ Service-ID ]
                             [ Change-Time ]
                             [ Number-Of-Participants ]
                             [ Participant-Action-Type ]
                             [ CUG-Information ]
                             [ AoC-Information ]
```

7.2.219A TAD-Identifier AVP

The *TAD-Identifier* AVP (AVP code 2717) is of type Enumerated and indicates the type of access network (CS or PS) through which the session shall be terminated.

It can be one of the following values:

0. CS
1. PS

7.2.220 Talk-Burst-Exchange AVP

The *Talk-Burst-Exchange* AVP (AVP code 1255) is of type Grouped and holds the talk burst related charging data.

It has the following ABNF grammar:

```
Talk-Burst-Exchange :: =   < AVP Header: 1255 >
```

{ PoC-Change-Time }
[Number-Of-Talk-Bursts]
[Talk-Burst-Volume]
[Talk-Burst-Time]
[Number-Of-Received-Talk-Bursts]
[Received-Talk-Burst-Volume]
[Received-Talk-Burst-Time]
[Number-Of-Participants]
[PoC-Change-Condition]

7.2.221 Talk-Burst-Time AVP

The *Talk-Burst-Time* AVP (AVP code 1286) is of type Unsigned32 and holds the duration in seconds of the sent talk bursts.

7.2.222 Talk-Burst-Volume AVP

The *Talk-Burst-Volume* AVP (AVP code 1287) is of type Unsigned32 and holds the volume in bytes of the sent talk bursts.

7.2.223 Tariff-Information AVP

The *Tariff-Information* AVP (AVP code 2060) is of type Grouped and holds a tariff definition either from the local provider or from 3rd party provider. It contains information about the operator and the ID of the service being provided, the current tariff and possible next tariff after tariff switch time. It may also chain to tariffs provided by intermediate operators in the chain.

It has the following ABNF grammar:

Tariff-Information :: = < AVP Header: 2060 >

{ Current-Tariff }
[Tariff-Time-Change]
[Next-Tariff]

7.2.224 Tariff-XML AVP

The *Tariff-XML* AVP (AVP code 2306) is of type UTF8String and holds the XML body describing the tariff/add-on charge information exchanged during the SIP transaction, as described in the TS 29.658 [222].

7.2.225 Terminating-IOI AVP

The *Terminating-IOI* AVP (AVP code 840) is of type UTF8String (alphanumeric string) and holds the Inter Operator Identifier (IOI) for the terminating network as generated by the IMS network element which takes responsibility for populating this parameter [404] in a SIP response as described in TS 24.229 [202].

The Terminating IOI contains the following values:

- Type 1 IOI:
  - IOI of the home network where the S-CSCF is located for SIP responses directed to the P-CSCF in the visited network when request was initiated by the served user.
  - IOI of the visited network where the TRF is located for SIP responses directed to the S-CSCF in the home network when request was initiated by the served user and "VPLMN routing" is applied in a Roaming Architecture for Voice over IMS with Local breakout.
  - IOI of the visited network where the P-CSCF is located for SIP responses directed to the S-CSCF in the home network when request was terminated at the served user.
- Type 2 IOI:

- IOI of the home network of the terminating end user where the S-CSCF is located in case a session is initiated toward the IMS. In case of redirection by the S-CSCF, *Terminating-IOI* AVP indicates the terminating party's network operator to which the session is redirected.

- IOI of the terminating network where the MGCF is located in case a session is initiated from the IMS toward the PSTN.

- Type 3 IOI:

  - IOI of the service provider network (originating side or terminating side) where the AS (proxy, terminating UA or redirect server or B2BUA) is located when receiving a SIP request as described in TS 24.229 [202].

  - IOI of the home network operator contacted by an AS when an AS (originating UA or B2BUA) initiates a SIP request as described in TS 24.229 [202].

For further details on the Type 1, Type 2 and Type 3 IOIs, please refer to TS 32.240 [1].

7.2.226 Time-First-Usage AVP

The *Time-First-Usage* AVP (AVP code 2043) is of type Time and holds the time in UTC format for the first IP packet to be transmitted and mapped to the current service data container.

7.2.227 Time-Last-Usage AVP

The *Time-Last-Usage* AVP (AVP code 2044) is of type Time and holds the time in UTC format for the last IP packet to be transmitted and mapped to the current service data container.

7.2.228 Time-Quota-Mechanism

The *Time-Quota-Mechanism* AVP (AVP code 1270) is of type Grouped.

It has the following syntax:

Time-Quota-Mechanism ::= < AVP Header: 1270>

{ Time-Quota-Type }
{ Base-Time-Interval }

The OCS may include this AVP in an Multiple-Services-Credit-Control AVP, when granting time quota.

7.2.229 Time-Quota-Threshold AVP

The *Time-Quota-Threshold* AVP (AVP code 868) is of type Unsigned32 and contains a threshold value in seconds. This AVP may be included within the Multiple-Services-Credit-Control AVP when this AVP also contains a Granted-Service-Units AVP containing a CC-Time AVP (i.e. when the granted quota is a time quota).

If received, the Credit Control client shall seek re-authorisation from the server for the quota when the quota contents fall below the supplied threshold. The client shall allow service to continue whilst the re-authorisation is progress, until the time at which the original quota would have been consumed.

7.2.230 Time-Quota-Type AVP

The *Time-Quota-Type* AVP (AVP code 1271) is of type Enumerated. It is used to indicate which time quota consumption mechanism shall be used for the associated Rating Group.

It has the following values:

DISCRETE_TIME_PERIOD (0)

CONTINUOUS_TIME_PERIOD (1)

7.2.231 Time-Stamps AVP

The *Time-Stamps* AVP (AVP code 833) is of type Grouped and holds the time stamp of the SIP Request and the time stamp of the response to the SIP Request.

It has the following ABNF grammar:

Time-Stamps ::= < AVP Header: 833 >

[SIP-Request-Timestamp]
[SIP-Response-Timestamp]
[SIP-Request-Timestamp-Fraction]
[SIP-Response-Timestamp-Fraction]

7.2.232 Time-Usage AVP

The *Time-Usage* AVP (AVP code 2045) is of type Unsigned32 and holds the effective used time within the service data container reporting interval.

7.2.233 Traffic-Data-Volumes AVP

The *Traffic-Data-Volumes* AVP (AVP code 2046) is of type Grouped. Its purpose is to allow the transmission of the IP-CAN bearer container, on encountering change on charging condition for this IP-CAN bearer.This container reports the volume count (separated for uplink and downlink).

It has the following ABNF grammar:

Traffic-Data-Volumes :: = < AVP Header: 2046>

[QoS-Information]
[Accounting-Input-Octets]
[Accounting-Output-Octets]
[Change-condition]
[Change-Time]
[3GPP-User-Location-Info]

7.2.233A Transcoder-Inserted-Indication AVP

The *Transcoder-Inserted-Indication* AVP (AVP code 2605) is of type Enumerated and indicates if a transcoder is inserted or not for the SDP media component.

The following values are defined:

0 Transcoder Not Inserted

1 Transcoder Inserted

7.2.233B Transit-IOI-List AVP

The *Transit-IOI-List* AVP (AVP code 2701) is of type UTF8String and holds the Inter Operator Identifiers (IOI) for the transit networks as generated by the IMS network elements which take responsibility for populating this parameter in a SIP request and response as described in TS 24.229 [202]. Multiple occurrences of this AVP shall be in chronological order, i.e. the value in the SIP request is listed first. If only a value for the SIP response is available, the Transit-IOI-List for the SIP request shall be included with the value "unknown".

7.2.234 Token-Text AVP

The *Token-Text* AVP (AVP code 1215) is of type UTF8String and contains extension information for the Message-Class AVP.

7.2.235 Trigger AVP

The *Trigger* AVP (AVP code 1264) is of type Grouped and holds the trigger types. The presence of the Trigger AVP without any Trigger-Type AVP in a CCA allows OCS to disable all the triggers. The presence of the Trigger AVP in the CCR identifies the event(s) triggering the CCR.

It has the following ABNF grammar:

Trigger :: = < AVP Header: 1264 >

* [Trigger-Type]

7.2.236 Trigger-Type AVP

The *Trigger-Type* AVP (AVP code 870) is of type Enumerated and indicates a single re-authorisation event type.

When included in the Credit Control Answer command, the Trigger-Type AVP indicates the events that shall cause the credit control client to re-authorise the associated quota. The client shall not re-authorise the quota when events which are not included in the Trigger AVP occur.

When included in the Credit Control Request command indicates the specific event which caused the re-authorisation request of the Reporting-Reason with value RATING_CONDITION_CHANGE associated.

It has the following values:

CHANGE_IN_SGSN_IP_ADDRESS (1)

- This value is used to indicate that a change in the SGSN IP address shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGE_IN_QOS (2)

- This value is used to indicate that a change in the end user negotiated QoS shall cause the credit control client to ask for a re-authorisation of the associated quota.

NOTE 1: This should not be used in conjunction with enumerated values 10 to 23.

CHANGE_IN_LOCATION (3)

- This value is used to indicate that a change in the end user location shall cause the credit control client to ask for a re-authorisation of the associated quota.

NOTE 2: This should not be used in conjunction with enumerated values 30 to 34.

CHANGE_IN_RAT (4)

- This value is used to indicate that a change in the radio access technology shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGE_IN_UE_TIMEZONE (5)

- This value is used to indicate that a change in the TimeZone where the end user is located shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_TRAFFIC_CLASS (10)

- This value is used to indicate that a change in the end user negotiated traffic class shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_RELIABILITY_CLASS (11)

- This value is used to indicate that a change in the end user negotiated reliability class shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_DELAY_CLASS (12)

- This value is used to indicate that a change in the end user negotiated delay class shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_PEAK_THROUGHPUT (13)

- This value is used to indicate that a change in the end user negotiated peak throughput shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_PRECEDENCE_CLASS (14)

- This value is used to indicate that a change in the end user negotiated precedence class shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_MEAN_THROUGHPUT (15)

- This value is used to indicate that a change in the end user negotiated mean throughput shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_MAXIMUM_BIT_RATE_FOR_UPLINK (16)

- This value is used to indicate that a change in the end user negotiated uplink maximum bit rate shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_MAXIMUM_BIT_RATE_FOR_DOWNLINK (17)

- This value is used to indicate that a change in the end user negotiated downlink maximum bit rate shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_RESIDUAL_BER (18)

- This value is used to indicate that a change in the end user negotiated residual BER shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_SDU_ERROR_RATIO (19)

- This value is used to indicate that a change in the end user negotiated SDU error ratio shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_TRANSFER_DELAY (20)

- This value is used to indicate that a change in the end user negotiated transfer delay shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_TRAFFIC_HANDLING_PRIORITY (21)

- This value is used to indicate that a change in the end user negotiated traffic handling priority shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_GUARANTEED_BIT_RATE_FOR_UPLINK (22)

- This value is used to indicate that a change in the end user negotiated uplink guaranteed bit rate shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINQOS_GUARANTEED_BIT_RATE_FOR_DOWNLINK (23)

- This value is used to indicate that a change in the end user negotiated downlink guaranteed bit rate shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINLOCATION_MCC (30)

- This value is used to indicate that a change in the MCC of the serving network shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINLOCATION_MNC (31)

- This value is used to indicate that a change in the MNC of the serving network shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINLOCATION_RAC (32)

- This value is used to indicate that a change in the RAC where the end user is located shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINLOCATION_LAC (33)

- This value is used to indicate that a change in the LAC where the end user is located shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINLOCATION_CellId (34)

- This value is used to indicate that a change in the Cell Identity where the end user is located shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINLOCATION_TAC (35)

- This value is used to indicate that a change in the TAC where the end user is located shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGEINLOCATION_ECGI (36)

- This value is used to indicate that a change in the ECGI where the end user is located shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGE_IN_MEDIA_COMPOSITION (40)

- This value is used to indicate that a change in the media composition (as identified within SDP) for an existing SIP session shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGE_IN_PARTICIPANTS_NMB (50)

- This value is used specifically for multi participating session to indicate that a change in the number of active participants within a session shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGE_IN_ THRSHLD_OF_PARTICIPANTS_NMB (51)

- This value is used specifically to indicate that a change in the threshold of participants number within a session shall cause the credit control client to ask for a re-authorisation of the associated quota.

NOTE 3: The threshold and the granularity of threshold are operator configurable. This should not be used in conjunction with value 50.

CHANGE_IN_USER_PARTICIPATING_TYPE (52)

- This value is used specifically to indicate that a change in the user participating type within a session shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGE_IN_SERVICE_CONDITION (60)

- This value is used to indicate that a change in rating conditions associated with a service occurs.
  The description of the conditions causing a change are service specific and may be documented in middle-tier specifications or may be configurable.

CHANGE_IN_SERVING_NODE(61)

- This value is used to indicate that a change in serving node shall cause the credit control client to ask for a re-authorisation of the associated quota.

CHANGE_IN_USER_CSG_INFORMATION (70)

- This value is used to indicate a request of reporting the event that the user enters/leaves a CSG cell. When used in a CCR, at entry to a CSG cell, the User-CSG-Information AVP shall be provided with the event report.

CHANGE_IN_HYBRID_SUBSCRIBED_USER_CSG_INFORMATION (71)

- This value is used to indicate a request of reporting the event that the user enters/leaves a hybrid cell that the user subscribes to. When used in a CCR, at entry to a hybrid cell where the user is a member, the User-CSG-Information AVP shall be provided with the event report.

CHANGE_IN_HYBRID_UNSUBSCRIBED_USER_CSG_INFORMATION (72)

- This value is used to indicate a request of reporting the event that the user enters/leaves a hybrid cell that the user does not subscribe to. When used in a CCR, at entry to a hybrid cell where the user is not a member, the User-CSG-Information AVP shall be provided with the event report.

7.2.237 Trunk-Group-ID AVP

The *Trunk-Group-ID* AVP (AVP code 851) is of type Grouped and identifies the incoming and outgoing PSTN legs.

It has the following ABNF grammar:

Trunk-Group-ID :: = <AVP Header: 851>

[Incoming-Trunk-Group-ID]
[Outgoing-Trunk-Group-ID]

7.2.237A Void

7.2.237B Void

7.2.237C TWAN-User-Location-Info AVP

The *TWAN-User-Location-Info* AVP (AVP code 2714) is of type Grouped and contains the UE location in a Trusted WLAN Access Network (TWAN): BSSID and SSID of the access point.

It has the following ABNF grammar:

TWAN-User-Location-Info :: = < AVP Header: 2714>

{SSID }
[BSSID]

7.2.238 Type-Number AVP

The *Type-Number* AVP (AVP code1204) is of type Enumerated and identifies the well-known media types. The values are taken from OMNA WSP Content Type Numbers [210]

7.2.239 Unit-Cost AVP

The *Unit-Cost* AVP (AVP code 2061) is of type Grouped and holds monetary value.

It has the same format of *Unit-Value*

It has the following ABNF grammar:

Unit-Cost :: = < AVP Header: 2061 >

{ Value-Digits }
[Exponent]

7.2.240 Unit-Quota-Threshold AVP

The *Unit-Quota-Threshold* AVP (AVP code 1226) is of type Unsigned32 and contains a threshold value in service specific units. This AVP may be included within the Multiple-Services-Credit-Control AVP when this AVP also contains a Granted-Service-Units AVP containing CC-Service-Specific-Units AVP (i.e. when the granted quota is service specific) or within Rate-Element AVP..

If received in the context of Multiple-Service-Credit-Control AVP, the Credit Control client shall seek re-authorisation from the server for the quota when the quota contents fall below the supplied threshold. The client shall allow service to continue whilst the re-authorisation is in progress, up to the volume indicated in the original quota.

In the context of the Rating-Element AVP it denotes the durability of a Rating Element within a Tariff. I.e. if the service consumed Unit-Quota-Threshold number of Unit-Types, the next Rating element becomes in effect.

7.2.240A User-CSG-Information AVP

The *User-CSG-Information* AVP (AVP code 2319) is of type Grouped and holds the user "Closed Subscriber Group" Information associated to CSG cell access: it comprises CSG ID within the PLMN, Access mode and indication on CSG membership for the user when hybrid access applies, as defined in TS 29.060 [225] for GPRS case, and in TS 29.274 [226] for EPC case.

It has the following ABNF grammar:

User-CSG-Information :: = < AVP Header: 2319>

{ CSG-Id }
{ CSG-Access-Mode }
[CSG-Membership-Indication]

7.2.241 User-Participating-Type AVP

The *User-Participating-Type* AVP(AVP code 1279) is of type Enumerated. It is a subfield of Participants-Group AVP to indicate the user participating type when participating in the PoC session.

The AVP may take the values as follows:

0 Normal;

1 NW PoC Box;

2 UE PoC Box.

7.2.242 User-Session-Id AVP

The *User-Session-Id* AVP (AVP code 830) is of type UTF8String and holds the session identifier. For a SIP session the *User-Session-Id* contains the SIP Call ID, as defined in RFC 3261 [405]. When the AS acts as B2BUA, the incoming Session-ID leg is covered.

7.2.243 Volume-Quota-Threshold AVP

The *Volume-Quota-Threshold* AVP (AVP code 869) is of type Unsigned32 and contains a threshold value in octets. This AVP may be included within the Multiple-Services-Credit-Control AVP when this AVP also contains a Granted-Service-Units AVP containing a CC-Total-Octets, CC-Input-Octets or CC-Output-Octets AVP (i.e. when the granted quota is a volume quota).

If received, the Credit Control client shall seek re-authorisation from the server for the quota when the quota contents fall below the supplied threshold. The client shall allow service to continue whilst the re-authorisation is progress, up to the volume indicated in the original quota.

7.2.244 WAG-Address AVP

The WAG-Address AVP (AVP code 890) is of type Address and contains the WAG IP address.

7.2.245 WAG-PLMN-Id AVP

The WAG-PLMN-Id AVP (AVP code 891) is of type OctetString and contains the WAG PLMN id (MCC and MNC).

Coding of this AVP is same as 3GPP-SGSN-MCC-MNC coding described in TS 29.061 [207].

7.2.246 WLAN-Information AVP

The WLAN-*Information* AVP (AVP code 875) is of type Grouped. Its purpose is to allow the transmission of additional WLAN service specific information elements. The format and the contents of the fields inside the WLAN-Information AVP is specified in TS 32.252 [22].

It has the following ABNF grammar:

```
WLAN-Information :: =    < AVP Header: 875>

                         [ WLAN-Session-Id ]
                         [ PDG-Address ]
                         [ PDG-Charging-Id ]
                         [ WAG-Address ]
                         [ WAG-PLMN-Id ]
                         [ WLAN-Radio-Container ]
                         [ WLAN-UE-Local-IPAddress ]
```

7.2.247 WLAN-Radio-Container AVP

The WLAN-Radio-Container AVP (AVP code 892) is of type Grouped. The WLAN-Radio-Container AVP has the following format:

```
WLAN-Radio-Container :: =    < AVP Header: 892>

                             [ Operator-Name ]
                             [ Location-Type ]
                             [ Location-Information ]
                             [ WLAN-Technology ]
```

7.2.248 WLAN-Session-Id AVP

The *WLAN-Session-Id* AVP (AVP code 1246) is of type Unsigned32 and contains the charging id generated by the AAA Server for the session.

Coding of this AVP is same as 3GPP-Charging-Id coding described in TS 29.061 [207].

7.2.249 WLAN-Technology AVP

The *WLAN-Technology* AVP (AVP code 893) is of type Unsigned32.

Editor's note: Actual content of this AVP is tbd.

7.2.250 WLAN-UE-Local-IPAddress AVP

The *WLAN-UE-Local-IPAddress* AVP (AVP code 894) is of type Address and contains the UE's local IP address.

7.3 3GPP2 Accesses specific AVPs

For the purpose of offline and online charging, the use of the Attribute Value Pairs (AVPs) defined for 3GPP2 Accesses is provided in the following table, and the specification including the detailed definition and description, is refered to.

These AVPs shall be used together with value 5535 (3GPP2) as Vendor-Id.

Table 7.3: 3GPP2 Accesses specific AVPs

AVP Name	AVP Code	Used in				Value Type	AVP Flag rules				
		ACR	ACA	CCR	CCA		Must	May	Should not	Must not	May Encr.
3GPP2-BSID	9010	X	-	X	-	refer [215]					

Annex A (informative): Bibliography

a **The 3GPP charging specifications**

- 3GPP TS 32.250: "Telecommunication management; Charging management; Circuit Switched (CS) domain charging".
- 3GPP TS 32.251: "Telecommunication management; Charging management; Packet Switched (PS) domain charging".
- 3GPP TS 32.252: "Telecommunication management; Charging management; Wireless Local Area Network (WLAN) charging".
- 3GPP TS 32.260: "Telecommunication management; Charging management; IP Multimedia Subsystem (IMS) charging".
- 3GPP TS 32.270: "Telecommunication management; Charging management; Multimedia Messaging Service (MMS) charging".
- 3GPP TS 32.271: "Telecommunication management; Charging management; Location Services (LCS) charging".
- 3GPP TS 32.272: "Telecommunication management; Charging management; Push-to-talk over Cellular (PoC) charging".
- 3GPP TS 32.273: "Telecommunication management; Charging management; Multimedia Broadcast and Multicast Service (MBMS) charging".
- 3GPP TS 32.274: "Telecommunication management; Charging management; Short Message Service (SMS) charging".
- 3GPP TS 32.275: "Telecommunication management; Charging management; MultiMedia Telephony (MMTel) charging".
- 3GPP TS 32.280: "Telecommunication management; Charging management; Advice of Charge (AoC) service".
- 3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) encoding rules description".
- 3GPP TS 32.297: "Telecommunication management; Charging management; Charging Data Record (CDR) file format and transfer".
- 3GPP TS 32.296: "Telecommunication management; Charging management; Online Charging System (OCS) applications and interfaces".
- 3GPP TS 32.295: "Telecommunication management; Charging management; Charging Data Record (CDR) transfer".

b **Common 3GPP specifications**

- 3GPP TS 33.201: "Access domain security".

c **other Domain and Service specific 3GPP / ETSI specifications**

-

d **Relevant ITU Recommendations**

-

e **Relevant IETF RFCs**

- IETF RFC 959 (1985): "File Transfer Protocol".
- IETF RFC 1350 "TFTP Protocol".

Annex B (informative): Change history

Change history								
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Cat**	**Old**	**New**
Dec 2007	SP-38	SP-070745	0202	--	Add new AVP codes to satisfy OMA charging requirements	C	8.0.0	8.1.0
Dec 2007	SP-38	SP-070745	0203	--	Add new values to PoC-User-Role-info-Units AVP - Align with OMA PoC charging requirements	C	8.0.0	8.1.0
Dec 2007	SP-38	SP-070745	0204	--	Add general description to PoC-Group-Name	B	8.0.0	8.1.0
Dec 2007	SP-38	SP-070925	0205	1	Introduce Diameter details for SMS charging	B	8.0.0	8.1.0
Mar 2008	SP-39	SP-080059	0206	--	Add IBCF to Node-Functionality AVP list of NEs	B	8.1.0	8.2.0
Mar 2008	SP-39	SP-080074	0207	--	Usage of CC-Correlation-Id in online charging - Align with IETF RFC 4006	C	8.1.0	8.2.0
Mar 2008	SP-39	SP-080074	0208	--	Align Number-Of-Messages-Sent AVP in Diameter Binding for SMS charging with new R8 TS 32.274	C	8.1.0	8.2.0
Mar 2008	SP-39	SP-080074	0209	--	Corrections on Diameter AVP for SMS Charging	F	8.1.0	8.2.0
Mar 2008	SP-39	SP-080074	0210	--	Add on Number Portability and Carrier Select routing information	B	8.1.0	8.2.0
Jun 2008	SP-40	SP-080330	0211	--	Correction on SCCP-Address AVPs	F	8.2.0	8.3.0
Jun 2008	SP-40	SP-080330	0212	--	Add PoC-Event-Type AVP into PoC-Information	B	8.2.0	8.3.0
Jun 2008	SP-40	SP-080330	0213	--	Correction to PoC-Controlling-Adress AVP and PoC-Group-Name AVP	F	8.2.0	8.3.0
Sep 2008	SP-41	SP-080466	0214	--	Correction of inconsistencies in Offline Charging and Online Charging messages	F	8.3.0	8.4.0
Sep 2008	SP-41	SP-080330	0215	--	Correction on AVP codes - Alignment with TS 29.230	F	8.3.0	8.4.0
Sep 2008	SP-41	SP-080330	0216	--	Multiple SMS destination - Alignment with TS 23.040	C	8.3.0	8.4.0
Dec 2008	SP-42	SP-080706	0218	-	Completion on message tables	F	8.4.0	8.5.0
Dec 2008	SP-42	SP-080707	0219	-	Service Context Id for MMTEL	B	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0220	-	Correction on AVP code allocation	F	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0221	-	Clarification on AVP descriptions for EPC Charging	F	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0222	-	Add SMS-SC as SMS node type	B	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0223	-	Additional Address Info for SMS charging	B	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0224	-	Add charging of SMS services to 32.299	B	8.4.0	8.5.0
Dec 2008	SP-42	SP-080707	0225	-	TS 32.299 AVPs Introduction for MMTel charging	B	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0226	-	Correction on References Section	F	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0227	-	Addition of SDP offer and answer and clarification on media initiator	B	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0228	-	Additional non-3GPP access information	F	8.4.0	8.5.0
Dec 2008	SP-42	SP-080706	0229	-	Add a new value to Trigger-Type AVP	B	8.4.0	8.5.0
Dec 2008	SP-42	SP-080852	0217	-	TS 32.299 AVPs for offline charging - Rf interface from S-GW and P-GW	B	8.4.0	8.5.0
Mar 2009	SP-43	SP-090206	0232		TS 32.299 MMTel information AVP alignment with 32.275 definition	B	8.5.0	8.6.0
Mar 2009	SP-43	SP-090206	0235		Add CONF charging specific parameters	B	8.5.0	8.6.0
Mar 2009	SP-43	SP-090203	0230	1	Correction on 'Subscription Id' category used for EPS offline Charging	C	8.5.0	8.6.0
Mar 2009	SP-43	SP-090203	0231	-	Service-Type and Service-Mode in Supplementary-service AVP : format change	F	8.5.0	8.6.0
Mar 2009	SP-43	SP-090206	0232	-	SMS AVP structure alignement	B	8.5.0	8.6.0
Mar 2009	SP-43	SP-090045	0234		Add Serving-Node-Type AVP to PS-Information in 32.299	B	8.5.0	8.6.0
Mar 2009	SP-43	SP-090206	0235	-	AoC Support in Ro	B	8.5.0	8.6.0
Mar 2009	SP-43	SP-090045	0236	-	EPS Offline Charging - Complete PS-information AVP description	B	8.5.0	8.6.0
Mar 2009	SP-43	SP-090203	0237	-	Multiple subscription-id in service-information for EPS offline Charging	B	8.5.0	8.6.0
Mar 2009	SP-43	SP-090206	0238	-	Missing information in PS information AVP for SGW/PGW CDRs in EPS offline charging	B	8.5.0	8.6.0
Jun 2009	SP-44	SP-090432	0243	-	Correction of Recipient-Info AVP	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0244	-	AVP code allocation for DCD Charging	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0245	-	Rel-8 CR 32.299 alignment with RFC 4006	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0246	-	Rel-8 CR 32.299 clarification of ICID	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0247	-	Remove generic "Non 3GPP specific information" parameter	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0248	-	Correction on PDP context usage	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0249	-	Correction on AoC-Information AVP	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0252	-	Correction on Refund Information	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0253	-	LCS-information AVP not complete	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0254	-	PS-information AVP description alignment with 32.251 definition	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090432	0257	-	Correction on EPC Charging	F	8.6.0	8.7.0
Jun 2009	SP-44	SP-090294	0251	-	Add MMTel supplementary services FA, CCBS&CCNR, MCID, CAT for MMTel Charging	B	8.7.0	9.0.0
Jun 2009	SP-44	SP-090292	0255	-	Rel-9 CR 32.299 addition of online charging flag	B	8.7.0	9.0.0
Jun 2009	SP-44	SP-090292	0256	-	Rel-9 CR 32.299 correction of timestamp granularity	B	8.7.0	9.0.0
Sep 2009	SP-45	SP-090536	0258	-	Correction on AVP definitions	A	9.0.0	9.1.0
Sep 2009	SP-45	SP-090536	0260	-	Correction on MMS-Information AVP	A	9.0.0	9.1.0
Sep 2009	SP-45	SP-090536	0262	-	Rel-9 CR 32.299 correction and alignment with TS 32.280	A	9.0.0	9.1.0
Sep 2009	SP-45	SP-090536	0264	-	Error in Number-Portability-Routing-Information AVP definition	A	9.0.0	9.1.0

Sep 2009	SP-45	SP-090538	0265	-	Add "Closed User Group (CUG)" for MMTel Charging	B	9.0.0	9.1.0
Sep 2009	SP-45	SP-090538	0266	-	Add 3PTY MMTel supplementary service charging	B	9.0.0	9.1.0
Sep 2009	SP-45	SP-090541	0267	-	R9 CR 32299 add MBMS GW address below MBMS information AVP	B	9.0.0	9.1.0
Sep 2009	SP-45	SP-090538	0268	-	New AVPs for RTTI support in IMS offline charging	B	9.0.0	9.1.0
Sep 2009	SP-45	SP-090536	0271	-	Correction on Content Type - Alignment with OMA definition	A	9.0.0	9.1.0
Sep 2009	SP-45	SP-090537	0272	-	Correction of time stamp diameter types	F	9.0.0	9.1.0
Sep 2009	SP-45	SP-090536	0274	-	Correction of Accounting Input/Output Octets handling	A	9.0.0	9.1.0
Sep 2009	SP-45	SP-090537	0275	-	Emergency bearer service consideration for charging	B	9.0.0	9.1.0
Sep 2009	SP-45	SP-090536	0277	-	Addition of IP multicast delivery indicator below MBMS information AVP	A	9.0.0	9.1.0
Dec 2009	SP-46	SP-090720	0279	-	Alignment of Address-Type AVP with 32.274	A	9.1.0	9.2.0
Dec 2009	SP-46	SP-090720	0281	-	Alignment with TS 32.251 for "Volume Limit" and "Time Limit" in Change-Condition AVP	A	9.1.0	9.2.0
Dec 2009	SP-46	SP-090720	0283	-	Multiple Change-Condition AVP for simultaneous Condition changes	A	9.1.0	9.2.0
Dec 2009	SP-46	SP-090721	0284	-	Editorial clean-up	D	9.1.0	9.2.0
Dec 2009	SP-46	SP-090722	0285	-	MMTel related AVP applicable for Online Charging	B	9.1.0	9.2.0
Dec 2009	SP-46	SP-090720	0287	-	Correction on priority session treatment	A	9.1.0	9.2.0
Dec 2009	SP-46	SP-090720	0289	-	Alignment with TS 32.251 for "User location Change" Condition in Change-Condition AVP	A	9.1.0	9.2.0
Dec 2009	SP-46	SP-090720	0291	-	Alignment between Change-Condition AVP value with ASN1 ServiceConditionChange value "serviceStop"	A	9.1.0	9.2.0
Dec 2009	SP-46	SP-090721	0292	-	AVP for Account Expiration Information from OCS to IMS Application Servers	B	9.1.0	9.2.0
Dec 2009	SP-46	SP-090721	0293	-	Aligning AoC- Information AVP with RTTI and subscription information	C	9.1.0	9.2.0
Dec 2009	SP-46	SP-090720	0295	-	Correction of Number Portability and Carrier Select information AVPs	A	9.1.0	9.2.0
Dec 2009	SP-46	SP-090721	0296	-	Add CSG parameters for CSG based online and offline charging	B	9.1.0	9.2.0
Mar 2010	SP-47	SP-100041	0297	-	Correction on AVP code definitions	F	9.2.0	9.3.0
Mar 2010	SP-47	SP-100040	0299	-	Correction of Role-of-Node AVP	A	9.2.0	9.3.0
Mar 2010	SP-47	SP-100040	0301	-	Alignment with TS 32.251 for "Charging Characteristics Selection Mode" parameter	A	9.2.0	9.3.0
Mar 2010	SP-47	SP-100041	0302	-	Add CSG parameters for CSG based online and offline charging	F	9.2.0	9.3.0
Mar 2010	SP-47	SP-100044	0303	-	MMTel related AVP applicable for Online Charging	F	9.2.0	9.3.0
Mar 2010	SP-47	SP-100040	0305	-	Correction for offline Charging from PGW - 3GPP2 User location	A	9.2.0	9.3.0
Mar 2010	SP-47	SP-100041	0306	-	Remove unused Service-Condition-Change AVP	F	9.2.0	9.3.0
Mar 2010	SP-47	SP-100041	0307	-	Correction on SDP handling in IMS Charging	F	9.2.0	9.3.0
Mar 2010	SP-47	SP-100044	0308	-	Add "Personal Network management" MMTel supplementary service charging description	B	9.2.0	9.3.0
Mar 2010	SP-47	SP-100044	0309	-	Add "Customized Ringing Signal (CRS)" MMTel supplementary service charging description	B	9.2.0	9.3.0
Jun 2010	SP-48	SP-100265	0312	-	Correction on AVP definitions	A	9.3.0	9.4.0
Oct 2010	SP-49	SP-100496	0314	-	Correction for Dual IP addresses associated to one PDN connection	A	9.4.0	9.5.0
Oct 2010	SP-49	SP-100495	0317	-	Correction on Charging-Rule-Based-Name AVP - Alignment with TS 23.203	A	9.4.0	9.5.0
Oct 2010	SP-49	SP-100496	0319	-	Correction on Event Charging with Reservation	A	9.4.0	9.5.0
Oct 2010	SP-49	SP-100497	0320	-	Correction of Reason-Code AVP	F	9.4.0	9.5.0
Dec 2010	SP-50	SP-100756	0328	-	Correction of Inter-Operator-Identifier AVP – Align with TS 32.260	A	9.5.0	9.6.0
Dec 2010	SP-50	SP-100757	0322	-	Correction of Trigger-Type AVP	F	9.5.0	9.6.0
Dec 2010	SP-50	SP-100758	0324	2	Add missing LCS-Format-Indicator AVP value for "SIP_URL"	F	9.5.0	9.6.0
Dec 2010	SP-50	SP-100759	0325	2	Replace the Authorized-QoS AVP name with Authorised-QoS AVP	F	9.6.0	10.0.0
Mar 2010	SP-51	SP-110109	0329	1	Add E.164 harmonized address format to the current E.212 in MMS Charging	C	10.0.0	10.1.0
Mar 2010	SP-51	SP-110105	0330	3	Adding CDR fields needed for Machine Type Communication	B	10.0.0	10.1.0
Mar 2010	SP-51	SP-110108	0332	2	Add missing enumeration value for E-CSCF network element in Node-Functionality AVP - Align with 32.298	A	10.0.0	10.1.0
Mar 2010	SP-51	SP-110108	0336	1	Add internal structure and encoding for the Location-Estimate AVP	A	10.0.0	10.1.0
Mar 2010	SP-51	SP-110109	0340	2	Correction to charging scenarios	D	10.0.0	10.1.0
Mar 2010	SP-51	SP-110108	0344	1	Correction of CSG trigger handling - Alignment with TS 29.212	A	10.0.0	10.1.0
Mar 2010	SP-51	SP-110109	0345	1	Addition of IARI in IMS charging information, alignment with TS 22.115 and TS 23.228	B	10.0.0	10.1.0
Mar 2010	SP-51	SP-110109	0347	1	R10 32299 Correction on AVP Subscriber-role	F	10.0.0	10.1.0
Mar 2010	SP-51	SP-110112	0349	-	Add 'Advice Of Charge (AoC)' MMTel supplementary service Charging description - Align with 32.275	B	10.0.0	10.1.0
May 2011	SP-52	SP-110281	0352	1	Correction to Re-authorization Request Message	F	10.1.0	10.2.0
May 2011	SP-52	SP-110281	0356	1	Correction of RAT-Type AVP, alignment with TS 29.212, Gx interface	F	10.1.0	10.2.0
May 2011	SP-52	SP-110404	0359	1	Correction on essential supported fields in EPC Online Charging	A	10.1.0	10.2.0
May 2011	SP-52	SP-110404	0362	1	Correction on Rf interface for missing information in SGW CDR	A	10.1.0	10.2.0
May 2011	SP-52	SP-110294	0363	1	AVPs enhancement for OMR Charging introduction	B	10.1.0	10.2.0
May 2011	SP-52	SP-110280	0365	1	Correction in SCC AS CDR for IMS service continuity	A	10.1.0	10.2.0

May 2011	SP-52	SP-110281	0366	1	Correction on IMS Application Reference Identifier (IARI) in IMS Charging	F	10.1.0	10.2.0
May 2011	SP-52	SP-110317	0350	1	Rc Context Definition for Diameter Usage	B	10.2.0	11.0.0
Sep 2011	SP-53	SP-110528	0370	-	Correction on PDN connection identifier for Charging	A	11.0.0	11.1.0
Sep 2011	SP-53	SP-110528	0375	-	Correction for dynamic address flags associated to PDN connection of PDP/PDN type IPv4v6	A	11.0.0	11.1.0
Sep 2011	SP-53	SP-110530	0377	-	Correction of RAT Type, alignment with TS 29.061	A	11.0.0	11.1.0
Sep 2011	SP-53	SP-110528	0381	1	Correction on AVP definition - Align with IETF RFC 3588	A	11.0.0	11.1.0
Sep 2011	SP-53	SP-110541	0393	1	Addition of Sponsored Data Connectivity charging - Align with TS 23.203	B	11.0.0	11.1.0
Dec 2011	SP-54	SP-110708	0420	2	Correction of Dynamic Address Flag usage for IPv4v6 PDN Connection in PS Information AVP	A	11.1.0	11.2.0
Dec 2011	SP-54	SP-110711	0412	1	Correction of IPv6 PDP/PDN prefix	A	11.1.0	11.2.0
Dec 2011	SP-54	SP-110711	0416	-	Correction of IETF specified AVP usage in 3GPP charging applications	A	11.1.0	11.2.0
Dec 2011	SP-54	SP-110712	0394	2	Add Transit IOI to IMS Offline Charging	B	11.1.0	11.2.0
Mar 2012	SP-55	SP-120048	0422	1	Add missing Trigger-Type value to address change of UE Timezone alignment with TS 29.212	A	11.2.0	11.3.0
Mar 2012	SP-55	SP-120049	0425	1	Add Status in AVP "Application-Server-Information	B	11.2.0	11.3.0
June-2012	SP-56	SP-120362	0428	1	Correction of Serving Node Type, alignment with 29.274	F	11.3.0	11.4.0
June-2012	SP-56	SP-120359	0430	1	Correction of AVP usage, alignment with RFC 4006	A	11.3.0	11.4.0
June-2012	SP-56	SP-120361	0433	1	Correction on AVP definition	A	11.3.0	11.4.0
June-2012	SP-56	SP-120362	0434	1	Correction of Multiple Service Credit Control use	F	11.3.0	11.4.0
June-2012	SP-56	SP-120359	0440	1	Correction of diameter AVP usages, alignment with RFC 4006	A	11.3.0	11.4.0
June-2012	SP-56	SP-120360	0447	1	Correction on SGW and PGW Address reporting, alignment with 29.212	A	11.3.0	11.4.0
June-2012	SP-56	SP-120374	0448	2	Enhancing IMS charging for RAVEL	B	11.3.0	11.4.0
June-2012	SP-56	SP-120362	0449	1	Correction of Termination Action procedure	F	11.3.0	11.4.0
June-2012	SP-56	SP-120397	0450	1	Add charging parameters for NetLoc	B	11.3.0	11.4.0
June-2012	SP-56	SP-120361	0452	-	Correction on PDP-Address-Prefix-Length	A	11.3.0	11.4.0
Sep-2012	SP-57	SP-120646	0456	1	Rename Service-type AVP	A	11.4.0	11.5.0
Sep-2012	SP-57	SP-120561	0460	-	Remove Authorised-Qos from P-CSCF CDR	A	11.4.0	11.5.0
Sep-2012	SP-57	SP-120566	0461	1	Correction on the AVP name	F	11.4.0	11.5.0
Sep-2012	SP-57	SP-120566	0462	1	Supplementation for Reporting-Reason AVP	C	11.4.0	11.5.0
Sep-2012	SP-57	SP-120564	0465	1	Correction of AoC-Information AVP usage	A	11.4.0	11.5.0
Sep-2012	SP-57	SP-120562	0467	1	Correction of Called-Party-Address AVP	A	11.4.0	11.5.0
Sep-2012	SP-57	SP-120566	0469	1	Correction of calling party handling	C	11.4.0	11.5.0
Sep-2012	SP-57	SP-120646	0472	2	Correction on AoC service support	A	11.4.0	11.5.0
Sep-2012	SP-57	SP-120627	0473	1	Reference list correction to align with the corrected TS 29.212 title	F	11.4.0	11.5.0
Dec-2012	SP-58	SP-120789	0474	1	Correction on the figure description of Centralized Unit Determination and Centralized Rating	F	11.5.0	11.6.0
Dec-2012	SP-58	SP-120789	0476	1	Clarification of Type 1 and Type 2 IOI Usage for IMS Roaming	F	11.5.0	11.6.0
Dec-2012	SP-58	SP-120785	0479	2	Emergency Indicator introduction in P-CSCF CDR	A	11.5.0	11.6.0
Dec-2012	SP-58	SP-120801	0481	-	Correction on NNI-Information AVP	F	11.5.0	11.6.0
Dec-2012	SP-58	SP-120792	0482	1	Introduction AVPs description for SMS over MME Charging	B	11.5.0	11.6.0
Dec-2012	SP-58	SP-120793	0483	1	Offline Charging description for ATCF	B	11.5.0	11.6.0
Dec-2012	SP-58	SP-120789	0484	-	Correction on charging for IMS transit functions	F	11.5.0	11.6.0
Mar-2013	SP-59	SP-130062	0488	1	Clarification of Type 1 IOI Usage and Multiple Sets of Inter Operator Identifiers for IMS Roaming	F	11.6.0	11.7.0
		SP-130054	0491	1	Related ICID Corrections for SRVCC Charging Correlation	F		
		SP-130050	0495	1	Re-introduce Authorized-Qos AVP specified as unused	A		

		SP-130054	0496	-	Correction of LCS-Client-Type AVP definition	F		
Jun-2013	SP-60	SP-130270	0501	1	Addition of IMS Visited Network Identifier	F	11.7.0	11.8.0
		SP-130270	0505	-	Correction on AVP definitions	F		
		SP-130303	0503	-	Correction on data accounting - alignment with TS 32.298	A		
		SP-130303	0527	-	Correction of User-Equipment-Info-Value : encoding	A		
		SP-130270	0529	1	Introduction of Charging for access to Trusted WLAN Access Network in EPC - over S2a	F		
Sep-2013	SP-61	SP-130443	0536	-	Missing value for ATCF in Node-Functionality AVP	F	11.8.0	11.9.0
Oct-2013					Fixing mistake in History Table (MCC)		11.9.0	11.9.1
Dec 2013	SP-62	SP-130677	0549	3	Correction for use of Destination-Host AVP in ACR	A	11.9.1	11.10.0
		SP-130618	0553	1	Corection for User Location Info Time	F		
		SP-130671	0558	-	Correction on inconsistencies for MMTel Charging	A		
		SP-130627	0564	2	Correction for Route Header for IMS Interconnection Charging	F		
		SP-130618	0566	-	Correction on Application-Server-Information AVP	F		
Mar-2014	SP-63	SP-140033	0574	1	Correction of data type for Time-Usage and applicability of Service-Specific-Info and AF-Charging-Identifier	A	11.10.0	11.11.0
			0580	-	Correction for S-GW change in Change-Condition AVP	A		
Jun-2014	SP-64	SP-140335	0588	-	Renaming of TWAN-SSID and TWAN-BSSID AVPs	F	11.11.0	11.12.0
		SP-140346	0590	1	Correction for TADS indication AVP	F		
		SP-140343	0594	1	Correction to support multiple Transit IOI Lists in IMS Charging	F		

History

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