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Presentation of Specification to TSG

Presentation to:	**TSG SA Meeting #23**
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Abstract of document:

This is the 3GPP Technical Specification for the IP Multimedia Subsystem (IMS) charging and includes the principle and mechanism for both online and offline charging for 3GPP IMS networks.

Changes since last presentation to TSG SA:
New

Outstanding Issues:

- Alignment work needed with 3GPP TS 32.299. These include:
  - Alignment of the structure and content with 32.299.
  - Updates to comply with the IETF Diameter Credit Control application. This is needed due to migration from CCA to DCC.

Contentious Issues:
None.

3GPP TS 32.260 V1.0.0 (2004-03)

Technical Specification

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Foreword

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

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

Version x.y.z

where:

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

1 Scope

The present document 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 3GPP 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 events 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 3GPP TS 32.240 [1].

The present document specifies the IMS Offline and Online Charging functions based on the functional stage 2 description of IMS in 3GPP TS 23.228 [11].

The present document specifies the Offline and Online Charging description for the IP Multimedia Subsystem (IMS), based on the functional descriptions of the IMS in 3GPP TS 23.228 [xxx]. This charging description includes the offline and online charging architecture and scenarios specific to IMS. It specifies the structure and content of the CDRs for offline charging as well as the charging events for online charging. The parameters, abstract syntax and encoding rules for these CDR types are specified in 3GPP TS 32.298 [51]. The mechanisms used to transfer the CDRs from the network to the operator's billing domain (e.g. the billing system or a mediation device) are specified in 3GPP TS 32.297 [52]. The 3GPP Diameter applications that are used for IMS online and offline charging are specified in 3GPP TS 32.299 [50].

All references, abbreviations, definitions, descriptions, principles and requirements, used in the present document, that are common across 3GPP TSs, are defined in the 3GPP Vocabulary, 3GPP TR 21.905 [100]. Those that are common across charging management in GSM/UMTS domains or subsystems are provided in the umbrella document 3GPP 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.

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*.

a) The 3GPP charging specifications

[1] 3GPP TS 32.240: "Telecommunication management; Charging management; Charging architecture and principles".

[2]-[9] Void.

[10] 3GPP TS 32.250: "Telecommunication management; Charging management; Circuit Switched (CS) domain charging".

[11] 3GPP TS 32.251: "Telecommunication management; Charging management; Packet Switched (PS) domain charging".

[12] 3GPP TS 32.252: "Telecommunication management; Charging management; Wireless Local Area Network (WLAN) charging".

[13]-[29] Void.

[30] 3GPP TS 32.270: "Telecommunication management; Charging management; Multimedia Messaging Service (MMS) charging".

[31] 3GPP TS 32.271: "Telecommunication management; Charging management; Location Services (LCS) charging".

[32]-[49] Void.

[50] 3GPP TS 32.299: "Telecommunication management; Charging management; Diameter charging application".

[51] 3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) encoding rules description".

[52] 3GPP TS 32.297: "Telecommunication management; Charging management; Charging Data Records (CDR) file format and transfer".

[53] 3GPP TS 32.296: "Telecommunication management; Charging management; On-line Charging System (OCS) applications and interfaces".

[54] 3GPP TS 32.295: "Telecommunication management; Charging management; Charging Data Record (CDR) transfer".

[55]-[99] Void.

b) Common 3GPP specifications

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

[101] 3GPP TS 22.101: "Service aspects; Service principles".

[102] 3GPP TS 22.115 "Service aspects; Charging and billing".

[103] 3GPP TS 23.002: "Network architecture".

[104] 3GPP TS 23.003: "Numbering, addressing and identification".

[105] 3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[106]-[199] Void.

c) other Domain and Service specific 3GPP / ETSI specifications

[200] 3GPP TS 22.228: "Service requirements for the IP multimedia core network subsystem; Stage 1".

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

[202] 3GPP TS 24.228: "Signalling flows for the IP multimedia call control based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[203] 3GPP TS 23.218: "IP Multimedia (IM) session handling; IM call model; Stage 2".

[204] 3GPP TS 24.229: "Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[204]-[399] Void.

e) Relevant IETF RFCs

[400] IETF RFC 959 (1985): "File Transfer Protocol".

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

[402] IETF Internet-Draft: "Diameter Credit Control Application".

[403] IETF RFC 2806: "URLs for Telephone Calls".

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

[405] IETF RFC 2486: "The Network Access Identifier".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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 an IMS Network Entity or an AS and CDF
Ro Online Charging Reference Point between an AS or MRFC and the ECF

3.3 Abbreviations

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

Editors note: These abbreviations have to be checked.

ACA ACcounting Answer
ACR ACcounting Request
AS Application Server
AVP Attribute Value Pair
B2BUA Back-to-Back User Agent
BGCF Breakout Gateway Control Function
CCA Credit Control Answer
CCF Charging Collection Function
CCR Credit Control Request
CDR Charging Data Record
CSCF Call Session Control Function (I-Interrogating; P-Proxy; and S-Serving)
ECF Event Charging Function
ECUR Event Charging with Unit Reservation
IEC Immediate Event Charging
IMS IP Multimedia Subsystem
ISC IMS Service Control
MGCF Media Gateway Control Function
MRFC Media Resource Function Controller
MRFP Multimedia Resource Function Processor
OCS Online Charging System
SDP Session Description Protocol
SIP Session Initiation Protocol
UA User Agent
UE User Equipment
ICID IMS Charging Identifier
ACID Application Charging Identifier

4 Architecture Considerations

4.1 High level XXX <domain> architecture

< Insert here a diagram / diagrams and, as necessary, a brief description of the architecture of the part of the 3GPP system that the present document is targeting. Usually, the diagram(s) should be taken from the respective part of 3GPP TS 32.240. In these diagrams, the nodes relevant for charging are colorized. A good source for the architecture description is the underlying architecture TS from SA2, e.g. 3GPP TS 23.060 for GPRS. >

4.2 XXX <domain> offline charging architecture

< This clause shall describe the mapping of the common offline charging architecture, as specified in 3GPP TS 32.240, onto the system / domain that the present document is targeting. All nodes that are colorized in the diagram(s) in subclause 4.1. shall be covered. If the present document does not specify offline charging for XXX, then an appropriate reference or other explanation shall be provided (cf. scope clause) >

4.3 XXX <domain> online charging architecture

< This clause shall describe the mapping of the common online charging architecture, as specified in 3GPP TS 32.240, onto the system / domain that the present document is targeting. All nodes that are colorized in the diagram(s) in subclause 4.1. shall be covered. If the present document does not specify online charging for XXX, then an appropriate reference or other explanation shall be provided (cf. scope clause) >

Editors note: Provide mapping of generic charging architecture for IMS.

5 Charging principles

5.1 IMS charging principles

The AS and MRFC are able to distinguish whether to apply offline or online charging, i.e. whether to send charging information on the Rf interface to the CDF or on the Ro interface to the OCS, which includes ECF and SCF as described in subclause 4.3 (or to use both). The decision of which interface to use is based on the information (CDF and/or ECF address) the AS/MRFC receive in the SIP signalling and the system configuration as provisioned by the operator. If the AS/MRFC only receive the CDF address and do not receive an ECF address then they use only the Rf interface. If only the OCS address was provided then they use only the Ro interface. In cases where both CDF and OCS addresses are provided it is possible to use both interfaces simultaneously.

However, operators may overrule the addresses received via the SIP signalling and use their own configured rules instead. Operators may configure locally on the AS/MRFC an OCS and/or CDF address. The CDF address may be locally configured on all other IMS nodes. The choice of whether the IMS nodes use the locally configured addresses or the addresses received by SIP signalling, and the decision on which interface(s) to use, is left for operator configuration.

All other IMS nodes (S-CSCF, P-CSCF, I-CSCF, BGCF and MGCF) apply offline charging via the Rf interface using the CDF address as received via SIP signalling or the locally configured CDF address. The S-CSCF supports online charging using the ISC interface, i.e. if the application server addressed over ISC is the Session Charging Function of the OCS.

Editor Note: Rephrase section.

5.2a IMS charging correlation

5.2a.1 Basic principles for IMS domain correlation

< Insert here a short description of IMS specific correlation and refer to 3GPP TS 32.240, where general correlation mechanisms will be defined >

5.2a.2 IMS Charging Identifier (ICID)

< Insert here a detailed description how ICID is generated and how and when it should be used. I.e. more or less text that is currently in TS 24.229 should be here with clarifications and more details. >

5.2a.3 Application Charging Identifier (ACID)

< If ACID will be accepter, the same kind of description than for ICID should be included here, i.e. more general than in annex B >

5.2 IMS offline charging scenarios

5.2.1 Basic principles

The offline charging functionality is based on the IMS network nodes reporting accounting information upon reception of various SIP methods or ISUP messages, 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 IMS network elements to the CDF.

The Diameter client uses ACR Start, Interim and Stop in procedures related to successful SIP sessions. It uses ACR Events for unsuccessful SIP sessions and for session unrelated procedures. Further details are specified in the tables below and in subclause 5.2.2.

It is operator configurable in the nodes for which SIP method or ISUP messages an *Accounting Request* is sent, with the exception that if accounting information is collected for sessions the ACR [Start] and ACR [Stop] messages are mandatory according to the tables below. Table 5.1 describes all possible ACRs that might be sent from a P-CSCF, I-CSCF, S-CSCF, MGCF or BGCF. A list of node specific ACRs, along with the AVPs to be included are detailed in 3GPP TS 32.299 [50].

The ACRs to be sent from a MRFC are described in table 5.2.

In the tables below, the terms "configurable" implies that operators may enable or disable the generation of an ACR message by the IMS node in response to a particular "Triggering SIP Method /ISUP Message". However, for those table entries marked with *, the operator can enable or disable the ACR message based on whether or not the SIP (Re) Invite message that is replied to by the "Triggering SIP Method /ISUP Message" carried piggybacked user data.

Table 5.1: Accounting Request Messages Triggered by SIP Methods or ISUP Messages for all IMS nodes except for MRFC and AS

Diameter Message	Triggering SIP Method /ISUP Message	Mandatory/ Configurable
ACR [Start]	SIP 200 OK acknowledging an initial SIP INVITE	Mandatory
	ISUP:ANM (applicable for the MGCF)	Mandatory
ACR [Interim]	SIP 200 OK acknowledging a SIP RE-INVITE or SIP UPDATE [e.g. change in media components]	Configurable
	Expiration of AVP [Acct-Interim-Interval]	Configurable
ACR [Stop]	SIP BYE message (both normal and abnormal session termination cases)	Mandatory
	ISUP:REL (applicable for the MGCF)	Mandatory
ACR [Event]	SIP 200 OK acknowledging non-session related SIP messages, which are:	
	SIP NOTIFY	Configurable
	SIP MESSAGE	Configurable
	SIP REGISTER	Configurable
	SIP SUBSCRIBE	Configurable
	SIP Final Response (4xx, 5xx or 6xx), indicating an unsuccessful SIP session set-up	Configurable *
	SIP Final Response (4xx, 5xx or 6xx), indicating an unsuccessful session-unrelated procedure	Configurable *
	SIP CANCEL, indicating abortion of a SIP session set-up	Configurable *
	I-CSCF completing a Cx Query that was issued in response to a SIP INVITE	Configurable
NOTE: SIP SUBSCRIBE with the field "Expires" set to 0 means unsubscribe. SIP REGISTER with its "Expires" header field or "Expires" parameter equal to 0 means Deregistration (see 3GPP TS 24.229 [204]).		

Table 5.2: Accounting Request Messages Triggered by SIP Methods for the MRFC

Diameter Message	Trigger	Mandatory/ Configurable
ACR [Start]	SIP 200 OK acknowledging an SIP INVITE for initiating a multimedia ad hoc conferencing session	Mandatory
ACR [Interim]	SIP ACK acknowledging a SIP INVITE to connect an UE to the conferencing session	Configurable
	Expiration of AVP [Acct-Interim-Interval]	Configurable
ACR [Stop]	SIP BYE message	Mandatory
	SIP Final Response with error codes 4xx, 5xx or 6xx indicating termination of an ongoing session	Mandatory

ASs support all four ACR types (Start/Interim/Stop/Event). The use of ACR Start, Interim and Stop (Session Charging) versus ACR Event (Event Charging) depends on the services provided by the application server. Example flows for an AS employing Event Charging and an AS using Session Charging are shown in subclause 5.2.2.1.

The ability of SIP methods not listed in tables 5.1 and 5.2 to trigger ACRs is for further study.

5.2.2 Message Flows and Types

The flows described in the present document specify the charging communications between IMS entities and the charging functions for different charging scenarios. The SIP messages associated with these charging scenarios are shown primarily for general information and to illustrate the charging triggers. They are not intended to be exhaustive of all the SIP message flows discussed in 3GPP TS 24.228 [200].

5.2.2.1 Message flows - Successful cases and scenarios

5.2.2.1.1 Session establishment - Mobile origination

Figure 5.1 shows the Diameter transactions that are required between CSCF and CDF during session establishment originated by a UE.

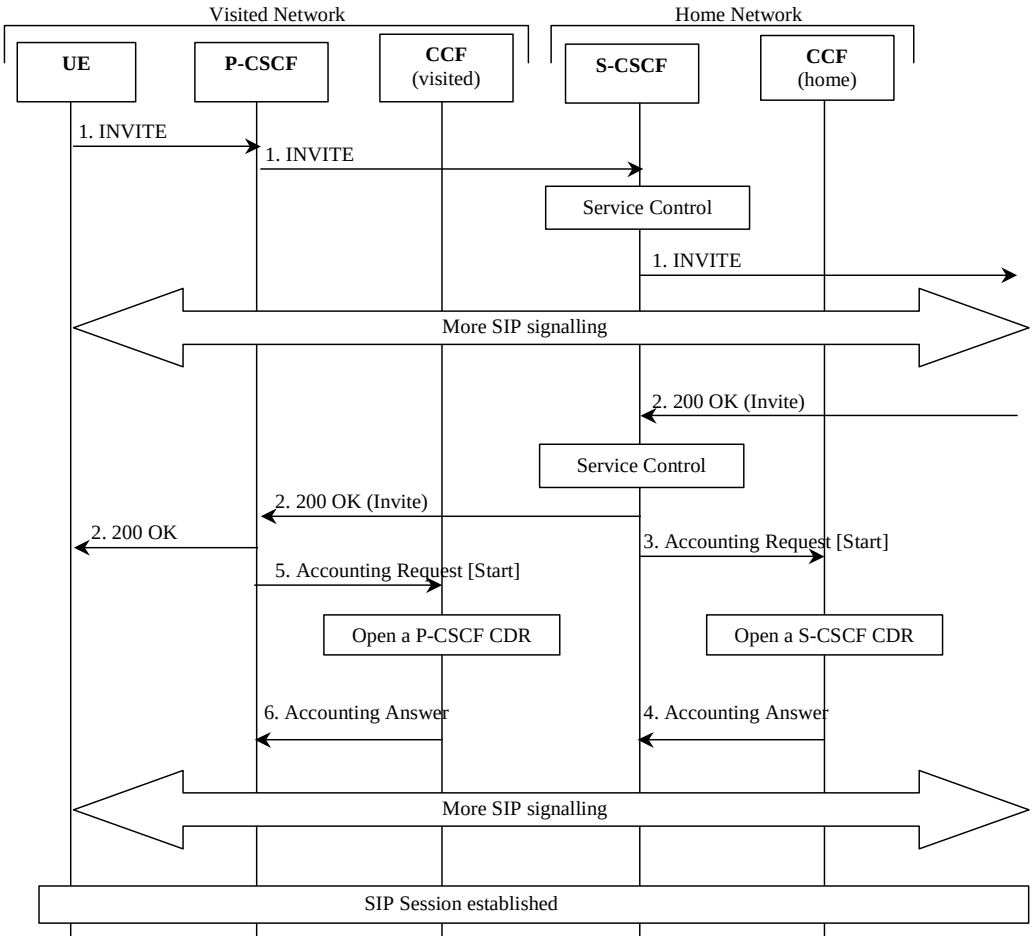

Figure 5.1: Message Sequence Chart for Session Establishment (Mobile Origination)

1. The session is initiated.
2. The destination party answers and a final response is received.
3. Upon reception of the final response, the S-CSCF sends an *Accounting-Request* with *Accounting-Record-Type* indicating START_RECORD to record start of a user session and start of a media component in the S-CSCF CDR.
4. The CDF acknowledges the reception of the data and opens a S-CSCF CDR.
5. Same as 3, but for P-CSCF.
6. Same as 4, but creating a P-CSCF CDR.

5.2.2.1.2 Session Establishment - Mobile Termination

Figure 5.2 shows the Diameter transactions that are required between CSCF and CDF during a session establishment that is terminated to a mobile. The I-CSCF is only involved in the INVITE transaction.

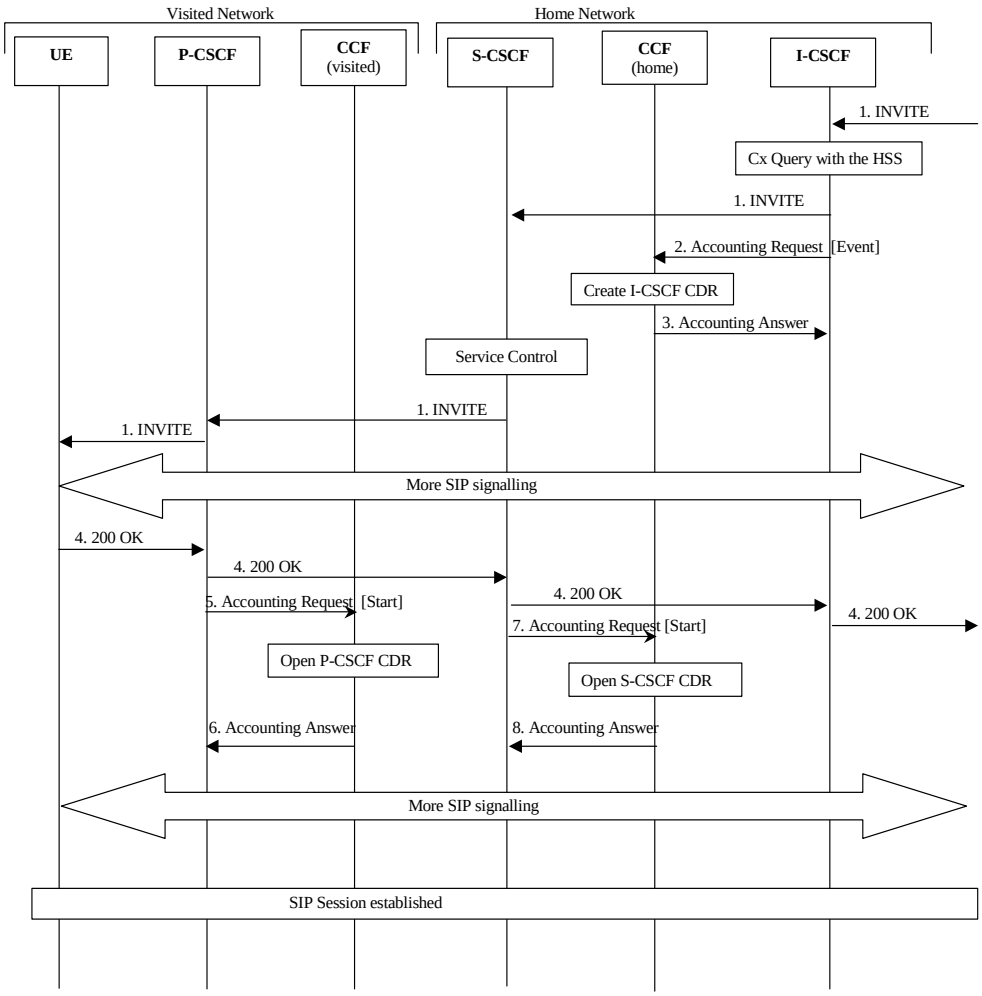

Figure 5.2: Message Sequence Chart for Session Establishment (Mobile Termination)

1. The session is initiated.
2. Upon completing a Cx query the I-CSCF sends an *Accounting Request* with the *Accounting-Record-Type* set to EVENT.
3. The CDF acknowledges the data received and creates an I-CSCF CDR.
4. The destination party answers and a final response is sent.
5. - 8. These steps are identical to the corresponding steps described in subclause 5.2.2.1.1.

5.2.2.1.3 Mid-session procedures

Figure 5.3 shows the Diameter transactions that are required between CSCF and CDF when a UE generates a SIP (Re-)INVITE or SIP UPDATE in mid-session, e.g. in order to modify media component(s), or when the hold and resume procedure is executed.

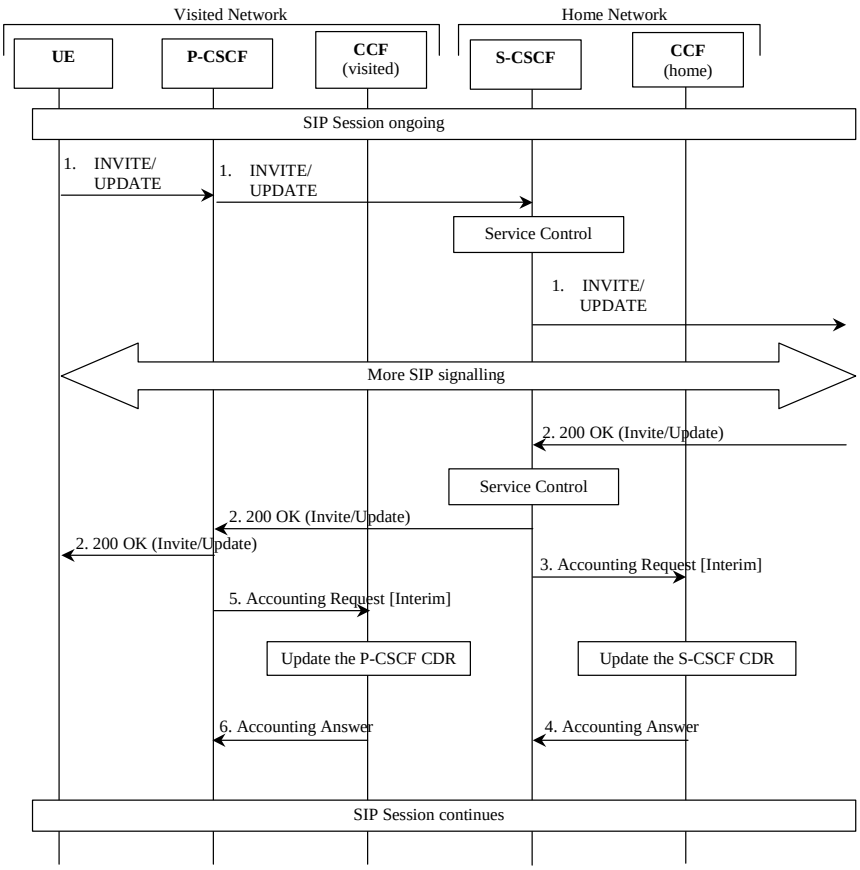

Figure 5.3: Message Sequence Chart for Media Modification

1. Modified media information is received from the subscriber.
2. The destination party acknowledges the media modification.
3. At modification of a media, the S-CSCF sends *Accounting-Request* with *Accounting-Record-Type* indicating INTERIM_RECORD to record modification of a media component in the S-CSCF CDR.
4. The CDF acknowledges the reception of the data and updates the S-CSCF CDR.
5. Same as 3, but for P-CSCF.
6. Same as 4, updating the P-CSCF CDR.

5.2.2.1.4 Session release - Mobile initiated

Figure 5.4 shows the Diameter transactions that are required between CSCF and CDF for a session release that is initiated by the UE.

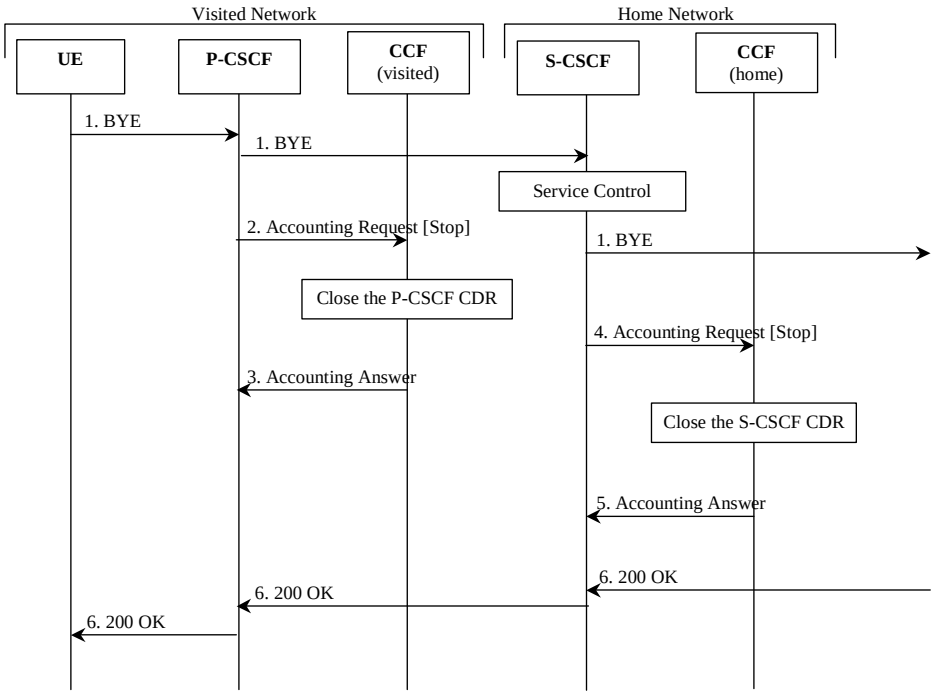

Figure 5.4: Message sequence chart for session release

1. The session is released.
2. At session termination the P-CSCF sends *Accounting-Request* with *Accounting-Record-Type* indicating STOP_RECORD to record stop of a session and stop of a media component in the P-CSCF CDR.
3. The CDF acknowledges the reception of the data and closes the P-CSCF CDR.
4. Same as 2, but for S-CSCF.
5. Same as 3, closing the S-CSCF CDR.
6. The release is acknowledged.

5.2.2.1.5 Void

Figure 5.5: Void

5.2.2.1.6 Session-unrelated procedures

Figure 5.6 shows the Diameter transactions that are required between CSCF and CDF for session-unrelated IMS procedures, i.e. those that relate to the Diameter ACR [Event], as listed in table 5.1.

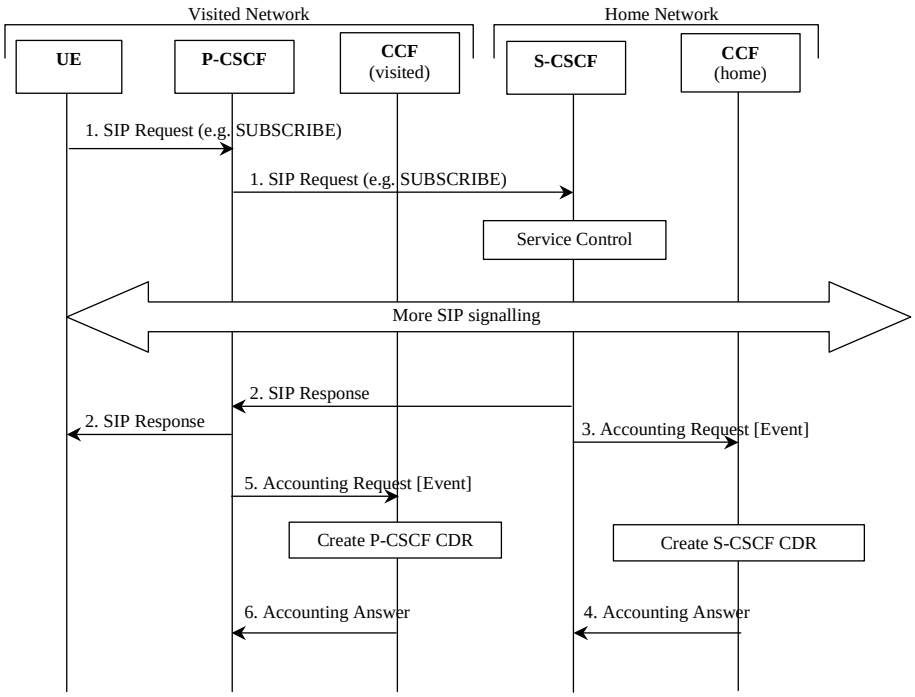

Figure 5.6: Message sequence chart for session-unrelated procedure

1. The P-CSCF receives a "SIP Request" (e.g. SUBSCRIBE) from the subscriber.
2. The "SIP Request" is acknowledged by the "SIP Response" as follows:
   - in the successful case, a 200 OK message is returned;
   - in case of failure an appropriate SIP error message is returned.

Depending on the used SIP method, there might be additional signalling between steps 1 and 2.

3. After the completion of the procedure, the S-CSCF sends *Accounting-Request* with *Accounting-Record-Type* indicating EVENT_RECORD to record transaction specific information in the S-CSCF CDR.
4. The CDF acknowledges the reception of the data and produces an S-CSCF CDR.
5. Same as 3, but for P-CSCF.
6. Same as 4, creating a P-CSCF CDR.

5.2.2.1.7 Session establishment - PSTN initiated

Figure 5.7 shows the Diameter transactions that are required between MGCF and CDF during session establishment initiated from the PSTN side.

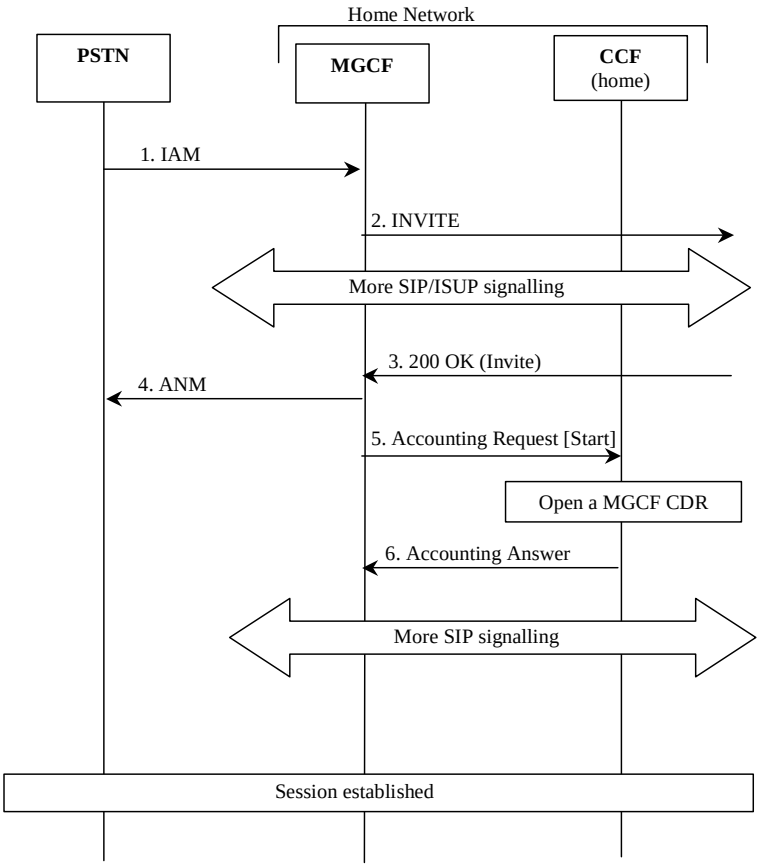

Figure 5.7: Message Sequence Chart for Session Establishment (PSTN Initiated)

1. The session is originated from the PSTN.
2. The session setup is triggered in the IMS.
3. The destination party answers and a final response is received.
4. MGCF forwards an answer message to the PSTN.
5. Upon reception of the final response, the MGCF sends an *Accounting-Request* with *Accounting-Record-Type* indicating START_RECORD to record start of a user session and start of a media component in the MGCF CDR.
6. The CDF acknowledges the reception of the data and opens a MGCF CDR.

5.2.2.1.8 Session establishment - IMS initiated

Figure 5.8 shows the Diameter transactions that are required between BGCF, MGCF and CDF during session establishment initiated from the IMS side.

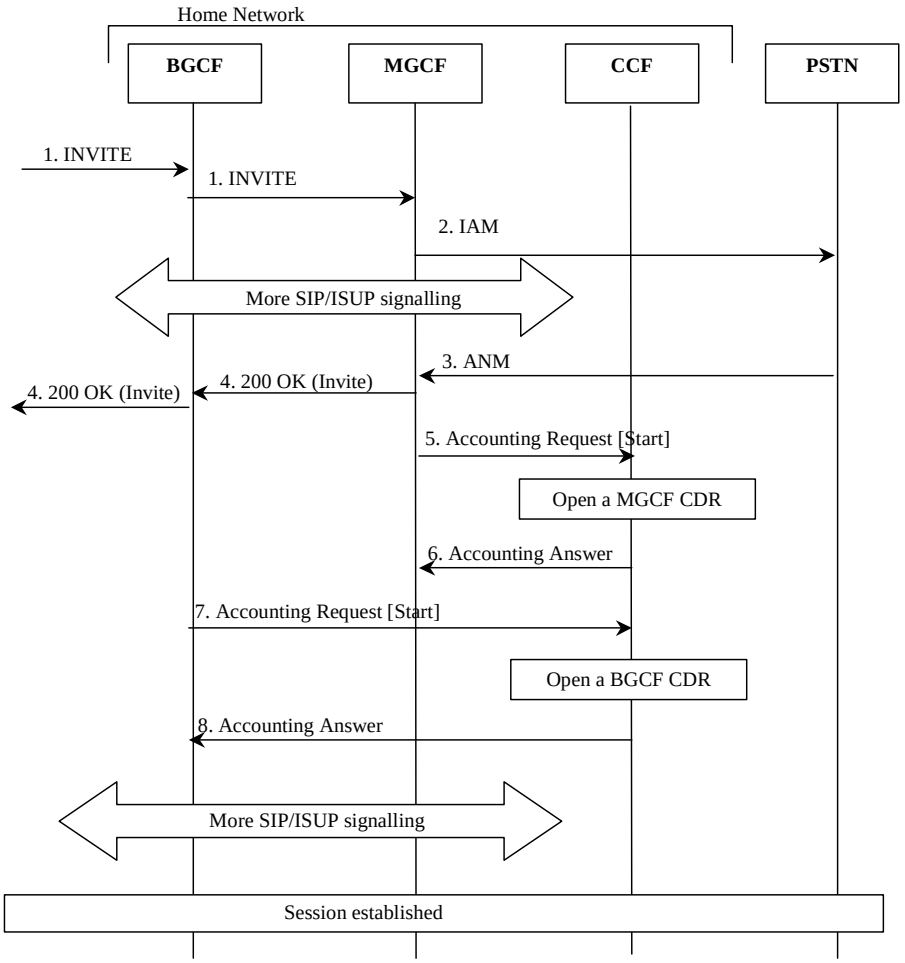

Figure 5.8: Message sequence chart for session establishment (IMS initiated)

1. The session is originated from the IMS.
2. A session towards PSTN is established.
3. The destination party answers and an answer message is received.
4. A final response message is sent to the session originator.
5. Upon reception of the answer message, the MGCF sends an *Accounting-Request* with *Accounting-Record-Type* indicating START_RECORD to record start of a user session and start of a media component in the MGCF CDR.
6. The CDF acknowledges the reception of the data and opens a MGCF CDR.
7. Upon reception of the 200 OK message, the BGCF sends an *Accounting-Request* with *Accounting-Record-Type* indicating START_RECORD to record start of a user session and start of a media component in the BGCF CDR.
8. The CDF acknowledges the reception of the data and opens a BGCF CDR.

5.2.2.1.9 Session release - PSTN initiated

Figure 5.9 shows the Diameter transactions that are required between BGCF, MGCF and CDF during a PSTN initiated session release. The BGCF is only involved if the session had been initiated from the IMS side.

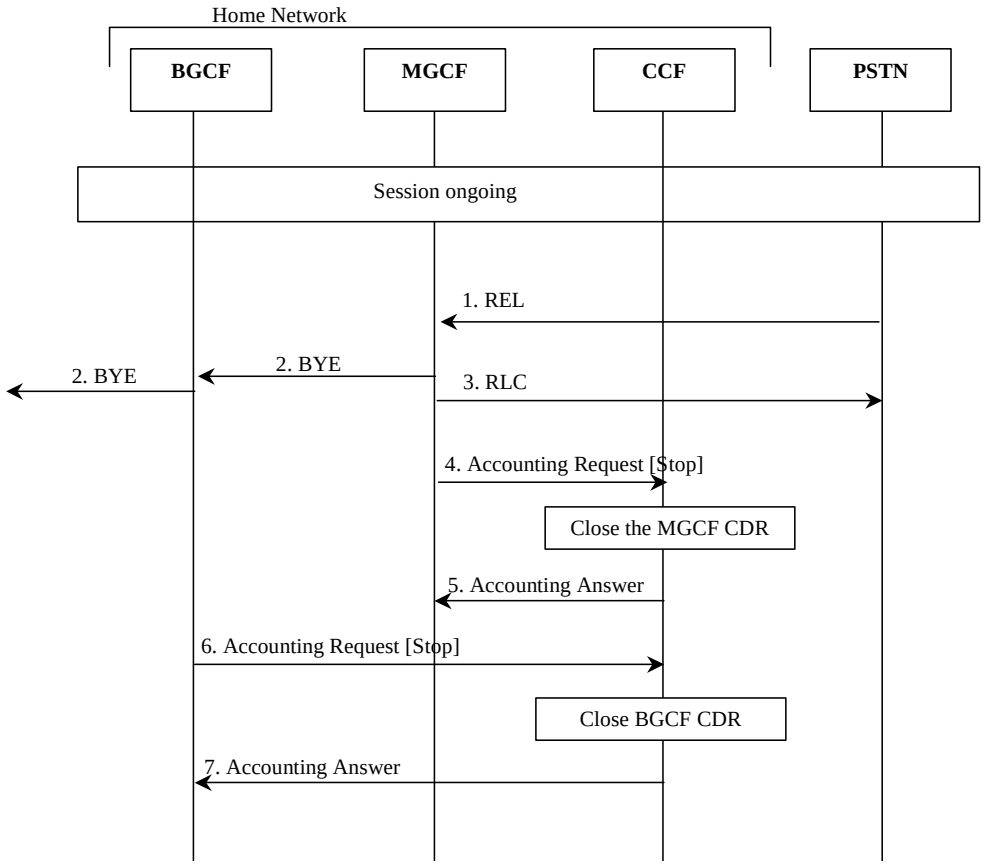

Figure 5.9: Message Sequence Chart for Session Release (PSTN initiated)

1. The session release is initiated from PSTN.
2. Session release continues within IMS.
3. The reception of the release message is acknowledged.
4. Upon reception of the release message, the MGCF sends an *Accounting-Request* with *Accounting-Record-Type* indicating STOP_RECORD to record stop of a session in the MGCF CDR.
5. The CDF acknowledges the reception of the data and closes the MGCF CDR.
6. Same as 4, but for BGCF.
7. Same as 5, but for BGCF.

5.2.2.1.10 Session Release - IMS Initiated

Figure 5.10 shows the Diameter transactions that are required between BGCF, MGCF and CDF during a IMS initiated session release.

The BGCF is only involved if the session had been initiated from the IMS side.

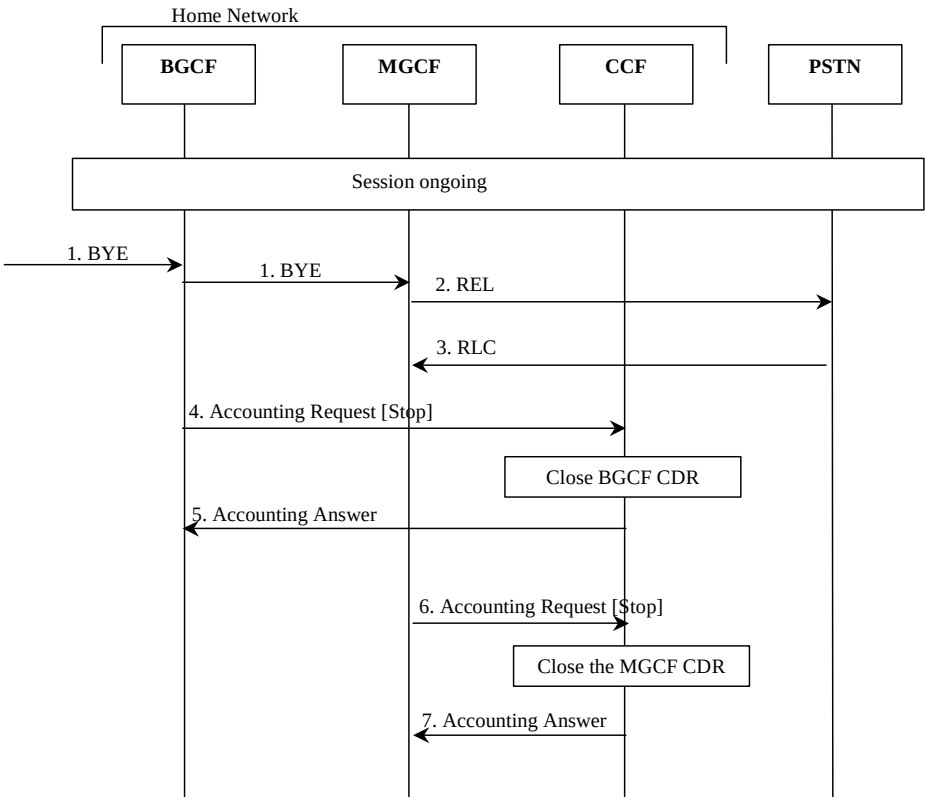

Figure 5.10: Message sequence chart for session release (IMS initiated)

5.2.2.1.11

1. The session release is initiated from the IMS side.
2. A release message is sent towards PSTN.
3. The acknowledgement of the release message is received from PSTN.
4. Upon reception of the BYE message, the BGCF sends an *Accounting-Request* with *Accounting-Record-Type* indicating STOP_RECORD to record stop of a session in the BGCF CDR.
5. The CDF acknowledges the reception of the data and closes the BGCF CDR.
6. Same as 4, but for MGCF.
7. Same as 5, but for MGCF.

5.2.2.1.11 Multi-Party Call

Editors note: Update according to 25-034650

Figure 5.11 shows the establishment of an ad hoc conference (multiparty call). An AS (acting as B2BUA) performs third party call control with the MRFC, where the S-CSCF is in the signalling path. The Application Server that is in control of the ad hoc conference is aware of the MRFC capabilities.

NOTE: Only accounting information sent from the MRFC is shown in detail in the figure. The SIP messages are for illustrative purpose only.

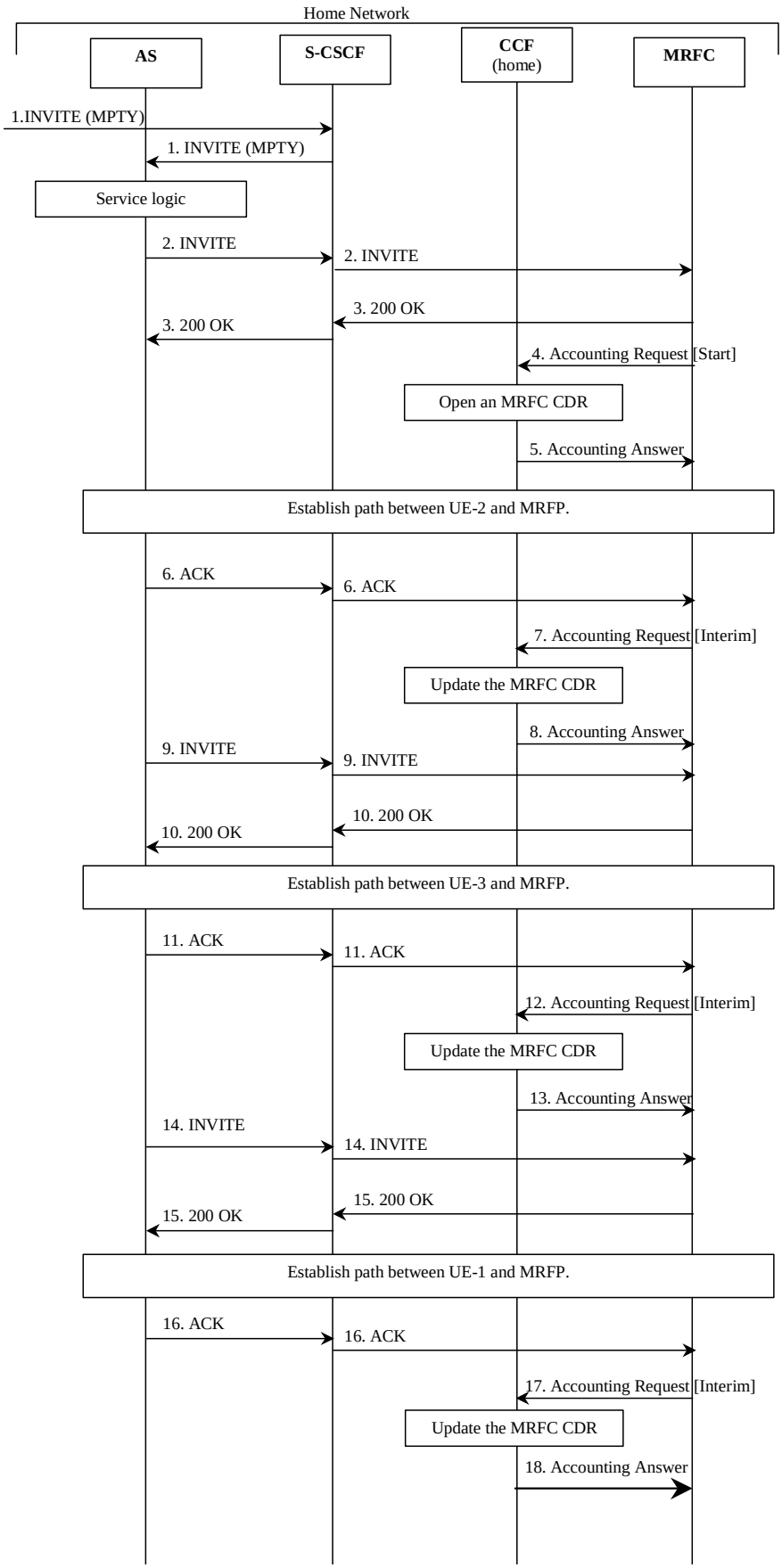

Figure 5.11: Message Sequence Chart for Multi-Party Call Establishment in MRFC

1. Sessions exist between UE-1 and UE-2, and between UE-1 and UE-3. A request is received from UE-1for putting all parties together to a multi-party call.
2. - 3. Request and acknowledgement to initiate multi-party call.
4. At session establishment the MRFC sends an *Accounting-Request* with *Accounting-Record-Type* indicating START_RECORD to record start of multi-party call in the MRFC CDR
5. The CDF acknowledges the reception of the data and creates the MRFC CDR.
6. Dialog between UE-2 and MRFP has been established.
7. The MRFC may send an *Accounting-Request* with *Accounting-Record-Type* indicating INTERIM_RECORD to report that UE-2 has been connected to the multi-party call.
8. The CDF acknowledges the reception of the data and updates the MRFC CDR.
9. New request sent to MRFC to prepare dialog for UE-3.
10. Request acknowledged.
11. Dialog between UE-3 and MRFP has been established.
12. The MRFC may send an *Accounting-Request* with *Accounting-Record-Type* indicating INTERIM_RECORD to report that UE-3 has been connected to the multi-party call.
13. The CDF acknowledges the reception of the data and updates the MRFC CDR.
14. New request sent to MRFC to prepare dialog for UE-1.
15. Request acknowledged.
16. Dialog between UE-1 and MRFP has been established.
17. The MRFC may send an *Accounting-Request* with *Accounting-Record-Type* indicating INTERIM_RECORD to report that UE-1 has been connected to the multi-party call.
18. The CDF acknowledges the reception of the data and updates the MRFC CDR.

5.2.2.1.12 AS related procedures - AS acting as a redirect server

Application servers may support a multitude of services which are not specified in 3GPP standards. Therefore it is not possible to standardize charging flows and procedures for those services. However, for all such services, the AS may apply either Event Charging, where ACR [Event] messages are generated, or Session Charging, using ACR [Start, Stop and Interim]. The following subclauses depict one example for each of the two scenarios. The first procedure, AS acting as a Redirect Server, depicts the "event" case, while the second procedure, AS acting as a Voice Mail Server, depicts the "session" case.

Figure 5.12 shows the case where an Application Server acts as a Redirect Server. In the figure below, UE-1 sets up a session towards UE-2 but due to Call Forwarding functionality located in the AS, a new number (to UE-3) is returned to UE-1. Finally UE-1 sets up the session towards UE-3.

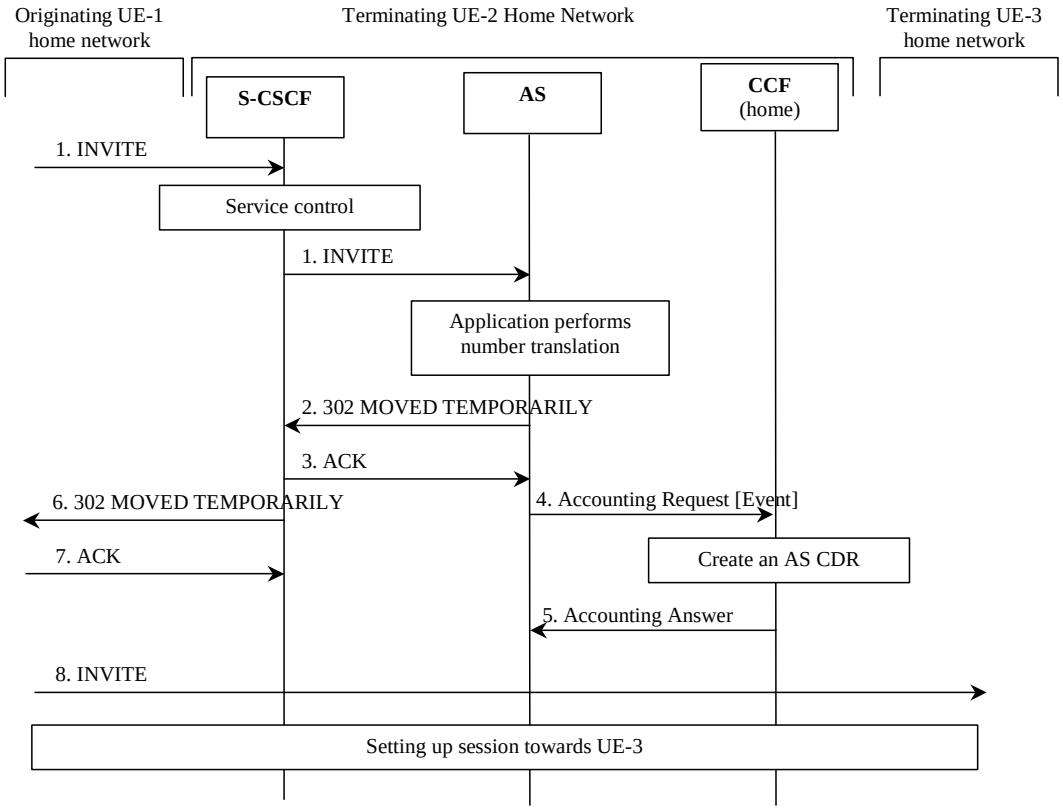

Figure 5.12: Message Sequence Chart for AS Acting as a Redirect Server

1. Sessions initiated by UE-1 towards UE-2.
2. - 3. Response indicating that session should be redirected towards another number (UE-3).
4. After successful service execution, the AS sends *Accounting-Request* with *Accounting-Record-Type* indicating EVENT_RECORD to record service specific information in the AS CDR.
5. The CDF acknowledges the reception of the data and creates the AS CDR.
6-7. Response indicating that session should be redirected towards another number (UE-3).
8. Session is initiated by UE-1 towards UE-3.

5.2.2.1.13 AS Related Procedures - AS Acting as a Voice Mail Server

Figure 5.13 shows the case where an Application Server acts as a Voice Mail Server. S-CSCF invokes the AS acting as Voice Mail Server according to procedure as defined in 3GPP TS 23.218 [203].

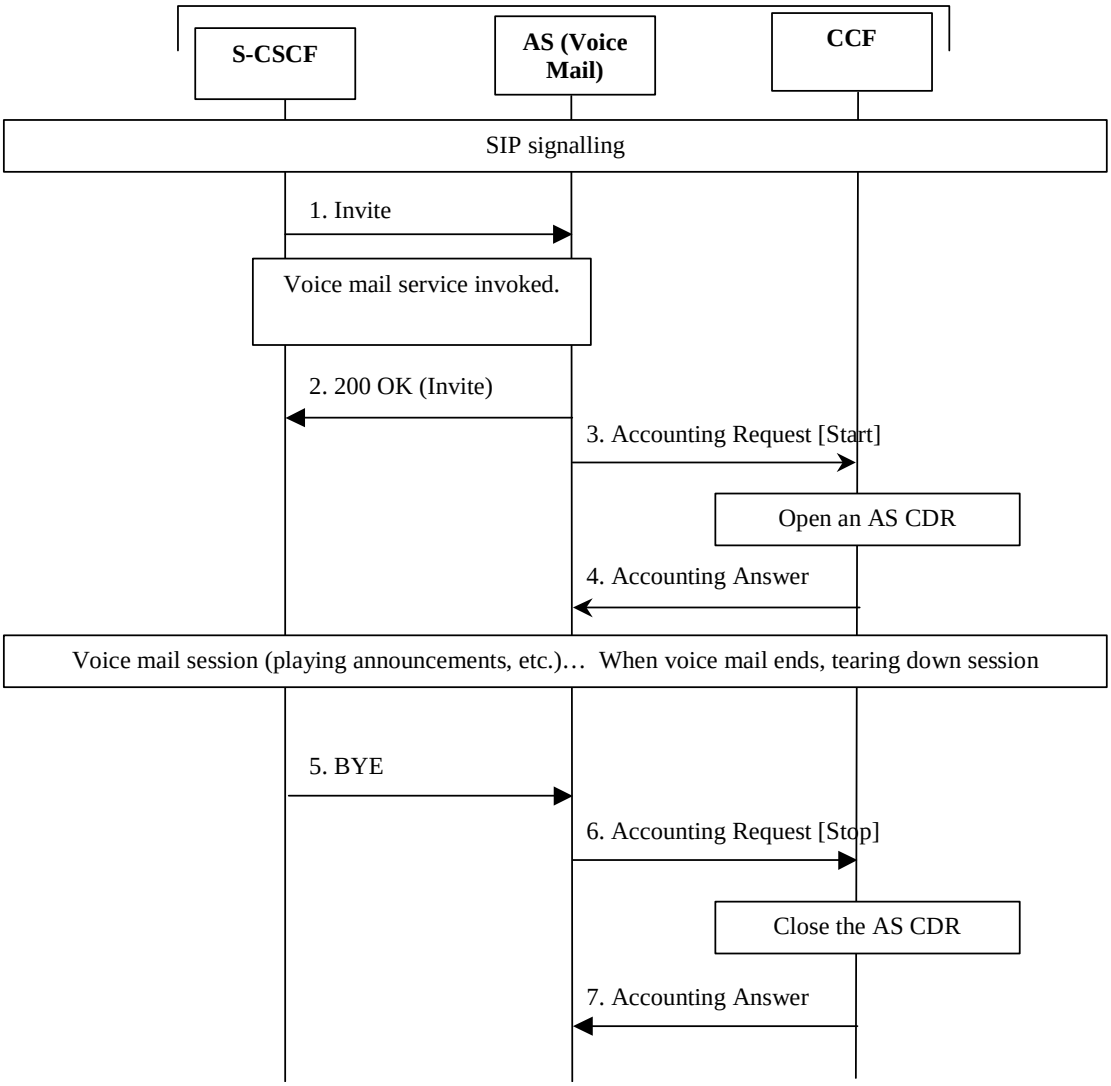

Figure 5.13: Message Sequence Chart for AS Acting as a Mail Server

1. AS receives the INVITE from the S-CSCF.
2. AS acknowledges the initiated Voice Mail session by issuing a 200 OK in response to the INVITE.
3. AS sends *Accounting-Request* with *Accounting-Record-Type* indicating START_RECORD to record start of a voice mail session.
4. The CDF acknowledges the reception of the *Accounting-Request* with *Accounting-Record-Type* indicating START_RECORD and opens a AS CDR.
5. Voice mail session release is initiated.
6. Upon reception of release message AS sends an *Accounting-Request* with *Accounting-Record-Type* indicating STOP_RECORD to record stop of a session in the AS CDR.
7. The CDF acknowledges the reception of the data and closes the AS CDR.

5.2.2.2 Message Flows - Error Cases and Scenarios

This subclause describes various error cases and how these should be handled. The error cases are grouped into the following categories:

- Failure in SIP Related Procedures:
  - Session Related Error Scenarios;
  - Session Unrelated Error Scenarios.
- Errors in Diameter (Accounting) Related Procedures.

5.2.2.2.1 Session Related SIP Procedures- Reception of SIP error messages

A SIP session is closed abnormally by the reception of a BYE message indicating the reason for such termination.

In this case, an ACR [Stop] message that includes an appropriate error indication is sent.

5.2.2.2.2 Session Related SIP Procedures - SIP session failure

All nodes involved in the SIP session are expected to exercise some kind of session supervision. In case a node detects an error in the SIP session, such as a timeout or the occurrence of an invalid SIP message that results in the inability to maintain the session, this IMS node will generate a BYE message towards both ends of the connection.

The node that sent the BYE to trigger session termination identifies the cause of the failure in the ACR [Stop] towards the CDF. All other nodes, i.e. those that receive the BYE, are not aware of an error, and therefore they treat this situation as any normal SIP session termination.

5.2.2.2.3 Session Unrelated SIP procedures

As described in subclause 5.1.2.1.2, a session unrelated SIP procedure may either be completed with the reception of a 200OK, or a SIP error message. If the latter occurs, i.e. there is a failure in the procedure, the ACR [Event] sent towards the CDF includes an appropriate error indication.

5.2.2.2.4 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 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.

5.2.2.2.5 No Reply from CDF

In case an IMS node does not receive an ACA in reply to an ACR, it may repeat the ACR message. The waiting time until a repetition is sent, and the maximum number of repetitions are both configurable by the operator. When the maximum number of repetitions is reached and still no ACA reply has been received, the IMS node 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.

5.2.2.2.6 Duplicate Detection

A Diameter client marks possible duplicate request messages (e.g. retransmission due to the link failover 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.

5.2.2.2.7 CDF Detected Failure

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

5.3 IMS Online Charging Scenarios

5.3.1 Basic Principles

IMS online charging essentially uses the 3GPP TS 32.299 [50] diameter application.

Editors Note: This section should be updated and aligned with 3GPP TS 32.299. Some of this text will go into 3GPP TS 32.299 and removed from the present document.

Two cases for online charging are distinguished:

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

Editors Note: Add SCUR? (FFS for 3GPP TS 32.299)

In the case of Immediate Event Charging (IEC), granting units to the IMS network element is performed in a single operation that also includes the deduction of the corresponding monetary units from the subscriber's account. The charging process is controlled by the corresponding credit control request which is sent for a given credit control event.

In contrast, Event Charging with Unit Reservation (ECUR) also includes the process of requesting, reserving, releasing and returning unused units. The deduction of the corresponding monetary units then occurs upon conclusion of the ECUR transaction. In this case, the credit control requestis used to control the credit control session. During a SIP session there can be repeated execution of unit reservation and debit operations as specified in 3GPP TS 32.240 [1].

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

NOTE: To the extent possible alignment with the IETF Credit Control Application, [402], is planned. However, this can only be accomplished when the current IETF draft receives an official RFC status.

5.3.2 Message flows and types

This subclause describes the message flows for the event charging procedures on the Ro interface.

5.3.2.1 Immediate Event Charging (IEC)

This subclause provides the details of the "Debit Units" operation specified in 3GPP TS 32.299 [50].

5.3.2.1.1 Message flows - Successful cases and scenarios

5.3.2.1.1.1 IEC - Debit Units Operation

The transactions that are required on the Ro interface in order to perform IEC with Debit Units operations is carried out as described in 3GPP TS 32.299 [50] where "Network Element" refers to IMS. The Debit Units operation may alternatively be carried out prior to, concurrently with or after service/content delivery. The IMS network element must ensure that the requested service execution is successful, when this scenario is used.

Editors Note: Must be aligned with 3GPP TS 32.299.

5.3.2.1.2 Message flows - 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 IMS network element. If the *Direct-Debiting-Failure-Handling* AVP is not used, the locally configured values are used instead.

5.3.2.1.2.1 Reception of SIP error messages

If SIP errors occur during service delivery, as defined in 3GPP TS 24.228 [202] and 3GPP TS 23.218 [203], it is up to the IMS network element to determine to what extent the service was delivered before the error occurred and act appropriately with respect to charging. This may imply that no units at all (or no more units) are debited.

5.3.2.1.2.2 Debit units operation failure

This case comprises situations where either no, or an erroneous response, is received from the ECF. The "no response" case is detected by the IMS network element when the connection supervision timer Tx expires [402] before a response *Credit-Control-Answer* (CCA) is received. The case of receiving an erroneous response implies that the IMS network element receives a *Credit-Control-Answer* (CCA), which it is unable to process, while Tx is running. The failure handling complies with the failure procedures for "Direct Debiting" scenario described in [402].

5.3.2.1.2.3 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 (within a reasonable time window) by the receiver entity.

Editors Note: Must be aligned/moved with 3GPP TS 32.299.

The IMS network element marks the request messages that are retransmitted after a link failover as possible duplicates with the T-flag as described in 3GPP TS 23.228 [201]. 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 IEC the duplicate detection is performed in the Correlation Function that is part of the OCS. The ECF that receives the possible duplicate request should mark as possible duplicate the corresponding request that is sent over the Rc interface.

5.3.2.2 Event Charging with Unit Reservation (ECUR)

This subclause provides the details of the "Reserve Units" and "Debit Units" operations specified in 3GPP TS 32.299 [50].

5.3.2.2.1 Message Flows - Successful Cases and Scenarios

5.3.2.2.1.1 ECUR - Reserve Units and Debit Units Operations

The transactions that are required on the Ro interface in order to perform ECUR with Reserve Units and Debit Units operations is carried out as described in 3GPP TS 32.299 [50] where "Network Element" refers to an IMS network element. Multiple replications of both of these operations are possible.

Editors Note: Must be aligned with 3GPP TS 32.299.

5.3.2.2.1.3 Expiration of Reservation Validity

This subclause defines how reserved units are returned, if not used, within a reasonable time. It should be possible that both the reservation and SIP sessions are cancelled or only the reservation is cancelled without removing the SIP session. Work on this is ongoing in IETF Credit Control Draft [402]. Alignment with [402] is planned.

5.3.2.2.2 Message Flows - 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 IMS network element. If *Credit-Control-Failure-Handling* AVP is not used, the locally configured values are used instead.

5.3.2.2.2.1 Reception of SIP Error Messages

If SIP errors occur during service delivery, as defined in 3GPP TS 24.228 [202] and 3GPP TS 23.218 [203], it is up to the IMS network element to determine to what extent the service was delivered before the error occurred and act appropriately with respect to charging. This may imply that no units at all (or no more units) are reserved or debited.

5.3.2.2.2.2 Reserve Units and Debit Units Operation Failure

This case comprises of OCS connection failure, and/or receiving error responses from the OCS.

The IMS network element detects an OCS connection failure when the timer Tx expires [402] or a transport failure is detected as defined in RFC 3588 [401]. The OCS also has the capability to detect failures when the timer Ts (RFC 3588 [401]) expires. The OCS should indicate the cause of failure by setting the appropriate result code as defined in RFC 3588 [401] and [402]. In any case, the failure handling of IMS network element and OCS complies with the failure procedures for session based credit control scenario described in [402].

5.3.2.2.2.3 Duplicate Detection

For credit control duplicate detection is performed only for possible duplicate event requests related to IEC as mentioned in subclause 5.3.2.1.2.3, as retransmission of ECUR related credit control requests is not allowed.

6 Definition of charging information

Charging Data Record Format Specifications (provide some introductory statement here).

6.1 Data description for IMS offline charging

6.1.1 Message Formats

6.1.1.1 Summary of Offline Charging Message Formats

The IMS nodes generate accounting information that can be transferred from the nodes to the CDF. For this purpose, the IMS Charging application employs the *Accounting-Request* and *Accounting-Answer* messages from the base Diameter protocol.

Table 6.1 describes the use of these messages for offline charging.

Table 6.1: Offline Charging Messages Reference Table

Command-Name	Source	Destination	Abbreviation
Accounting-Request	S-CSCF, I-CSCF, P-CSCF, MRFC, MGCF, BGCF, AS	CDF	ACR
Accounting-Answer	CDF	S-CSCF, I-CSCF, P-CSCF, MRFC, MGCF, BGCF, AS	ACA

6.1.1.2 Structure for the Accounting Message Formats

Editors Note: An over all description of accounting messages and parameters and refer to 3GPP TS 32.299 [50].

6.1.1.2.1 Accounting-Request Message

Table 6.2 illustrates the basic structure of a Diameter *Accounting-Request* message as used for IMS offline charging. The use of the AVPs is specified in 3GPP TS 32.299 [50] per IMS node and ACR type.

Editors Note: rework the table to included which network elements use which parameters.

Table 6.2: Accounting-Request (ACR) Message Contents for Offline Charging

Diameter base protocol AVPs	
AVP	**Used in offline ACR**
<Diameter-Header:271,REQ,PXY>	Yes
<Session-Id> -- Diameter Session Id	Yes
{Origin-Host}	Yes
{Origin-Realm}	Yes
{Destination-Realm}	Yes
{Accounting-Record-Type}	Yes
{Accounting-Record-Number}	Yes
[Acct-Application-Id]	No
[Vendor-Specific-Application-Id]	Yes
[User-Name]	Yes
[Accounting-Sub-Session-Id]	No
[Accounting-RADIUS-Session-Id]	No
[Acct-Multi-Session-Id]	No
[Acct-Interim-Interval]	Yes
[Accounting-Realtime-Required]	No
[Origin-State-Id]	Yes
[Event-Timestamp]	Yes
*[Proxy-Info]	No
*[Route-Record]	No
*[AVP]	No
3GPP Diameter accounting AVPs	
[Event-Type]	Yes
[Role-of-node]	Yes
[User-Session-ID]	Yes
[Calling-Party-Address]	Yes
[Called-Party-Address]	Yes
[Time-stamps]	Yes
*[Application-Server]	Only for S-CSCF
*[Application-provided-Called-Party-Address]	Only for S-CSCF
*[Inter-Operator-Identifier]	Yes
[IMS-Charging-Identifier]	Yes
*[SDP-Session-Description]	Yes
*[SDP-Media-Component]	Yes
[GGSN-Address]	Yes
[Served-Party-IP-Address]	Only for P-CSCF
[Authorized-QoS]	Only for P-CSCF
[Server-Capabilities]	Only for I-CSCF
[Trunk-Group-ID]	Only for MGCF
[Bearer-Service]	Only for MGCF
[Service-ID]	Only for MRFC
[UUS-Data]	Yes
[Cause]	Yes

NOTE: For AVP of type "Grouped" only the group AVP is listed in table 6.2. Detailed descriptions of the AVPs is provided in TS 32.299 [50].

Editors note: check references above.

6.1.1.2.2 Accounting-Answer Message

Table 6.3 illustrates the basic structure of a Diameter *Accounting-Answer* message as used for IMS charging. This message is always used by the CDF as specified below, regardless of the IMS node it is received from and the ACR record type that is being replied to.

Editors Note: rework the table to included which network elements use which parameters.

Table 6.3: Accounting-Answer (ACA) Message Contents for Offline Charging

Diameter base protocol AVPs	
AVP	**Used in Offline ACA**
<Diameter-Header:271,PXY>	Yes
<Session-Id>	Yes
{Result-Code}	Yes
{Origin-Host}	Yes
{Origin-Realm}	Yes
{Accounting-Record-Type}	Yes
{Accounting-Record-Number}	Yes
[Acct-Application-Id]	No
[Vendor-Specific-Application-Id]	Yes
[User-Name]	Yes
[Accounting-Sub-Session-Id]	No
[Accounting-RADIUS-Session-Id]	No
[Acct-Multi-Session-Id]	No
[Error-Reporting-Host]	No
[Acct-Interim-Interval]	Yes
[Accounting-Realtime-Required]	No
[Origin-State-Id]	Yes
[Event-Timestamp]	Yes
*[Proxy-Info]	No
*[AVP]	No

6.1.2 CDR Description on the Bi Interface

6.1.2.1 CDR Field Types

The following Standard CDR content and format are considered:

- S-CSCF-CDR generated based on information from the S-CSCF.
- I-CSCF-CDR generated based on information from the I-CSCF.
- P-CSCF-CDR generated based on information from the P-CSCF.
- BGCF-CDR generated based on information from the BGCF.
- MGCF-CDR generated based on information from the MGCF.
- MRFC-CDR generated based on information from the MRFC.
- AS-CDR generated based on information from the AS.

The content of each CDR type is defined in table 6.7. For each CDR type the field definition includes the field name and category. The field descriptions are provided in 3GPP TS 32.298 [51].

Equipment vendors shall be able to provide all of the fields listed in the CDR content table in order to claim compliance with the present document. However, since CDR processing and transport consume network resources, operators may opt to eliminate some of the fields that are not essential for their operation. This operator provisionable reduction is specified by the field category.

A field category can have one of two primary values:

M This field is **M**andatory and shall always be present in the CDR.

C This field shall be present in the CDR only when certain **C**onditions are met. These Conditions are specified as part of the field definition.

Some of these fields are designated as Operator provisionable. Using TMN management functions or specific tools provided by an equipment vendor, operators may choose if they wish to include or omit the field from the CDR. Once omitted, this field is not generated in a CDR. To avoid any potential ambiguity, a CDR generating element MUST be able to provide all these fields. Only an operator can choose whether or not these fields should be generated in their system.

Those fields that the operator may configure to be present or absent are further qualified with the "Operator provisionable" subscript as follows:

M_o This is a field that, if provisioned by the operator to be present, shall always be included in the CDRs. In other words, an M_o parameter that is provisioned to be present is a mandatory parameter.

C_o This is a field that, if provisioned by the operator to be present, shall be included in the CDRs when the required conditions are met. In other words, a C_o parameter that is configured to be present is a conditional parameter.

The CDF provides the CDRs at the Bi interface in the format and encoding described in the present document. Additional CDR formats and contents may be available at the interface to the billing system to meet the requirements of the billing system, these are outside of the scope of 3GPP standardization.

6.1.2.2 CDR Triggers

6.1.2.2.1 Session Related CDRs

Reflecting the usage of multimedia sessions IMS CDRs are generated by the CDF on a per session level. In the scope of the present document the term "session" refers always to a SIP session. The coherent media components are reflected inside the session CDRs with a media component container comprising of all the information necessary for the description of a media component.

Accounting information for SIP sessions is transferred from the IMS nodes involved in the session to the CDF using Diameter ACR Start, Interim and Stop messages. A session CDR is opened in the CDF upon reception of a Diameter ACR [Start] message. Partial CDRs may be generated upon reception of a Diameter ACR [Interim] message which is sent by the network entity towards the CDF due to a session modification procedure (i.e. change in media). Session CDRs are updated, or partial CDRs are generated upon reception of a diameter ACR [Interim] message which is sent by the network entity due to expiration of the Accounting-Interim-Interval AVP. The CDF closes the final session CDR upon reception of a Diameter ACR [Stop] message, which indicates that the SIP session is terminated. Further details on triggers for the generation of IMS CDRs are specified in 3GPP TS 32.240 [1].

Accounting information for unsuccessful session set-up attempts may be sent by the IMS node to the CDF employing the Diameter ACR [Event] message. The behaviour of the CDF upon receiving ACR [Event] messages is specified in subclause 6.1.2.2.2.

6.1.2.2.2 Session Unrelated CDRs

To reflect chargeable events not directly related to a session the CDF may generate CDRs upon the occurrence of session unrelated SIP procedures, such as registration respectively de-registration events. Accounting information for SIP session-unrelated procedures is transferred from the IMS nodes involved in the procedure to the CDF using Diameter ACR [Event] messages. Session unrelated CDRs are created in the CDF in a "one-off" action based on the information contained in the Diameter ACR [Event] message. One session unrelated CDR is created in the CDF for each Diameter ACR [Event] message received, whereas the creation of partial CDRs is not applicable for session unrelated CDRs. The cases for which the IMS nodes send ACR [Event] messages are listed per SIP procedure in tables 5.1 and 5.2.

Further details on triggers for the generation of IMS CDRs are specified in 3GPP TS 32.240 [1].

6.1.2.3 S-CSCF CDR Content

The detailed description of the field is provided in 3GPP TS 32.298 [51].

Table 6.4: Charging Data of S-CSCF CDR

Field	Category	Description
Record Type	M	Identifies the type of record. The parameter is derived from the *Origin-Host* AVP
Retransmission	C_O	This parameter, when present, indicates that information from retransmitted Diameter ACRs has been used in this CDR
SIP Method	C_O	Specifies the SIP-method for which the CDR is generated. Only available in session unrelated cases
Role of Node	M_O	This fields indicates the role of the AS/CSCF
Node Address	M_O	This item holds the address of the node providing the information for the CDR. This may either be the IP address or the FQDN of the IMS node generating the accounting data. This parameter corresponds to the *Origin-Host* AVP
Session ID	M_O	The Session identification. For a SIP session the Session-ID contains the SIP Call ID as defined in the Session Initiation Protocol RFC [16]
Calling Party Address	M_O	The address (Public User ID) of the party requesting a service or initiating a session. This field holds either the SIP URL (according to RFC 3261 [16]) or the TEL URL (according to RFC 2806 [20]) of the calling party
Called Party Address	M_O	In the context of an end-to-end SIP transaction this field holds the address of the party (Public User ID) to whom the SIP transaction is posted
Private User ID	M_O	Holds the used Network Access Identifier of the served party according to RFC 2486 [6]. This parameter corresponds to the *User-Name* AVP
Service Request Time Stamp	M_O	This field contains the time stamp which indicates the time at which the service was requested
Service Delivery Start Time Stamp	M_O	This field holds the time stamp reflecting either: successful session set-up, a delivery unrelated service, an unsuccessful session set-up and an unsuccessful session unrelated request.
Service Delivery End Time Stamp	C_O	This field records the time at which the service delivery was terminated. It is Present only in SIP session related case
Record Opening Time	C_O	A time stamp reflecting the time the CCF opened this record. Present only in SIP session related case
Record Closure Time	M_O	A Time stamp reflecting the time the CCF closed the record
Application Servers Information	C_O	This a grouped CDR field containing the fields: "Application Server Involved" and "Application Provided Called Parties"
Application Servers Involved	C_O	Holds the ASs (if any) identified by the SIP URLs
Application Provided Called Parties	C_O	Holds a list of the Called Party Address(es), if the address(es) are determined by an AS (SIP URL, E.164…)
Inter Operator Identifiers	C_O	Holds the identification of the home network (originating and terminating) if exchanged via SIP signalling, as recorded in the *Inter-Operator-Identifier* AVP
Originating IOI	C_O	
Terminating IOI	C_O	
Local Record Sequence Number	M_O	This field includes a unique record number created by this node. The number is allocated sequentially for each partial CDR (or whole CDR) including all CDR types. The number is unique within the CCF
Record Sequence Number	C_O	This field contains a running sequence number employed to link the partial records generated by the CCF for a particular session
Cause For Record Closing	M_O	This field contains a reason for the release of the CDR
Incomplete CDR Indication	C_O	This field provides additional diagnostics when the CCF detects missing ACRs
IMS Charging Identifier	M_O	This parameter holds the IMS charging identifier (ICID) as generated by the IMS node for the SIP session
SDP Session Description	Co	Holds the Session portion of the SDP data exchanged between the User Agents if available in the SIP transaction
List of SDP Media Components	C_O	This is a grouped field comprising several sub-fields associated with one media component. It may occur several times in one CDR. The field is present only in a SIP session related case
SIP Request Timestamp	M_O	This parameter contains the time of the SIP Request (usually a (Re)Invite)
SIP Response Timestamp	M_O	This parameter contains the time of the response to the SIP Request (usually a 200 OK)

Field	Category	Description
SDP Media Components	M_O	This is a grouped field comprising several sub-fields associated with one media component. Since several media components may exist for a session in parallel these sub-fields may occur several times
SDP Media Name	M_O	This field holds the name of the media as available in the SDP data
SDP Media Description	M_O	This field holds the attributes of the media as available in the SDP data
GPRS Charging ID	M_O	This parameter holds the GPRS charging ID (GCID) which is generated by the GGSN for a GPRS PDP context
Media Initiator Flag	C_O	This field indicates if the called party has requested the session modification and it is present only if the initiator was the called party
GGSN Address	C_O	This parameter holds the control plane IP address of the GGSN that handles one or more media component(s) of a IMS session
Service Delivery Failure Reason	C_O	Holds the reason for why a requested service could not be successfully provided (i.e. SIP error codes taken from *SIP-Method* AVP). This field is not present in case of a successful service delivery
List of Message Bodies	C_O	This grouped field comprising several sub-fields describing the data that may be conveyed end-to-end in the body of a SIP message. Since several message bodies may be exchanged via SIP-signalling, this grouped field may occur several times
Content-Type	C_O	This sub-field of Message Bodies holds the MIME type of the message body, Examples are: application/zip, image/gif, audio/mpeg, etc.
Content-Disposition	C_O	This sub-field of Message Bodies holds the content disposition of the message body inside the SIP signalling, Content-disposition header field equal to "render", indicates that "the body part should be displayed or otherwise rendered to the user". Content disposition values are: session, render, inline, icon, alert, attachment, etc.
Content-Length	C_O	This sub-field of Message Bodies holds the size of the data of a message body in bytes
Originator	C_O	This sub-field of the "List of Message Bodies" indicates the originating party of the message body
Record Extensions	C_O	A set of operator/manufacturer specific extensions to the record, conditioned upon existence of an extension

6.1.2.4 P-CSCF CDR Content

The detailed description of the field is provided in 3GPP TS 32.298 [51].

Table 6.5: Charging Data of P-CSCF CDR

Field	Category	Description
Record Type	M	Identifies the type of record. The parameter is derived from the *Origin-Host* AVP
Retransmission	C_O	This parameter, when present, indicates that information from retransmitted Diameter ACRs has been used in this CDR
SIP Method	C_O	Specifies the SIP-method for which the CDR is generated. Only available in session unrelated cases
Role of Node	M_O	This fields indicates the role of the AS/CSCF
Node Address	M_O	This item holds the address of the node providing the information for the CDR. This may either be the IP address or the FQDN of the IMS node generating the accounting data. This parameter corresponds to the *Origin-Host* AVP
Session ID	M_O	The Session identification. For a SIP session the Session-ID contains the SIP Call ID as defined in the Session Initiation Protocol RFC [16]
Calling Party Address	M_O	The address (Public User ID) of the party requesting a service or initiating a session. This field holds either the SIP URL (according to RFC 3261 [16]) or the TEL URL (according to RFC 2806 [20]) of the calling party
Called Party Address	M_O	In the context of an end-to-end SIP transaction this field holds the address of the party (Public User ID) to whom the SIP transaction is posted
Served Party IP Address	M_O	This field contains the IP address of either the calling or called party, depending on whether the P-CSCF is in touch with the calling or called network
Service Request Time Stamp	M_O	This field contains the time stamp which indicates the time at which the service was requested
Service Delivery Start Time Stamp	M_O	This field holds the time stamp reflecting either: successful session set-up, a delivery unrelated service, an unsuccessful session set-up and an unsuccessful session unrelated request.
Service Delivery End Time Stamp	C_O	This field records the time at which the service delivery was terminated. It is Present only in SIP session related case

Field	Category	Description
Record Opening Time	C_O	A time stamp reflecting the time the CCF opened this record. Present only in SIP session related case
Record Closure Time	M_O	A Time stamp reflecting the time the CCF closed the record
Inter Operator Identifiers	C_O	Holds the identification of the home network (originating and terminating) if exchanged via SIP signalling, as recorded in the *Inter-Operator-Identifier* AVP
Originating IOI	C_O	
Terminating IOI	C_O	
Local Record Sequence Number	M_O	This field includes a unique record number created by this node. The number is allocated sequentially for each partial CDR (or whole CDR) including all CDR types. The number is unique within the CCF
Record Sequence Number	C_O	This field contains a running sequence number employed to link the partial records generated by the CCF for a particular session
Cause For Record Closing	M_O	This field contains a reason for the release of the CDR
Incomplete CDR Indication	C_O	This field provides additional diagnostics when the CCF detects missing ACRs
IMS Charging Identifier	M_O	This parameter holds the IMS charging identifier (ICID) as generated by the IMS node for the SIP session
SDP Session Description	Co	Holds the Session portion of the SDP data exchanged between the User Agents if available in the SIP transaction
List of SDP Media Components	C_O	This is a grouped field comprising several sub-fields associated with one media component. It may occur several times in one CDR. The field is present only in a SIP session related case
SIP Request Timestamp	M_O	This parameter contains the time of the SIP Request (usually a (Re)Invite)
SIP Response Timestamp	M_O	This parameter contains the time of the response to the SIP Request (usually a 200 OK)
SDP Media Components	M_O	This is a grouped field comprising several sub-fields associated with one media component. Since several media components may exist for a session in parallel these sub-fields may occur several times
SDP Media Name	M_O	This field holds the name of the media as available in the SDP data
SDP Media Description	M_O	This field holds the attributes of the media as available in the SDP data
GPRS Charging ID	M_O	This parameter holds the GPRS charging ID (GCID) which is generated by the GGSN for a GPRS PDP context
Media Initiator Flag	C_O	This field indicates if the called party has requested the session modification and it is present only if the initiator was the called party
Authorized QoS	C_O	Authorized QoS as defined in 3GPP TS 23.207 [7] / 3GPP TS 29.207 [8] and applied via the Go interface
GGSN Address	C_O	This parameter holds the control plane IP address of the GGSN that handles one or more media component(s) of a IMS session
Service Delivery Failure Reason	C_O	Holds the reason for why a requested service could not be successfully provided (i.e. SIP error codes taken from *SIP-Method* AVP). This field is not present in case of a successful service delivery
List of Message Bodies	C_O	This grouped field comprising several sub-fields describing the data that may be conveyed end-to-end in the body of a SIP message. Since several message bodies may be exchanged via SIP-signalling, this grouped field may occur several times
Content-Type	C_O	This sub-field of Message Bodies holds the MIME type of the message body, Examples are: application/zip, image/gif, audio/mpeg, etc.
Content-Disposition	C_O	This sub-field of Message Bodies holds the content disposition of the message body inside the SIP signalling, Content-disposition header field equal to "render", indicates that "the body part should be displayed or otherwise rendered to the user". Content disposition values are: session, render, inline, icon, alert, attachment, etc.
Content-Length	C_O	This sub-field of Message Bodies holds the size of the data of a message body in bytes
Originator	C_O	This sub-field of the "List of Message Bodies" indicates the originating party of the message body
Record Extensions	C_O	A set of operator/manufacturer specific extensions to the record, conditioned upon existence of an extension

6.1.2.5 I-CSCF CDR Content

The detailed description of the field is provided in 3GPP TS 32.298 [51].

Table 6.6: Charging Data of I-CSCF CDR

Field	Category	Description
Record Type	M	Identifies the type of record. The parameter is derived from the *Origin-Host* AVP
Retransmission	C_O	This parameter, when present, indicates that information from retransmitted Diameter ACRs has been used in this CDR
SIP Method	C_O	Specifies the SIP-method for which the CDR is generated. Only available in session unrelated cases
Role of Node	M_O	This fields indicates the role of the AS/CSCF
Node Address	M_O	This item holds the address of the node providing the information for the CDR. This may either be the IP address or the FQDN of the IMS node generating the accounting data. This parameter corresponds to the *Origin-Host* AVP
Session ID	M_O	The Session identification. For a SIP session the Session-ID contains the SIP Call ID as defined in the Session Initiation Protocol RFC [16]
Calling Party Address	M_O	The address (Public User ID) of the party requesting a service or initiating a session. This field holds either the SIP URL (according to RFC 3261 [16]) or the TEL URL (according to RFC 2806 [20]) of the calling party
Called Party Address	M_O	In the context of an end-to-end SIP transaction this field holds the address of the party (Public User ID) to whom the SIP transaction is posted
Service Request Time Stamp	M_O	This field contains the time stamp which indicates the time at which the service was requested
Inter Operator Identifiers	C_O	Holds the identification of the home network (originating and terminating) if exchanged via SIP signalling, as recorded in the *Inter-Operator-Identifier* AVP
Originating IOI	C_O	
Terminating IOI	C_O	
Local Record Sequence Number	M_O	This field includes a unique record number created by this node. The number is allocated sequentially for each partial CDR (or whole CDR) including all CDR types. The number is unique within the CCF
Cause For Record Closing	M_O	This field contains a reason for the release of the CDR
Incomplete CDR Indication	C_O	This field provides additional diagnostics when the CCF detects missing ACRs
S-CSCF Information	C_O	This field contains Information related to the serving CSCF, e.g. the S-CSCF capabilities upon registration event or the S-CSCF address upon the session establishment event
IMS Charging Identifier	M_O	This parameter holds the IMS charging identifier (ICID) as generated by the IMS node for the SIP session
GGSN Address	C_O	This parameter holds the control plane IP address of the GGSN that handles one or more media component(s) of a IMS session
Service Delivery Failure Reason	C_O	Holds the reason for why a requested service could not be successfully provided (i.e. SIP error codes taken from *SIP-Method* AVP). This field is not present in case of a successful service delivery
Record Extensions	C_O	A set of operator/manufacturer specific extensions to the record, conditioned upon existence of an extension

6.1.2.6 MRFC CDR Content

The detailed description of the field is provided in 3GPP TS 32.298 [51].

Table 6.7: Charging Data of MRFC CDR

Field	Category	Description
Record Type	M	Identifies the type of record. The parameter is derived from the *Origin-Host* AVP
Retransmission	C_O	This parameter, when present, indicates that information from retransmitted Diameter ACRs has been used in this CDR
SIP Method	C_O	Specifies the SIP-method for which the CDR is generated. Only available in session unrelated cases
Role of Node	M_O	This fields indicates the role of the AS/CSCF

Field	Category	Description
Node Address	M_O	This item holds the address of the node providing the information for the CDR. This may either be the IP address or the FQDN of the IMS node generating the accounting data. This parameter corresponds to the *Origin-Host* AVP
Session ID	M_O	The Session identification. For a SIP session the Session-ID contains the SIP Call ID as defined in the Session Initiation Protocol RFC [16]
Service ID	M_O	This field identifies the service the MRFC is hosting. For conferences the conference ID is used here
Calling Party Address	M_O	The address (Public User ID) of the party requesting a service or initiating a session. This field holds either the SIP URL (according to RFC 3261 [16]) or the TEL URL (according to RFC 2806 [20]) of the calling party
Called Party Address	C_O	In the context of an end-to-end SIP transaction this field holds the address of the party (Public User ID) to whom the SIP transaction is posted
Service Request Time Stamp	M_O	This field contains the time stamp which indicates the time at which the service was requested
Service Delivery Start Time Stamp	M_O	This field holds the time stamp reflecting either: successful session set-up, a delivery unrelated service, an unsuccessful session set-up and an unsuccessful session unrelated request.
Service Delivery End Time Stamp	C_O	This field records the time at which the service delivery was terminated. It is Present only in SIP session related case
Record Opening Time	C_O	A time stamp reflecting the time the CCF opened this record. Present only in SIP session related case
Record Closure Time	M_O	A Time stamp reflecting the time the CCF closed the record
Application Servers Information	C_O	This a grouped CDR field containing the fields: "Application Server Involved" and "Application Provided Called Parties"
Application Servers Involved	C_O	Holds the ASs (if any) identified by the SIP URLs
Application Provided Called Parties	C_O	Holds a list of the Called Party Address(es), if the address(es) are determined by an AS (SIP URL, E.164…)
Inter Operator Identifiers	C_O	Holds the identification of the home network (originating and terminating) if exchanged via SIP signalling, as recorded in the *Inter-Operator-Identifier* AVP
Originating IOI	C_O	
Terminating IOI	C_O	
Local Record Sequence Number	M_O	This field includes a unique record number created by this node. The number is allocated sequentially for each partial CDR (or whole CDR) including all CDR types. The number is unique within the CCF
Record Sequence Number	C_O	This field contains a running sequence number employed to link the partial records generated by the CCF for a particular session
Cause For Record Closing	M_O	This field contains a reason for the release of the CDR
Incomplete CDR Indication	C_O	This field provides additional diagnostics when the CCF detects missing ACRs
IMS Charging Identifier	M_O	This parameter holds the IMS charging identifier (ICID) as generated by the IMS node for the SIP session
SDP Session Description	Co	Holds the Session portion of the SDP data exchanged between the User Agents if available in the SIP transaction
List of SDP Media Components	C_O	This is a grouped field comprising several sub-fields associated with one media component. It may occur several times in one CDR. The field is present only in a SIP session related case
SIP Request Timestamp	M_O	This parameter contains the time of the SIP Request (usually a (Re)Invite)
SIP Response Timestamp	M_O	This parameter contains the time of the response to the SIP Request (usually a 200 OK)
SDP Media Components	M_O	This is a grouped field comprising several sub-fields associated with one media component. Since several media components may exist for a session in parallel these sub-fields may occur several times
SDP Media Name	M_O	This field holds the name of the media as available in the SDP data
SDP Media Description	M_O	This field holds the attributes of the media as available in the SDP data
GPRS Charging ID	M_O	This parameter holds the GPRS charging ID (GCID) which is generated by the GGSN for a GPRS PDP context
Media Initiator Flag	C_O	This field indicates if the called party has requested the session modification and it is present only if the initiator was the called party
GGSN Address	C_O	This parameter holds the control plane IP address of the GGSN that handles one or more media component(s) of a IMS session

Field	Category	Description
Service Delivery Failure Reason	C_O	Holds the reason for why a requested service could not be successfully provided (i.e. SIP error codes taken from *SIP-Method* AVP). This field is not present in case of a successful service delivery
Record Extensions	C_O	A set of operator/manufacturer specific extensions to the record, conditioned upon existence of an extension

6.1.2.7 MGCF CDR Content

The detailed description of the field is provided in 3GPP TS 32.298 [51].

Table 6.8: Charging Data of MGCF CDR

Field	Category	Description
Record Type	M	Identifies the type of record. The parameter is derived from the *Origin-Host* AVP
Retransmission	C_O	This parameter, when present, indicates that information from retransmitted Diameter ACRs has been used in this CDR
SIP Method	C_O	Specifies the SIP-method for which the CDR is generated. Only available in session unrelated cases
Role of Node	M_O	This fields indicates the role of the AS/CSCF
Node Address	M_O	This item holds the address of the node providing the information for the CDR. This may either be the IP address or the FQDN of the IMS node generating the accounting data. This parameter corresponds to the O*rigin-Host* AVP
Session ID	M_O	The Session identification. For a SIP session the Session-ID contains the SIP Call ID as defined in the Session Initiation Protocol RFC [16]
Calling Party Address	M_O	The address (Public User ID) of the party requesting a service or initiating a session. This field holds either the SIP URL (according to RFC 3261 [16]) or the TEL URL (according to RFC 2806 [20]) of the calling party
Called Party Address	M_O	In the context of an end-to-end SIP transaction this field holds the address of the party (Public User ID) to whom the SIP transaction is posted
Service Request Time Stamp	M_O	This field contains the time stamp which indicates the time at which the service was requested
Service Delivery Start Time Stamp	M_O	This field holds the time stamp reflecting either: successful session set-up, a delivery unrelated service, an unsuccessful session set-up and an unsuccessful session unrelated request.
Service Delivery End Time Stamp	C_O	This field records the time at which the service delivery was terminated. It is Present only in SIP session related case
Record Opening Time	C_O	A time stamp reflecting the time the CCF opened this record. Present only in SIP session related case
Record Closure Time	M_O	A Time stamp reflecting the time the CCF closed the record
Inter Operator Identifiers	C_O	Holds the identification of the home network (originating and terminating) if exchanged via SIP signalling, as recorded in the *Inter-Operator-Identifier* AVP
Originating IOI	C_O	
Terminating IOI	C_O	
Local Record Sequence Number	M_O	This field includes a unique record number created by this node. The number is allocated sequentially for each partial CDR (or whole CDR) including all CDR types. The number is unique within the CCF
Record Sequence Number	C_O	This field contains a running sequence number employed to link the partial records generated by the CCF for a particular session
Cause For Record Closing	M_O	This field contains a reason for the release of the CDR
Incomplete CDR Indication	C_O	This field provides additional diagnostics when the CCF detects missing ACRs
IMS Charging Identifier	M_O	This parameter holds the IMS charging identifier (ICID) as generated by the IMS node for the SIP session
SDP Session Description	Co	Holds the Session portion of the SDP data exchanged between the User Agents if available in the SIP transaction
List of SDP Media Components	C_O	This is a grouped field comprising several sub-fields associated with one media component. It may occur several times in one CDR. The field is present only in a SIP session related case
SIP Request Timestamp	M_O	This parameter contains the time of the SIP Request (usually a (Re)Invite)
SIP Response Timestamp	M_O	This parameter contains the time of the response to the SIP Request (usually a 200 OK)

Field	Category	Description
SDP Media Components	M_O	This is a grouped field comprising several sub-fields associated with one media component. Since several media components may exist for a session in parallel these sub-fields may occur several times
SDP Media Name	M_O	This field holds the name of the media as available in the SDP data
SDP Media Description	M_O	This field holds the attributes of the media as available in the SDP data
GPRS Charging ID	M_O	This parameter holds the GPRS charging ID (GCID) which is generated by the GGSN for a GPRS PDP context
Media Initiator Flag	C_O	This field indicates if the called party has requested the session modification and it is present only if the initiator was the called party
GGSN Address	C_O	This parameter holds the control plane IP address of the GGSN that handles one or more media component(s) of a IMS session
Service Delivery Failure Reason	C_O	Holds the reason for why a requested service could not be successfully provided (i.e. SIP error codes taken from *SIP-Method* AVP). This field is not present in case of a successful service delivery
Trunk Group ID Incoming/Outgoing	M_O	Contains the outgoing trunk group ID for an outgoing session/call or the incoming trunk group ID for an incoming session/call
Bearer Service	M_O	Holds the used bearer service for the PSTN leg
Record Extensions	C_O	A set of operator/manufacturer specific extensions to the record, conditioned upon existence of an extension

6.1.2.8 BGCF CDR Content

The detailed description of the field is provided in 3GPP TS 32.298 [51].

Table 6.9: Charging Data of BGCF CDR

Field	Category	Description
Record Type	M	Identifies the type of record. The parameter is derived from the *Origin-Host* AVP
Retransmission	C_O	This parameter, when present, indicates that information from retransmitted Diameter ACRs has been used in this CDR
SIP Method	C_O	Specifies the SIP-method for which the CDR is generated. Only available in session unrelated cases
Role of Node	M_O	This fields indicates the role of the AS/CSCF
Node Address	M_O	This item holds the address of the node providing the information for the CDR. This may either be the IP address or the FQDN of the IMS node generating the accounting data. This parameter corresponds to the *Origin-Host* AVP
Session ID	M_O	The Session identification. For a SIP session the Session-ID contains the SIP Call ID as defined in the Session Initiation Protocol RFC [16]
Calling Party Address	M_O	The address (Public User ID) of the party requesting a service or initiating a session. This field holds either the SIP URL (according to RFC 3261 [16]) or the TEL URL (according to RFC 2806 [20]) of the calling party
Called Party Address	M_O	In the context of an end-to-end SIP transaction this field holds the address of the party (Public User ID) to whom the SIP transaction is posted
Service Request Time Stamp	M_O	This field contains the time stamp which indicates the time at which the service was requested
Service Delivery Start Time Stamp	M_O	This field holds the time stamp reflecting either: successful session set-up, a delivery unrelated service, an unsuccessful session set-up and an unsuccessful session unrelated request.
Service Delivery End Time Stamp	C_O	This field records the time at which the service delivery was terminated. It is Present only in SIP session related case
Record Opening Time	C_O	A time stamp reflecting the time the CCF opened this record. Present only in SIP session related case
Record Closure Time	M_O	A Time stamp reflecting the time the CCF closed the record
Inter Operator Identifiers	C_O	Holds the identification of the home network (originating and terminating) if exchanged via SIP signalling, as recorded in the *Inter-Operator-Identifier* AVP
Originating IOI	C_O	
Terminating IOI	C_O	
Local Record Sequence Number	M_O	This field includes a unique record number created by this node. The number is allocated sequentially for each partial CDR (or whole CDR) including all CDR types. The number is unique within the CCF
Record Sequence Number	C_O	This field contains a running sequence number employed to link the partial records generated by the CCF for a particular session

Field	Category	Description
Cause For Record Closing	M_O	This field contains a reason for the release of the CDR
Incomplete CDR Indication	C_O	This field provides additional diagnostics when the CCF detects missing ACRs
IMS Charging Identifier	M_O	This parameter holds the IMS charging identifier (ICID) as generated by the IMS node for the SIP session
SDP Session Description	Co	Holds the Session portion of the SDP data exchanged between the User Agents if available in the SIP transaction
List of SDP Media Components	C_O	This is a grouped field comprising several sub-fields associated with one media component. It may occur several times in one CDR. The field is present only in a SIP session related case
SIP Request Timestamp	M_O	This parameter contains the time of the SIP Request (usually a (Re)Invite)
SIP Response Timestamp	M_O	This parameter contains the time of the response to the SIP Request (usually a 200 OK)
SDP Media Components	M_O	This is a grouped field comprising several sub-fields associated with one media component. Since several media components may exist for a session in parallel these sub-fields may occur several times
SDP Media Name	M_O	This field holds the name of the media as available in the SDP data
SDP Media Description	M_O	This field holds the attributes of the media as available in the SDP data
GPRS Charging ID	M_O	This parameter holds the GPRS charging ID (GCID) which is generated by the GGSN for a GPRS PDP context
Media Initiator Flag	C_O	This field indicates if the called party has requested the session modification and it is present only if the initiator was the called party
GGSN Address	C_O	This parameter holds the control plane IP address of the GGSN that handles one or more media component(s) of a IMS session
Service Delivery Failure Reason	C_O	Holds the reason for why a requested service could not be successfully provided (i.e. SIP error codes taken from *SIP-Method* AVP). This field is not present in case of a successful service delivery
Record Extensions	C_O	A set of operator/manufacturer specific extensions to the record, conditioned upon existence of an extension

6.1.2.9 SIP AS CDR Content

The detailed description of the field is provided in 3GPP TS 32.298 [51].

Table 6.10: Charging Data of AS CDR

Field	Category	Description
Record Type	M	Identifies the type of record. The parameter is derived from the *Origin-Host* AVP
Retransmission	C_O	This parameter, when present, indicates that information from retransmitted Diameter ACRs has been used in this CDR
SIP Method	C_O	Specifies the SIP-method for which the CDR is generated. Only available in session unrelated cases
Role of Node	M_O	This fields indicates the role of the AS/CSCF
Node Address	M_O	This item holds the address of the node providing the information for the CDR. This may either be the IP address or the FQDN of the IMS node generating the accounting data. This parameter corresponds to the O*rigin-Host* AVP
Session ID	M_O	The Session identification. For a SIP session the Session-ID contains the SIP Call ID as defined in the Session Initiation Protocol RFC [16]
Calling Party Address	M_O	The address (Public User ID) of the party requesting a service or initiating a session. This field holds either the SIP URL (according to IETF RFC 3261 [16]) or the TEL URL (according to RFC 2806 [20]) of the calling party
Called Party Address	M_O	In the context of an end-to-end SIP transaction this field holds the address of the party (Public User ID) to whom the SIP transaction is posted
Service Request Time Stamp	M_O	This field contains the time stamp which indicates the time at which the service was requested
Service Delivery Start Time Stamp	M_O	This field holds the time stamp reflecting either: successful session set-up, a delivery unrelated service, an unsuccessful session set-up and an unsuccessful session unrelated request.
Service Delivery End Time Stamp	C_O	This field records the time at which the service delivery was terminated. It is Present only in SIP session related case

Field	Category	Description
Record Opening Time	C_O	A time stamp reflecting the time the CCF opened this record. Present only in SIP session related case
Record Closure Time	M_O	A Time stamp reflecting the time the CCF closed the record
Inter Operator Identifiers	C_O	Holds the identification of the home network (originating and terminating) if exchanged via SIP signalling, as recorded in the *Inter-Operator-Identifier* AVP
Originating IOI	C_O	
Terminating IOI	C_O	
Local Record Sequence Number	M_O	This field includes a unique record number created by this node. The number is allocated sequentially for each partial CDR (or whole CDR) including all CDR types. The number is unique within the CCF
Record Sequence Number	C_O	This field contains a running sequence number employed to link the partial records generated by the CCF for a particular session
Cause For Record Closing	M_O	This field contains a reason for the release of the CDR
Incomplete CDR Indication	C_O	This field provides additional diagnostics when the CCF detects missing ACRs
IMS Charging Identifier	M_O	This parameter holds the IMS charging identifier (ICID) as generated by the IMS node for the SIP session
SDP Session Description	Co	Holds the Session portion of the SDP data exchanged between the User Agents if available in the SIP transaction
List of SDP Media Components	C_O	This is a grouped field comprising several sub-fields associated with one media component. It may occur several times in one CDR. The field is present only in a SIP session related case
SIP Request Timestamp	M_O	This parameter contains the time of the SIP Request (usually a (Re)Invite)
SIP Response Timestamp	M_O	This parameter contains the time of the response to the SIP Request (usually a 200 OK)
SDP Media Components	M_O	This is a grouped field comprising several sub-fields associated with one media component. Since several media components may exist for a session in parallel these sub-fields may occur several times
SDP Media Name	M_O	This field holds the name of the media as available in the SDP data
SDP Media Description	M_O	This field holds the attributes of the media as available in the SDP data
GPRS Charging ID	M_O	This parameter holds the GPRS charging ID (GCID) which is generated by the GGSN for a GPRS PDP context
Media Initiator Flag	C_O	This field indicates if the called party has requested the session modification and it is present only if the initiator was the called party
GGSN Address	C_O	This parameter holds the control plane IP address of the GGSN that handles one or more media component(s) of a IMS session
Service Delivery Failure Reason	C_O	Holds the reason for why a requested service could not be successfully provided (i.e. SIP error codes taken from *SIP-Method* AVP). This field is not present in case of a successful service delivery
Service Specific Data	C_O	This field contains service specific data
List of Message Bodies	C_O	This grouped field comprising several sub-fields describing the data that may be conveyed end-to-end in the body of a SIP message. Since several message bodies may be exchanged via SIP-signalling, this grouped field may occur several times
Content-Type	C_O	This sub-field of Message Bodies holds the MIME type of the message body, Examples are: application/zip, image/gif, audio/mpeg, etc.
Content-Disposition	C_O	This sub-field of Message Bodies holds the content disposition of the message body inside the SIP signalling, Content-disposition header field equal to "render", indicates that "the body part should be displayed or otherwise rendered to the user". Content disposition values are: session, render, inline, icon, alert, attachment, etc.
Content-Length	C_O	This sub-field of Message Bodies holds the size of the data of a message body in bytes
Originator	C_O	This sub-field of the "List of Message Bodies" indicates the originating party of the message body
Record Extensions	C_O	A set of operator/manufacturer specific extensions to the record, conditioned upon existence of an extension

6.2 Data description for IMS online charging

6.2.1 Void

6.2.2 Void

6.2.3 Message Formats

6.2.3.1 Summary of Online Charging Message Formats

The existing Diameter credit control extension internet-draft [402] proposes 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 defined in 3GPP TS 32.299 [50].

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 6.8 describes the use of these messages for online charging.

Table 6.8: Online Charging Messages Reference Table

Command-Name	Source	Destination	Abbreviation
Credit-Control-Request	MRFC, AS	OCS	CCR
Credit-Control-Answer	OCS	MRFC, AS	CCA

6.2.3.2 Structure for the Credit Control Message Formats

Editors Note: An over all description of accounting messages and parameters and refer to 3GPP TS 32.299.

6.2.3.2.1 Credit-Control-Request Message

Table 6.8 illustrates the basic structure of a Diameter credit control request message as used for IMS online charging.

Editors Note: rework the table to included which network elements use which parameters.

Table 6.8: Credit-Control-Request (CCR) Message Contents for Online Charging

Diameter Credit Control Application AVPs	
AVP	**Used in Online CCR**
<Diameter Header: 272, REQ, PXY>	Yes
<Session-Id>	Yes
{Origin-Host}	Yes
{Origin-Realm}	Yes
{Destination-Realm }	Yes
{Auth-Application-Id}	Yes
[Destination-Host]	Yes
[Vendor-Specific-Application-Id]	Yes
[User-Name]	Yes
[Acct-Multi-Session-Id]	No
[Origin-State-Id]	Yes
[Event-Timestamp]	Yes
* [Proxy-Info]	No
* [Route-Record]	No
[Termination-Cause]	No
*[AVP]	No
{CC-Request-Type}	Yes
{CC-Request-Number}	Yes
{CC-Subsession-Id}	Yes
[Subscription-Id]	Yes
[Requested-Action]	Yes
*[Requested-Service-Unit]	Yes
*[Used-Service-Unit]	Yes
*[Service-Parameter-Info]	Yes
*[CC-Correlation-Id]	No
[Service-Identifier]	No
3GPP Diameter accounting AVPs	
[Event-Type]	Yes
[Role-of-node]	Yes
[User-Session-ID]	Yes
[Calling-Party-Address]	Yes
[Called-Party-Address]	Yes
[Time-stamps]	Yes
*[Application-Server]	No
*[Application-Provided-Called-Party-Address]	Yes
*[Inter-Operator-Identifier]	Yes
[IMS-Charging-Identifier]	Yes
*[SDP-Session-Description]	Yes
*[SDP-Media-Component]	Yes
[GGSN-Address]	Yes
[Served-Party-IP-Address]	No
[Authorized QoS]	No
[Server-Capabilities]	No
[Trunk-Group-ID]	No
[Bearer-Service]	No
[Service-Id]	Yes
[UUS-Data]	Yes
[Cause]	Yes

The detailed use of the AVPs for IMS network elements and for each CCR request type (initial/update/termination/event) is specified in 3GPP TS 32.299 [50].

6.2.3.2.2 Credit-Control-Answer Message

Table 6.9 illustrates the basic structure of a Diameter credit control answer message as used for IMS charging. This message is always used by the OCS as specified below, independent of the receiving IMS node and the CCR request type that is being replied to.

Editors Note: rework the table to included which network elements use which parameters.

Table 6.9: Credit Control Answer (CCA) Message Contents for Online Charging

Diameter Credit Control Application AVPs	
AVP	**Used in online CCA**
<Diameter Header: 272, PXY>	Yes
<Session-Id>	Yes
{Result-Code}	Yes
{Origin-Host}	Yes
{Origin-Realm}	Yes
[Auth-Application-Id]	Yes
[Vendor-Specific-Application-Id]	Yes
[User-Name]	Yes
[Acct-Multi-Session-Id]	No
[Redirect-Host]	No
[Redirect-Host-Usage]	No
[Redirect-Max-Cache-Time]	No
[Origin-State-Id]	Yes
[Event-Timestamp]	Yes
* [Proxy-Info]	No
*[AVP]	No
{CC-Request-Type}	Yes
{CC-Request-Number}	Yes
{CC-Subsession-Id}	Yes
[CC-Failover-Supported]	No
[Subscription-Id]	Yes
*[Granted-Service-Unit]	Yes
[Tariff-Switch-Definition]	Yes
[Cost-Information]	Yes
[Final-Unit-Indication]	Yes
[Check-Balance-Result]	Yes
[Credit-Control-Failure-Handling]	Yes
[Validity-Time]	Yes
[Direct-Debiting-Failure-Handling]	Yes

Annex A (informative): Application Charging ID

Editors note: Subject for further review.

A.1 Charging correlation procedures for presence

For presence service, ICID is not sufficient for correlation information for presence charging because ICID is used only to correlate IMS session level with bearer level for IMS basic PS services. In realese 6, non SIP protocol such as XCAP for Ut interface shall also trigger to generate the ICID for charging purposes. Besides that in rel6, new services such as presence, conference, etc is coming up where ICID is not enough correlation information any more.

Since presence service is involved with the other SIP requests triggered by Presence server or Resource list server, new ACID (Application Charging ID) shall be generated apart from ICID during presence related SIP/non SIP requests.

The ACID is used for correlation between the multiple session related or session unrelated dialog for watcher and the session related or session unrelated dialog for the presentities. Because these multiple set of dialogs shares the related charging data records so that these shall be treaded as one package for charging purposes.

The ACID is generated at the first entity which decides the SIP/non SIP request as presence service or conference service. Note that in case when the combined presence and conference services are occurred, for example, first initiated ACID triggered by either of service is used entirely until all involved dialogs are terminated.

A.1.1 Subscription for presence event notification

When S-CSCF receives SUBSCRIBE from the watcher, S-CSCF shall check event header in SUBSCRIBE and shall generate ACID if event header is set to " presence". S-CSCF shall insert the ACID to P-Application Charging-Vector header of SUBSCRIBE when S-CSCF sends SUBSCRIBE to presence server. The presence server shall insert ACID to 200 OK when the presence server sends 200 OK to the watcher.

A.1.2 Subscription for his own resource list

When S-CSCF receives SUBSCRIBE from the watcher, S-CSCF shall check event header in SUBSCRIBE and shall generate ACID if event header is set to " presence". S-CSCF shall insert the ACID to P-Service Charging-Vector header of SUBSCRIBE when S-CSCF sends SUBSCRIBE to resource list server. The resource list server shall insert ACID to 200 OK when the resource list server sends 200 OK to the watcher.

A.1.3 RLS subscription to presentities

When RLS sends SUBSCRIBE to presence server belonging to presentities, RLS shall insert ACID into P-Application Charging-Vector header of SUBSCRIBE saved locally when SUBSCRIBE is received from the watcher. In case when RLS has to send multiple SUBSCRIBE to presentities, the same SCID shall be inserted into SUBSCRIBE to each presentity.

A.1.4 Updating of presence information by UE

When S-CSCF receives PUBLISH from the presentity, S-CSCF shall check ACID saved locally for the presentity S-CSCF shall insert the ACID to P-Service Charging-Vector header of PUBLISH when S-CSCF sends PUBLISH to presence server. The presence server shall insert the SCID to 200 OK when the presence server sends 200 OK to the presentity.

A.1.5 PS notifying watcher of updates to presence information

When PS sends NOTIFY to watcher, PS shall insert ACID into NOTIFY saved locally when SUBSCRIBE is received from the watcher.

A.1.6 PS notifying resource list server and watcher of updates to presence information

When PS sends NOTIFY to RLS, PS shall insert ACID into P-Service Charging-Vector header of NOTIFY saved locally when SUBSCRIBE is received from the watcher. In case when RLS has to send multiple NOTIFY to watchers, the same ACID shall be inserted into NOTIFY to each watcher.

A.1.7 Generation of ICID for non SIP request

For the presence service, on receiving the non SIP request (ex. XCAP for Ut interface) at P-CSCF or on initiating the non SIP request at AS, ICID shall be generated and inserted into the relevant xml parameter of message and sent to the next entities.

A.2 Charging correlation procedures for Conference

Since conference service is involved with multi-party sessions triggered by Focus or other participants, ACID shall be also generated apart from ICID during conference related SIP/non SIP requests. ACID is used for correlation between the session related or session unrelated dialog for participants. Because these set of dialogs share the related charging data records so that these shall be treaded as one package for charging purposes in later use. The ACID is generated at the first entity which decides the SIP/non SIP requests as conference service. The ACID is also used for presence or other service.

Note that in case when the combined presence and conference services are occurred , for example, first initiated ACID triggered by either of service is used entirely until all involved dialogs are terminated.

A.2.1 Joining a conference using the conference URI - dial in

When S-CSCF receives INVITE from participant, S-CSCF shall check conference URI in INVITE and shall generate ACID if present. S-CSCF shall insert the ACID to P-Service-Charging ID-Vector of INVITE when S-CSCF sends INVITE to Focus. Focus shall insert ACID to 200 OK when Focus sends 200 OK to the participant.

A.2.2 Adding a participant by the Focus - dial out

When Focus initiates INVITE to participant, the Focus shall generate ACID and shall insert the ACID to P-Service-Charging ID-Vector of INVITE when the Focus sends INVITE to the participant.

A.2.3 Manually creating a conference by dialling into conferencing application

When a conference server application receives INVITE from participant, the application requests additional input from participant before it is able to create a conference. After focus is created, when the focus initiates INVITE to participant, the Focus shall generate ACID and shall insert the generated ACID to P-Service-Charging ID-Vector of INVITE when the Focus sends INVITE to the participant.

A.2.4 Creating a Conference by conference-unaware UA

In this case, participant creates the conference URI (using some convention agreed to with the focus domain) and sends an INVITE to that URI which creates the focus. When S-CSCF receives INVITE from participant, S-CSCF shall check conference URI in INVITE and shall generate ACID if present. S-CSCF shall insert the generated ACID to P-Service-Charging ID-Vector of INVITE when S-CSCF sends INVITE to Focus. Focus shall insert ACID to 200 OK when Focus sends 200 OK to participant.

A.2.5 Creating a Conference using Ad-Hoc SIP methods

In this case, the conference factory URI is used to automatically create the conference. The SIP URI of the conference factory is provided with preconfigured data in UA. Initial INVITE from participant is sent to conference factory for creating the focus. The conference factory applications send back a 302 Moved temporally response with the conference URI generated at conference factory. After receiving 302 Moved temporally, participant sends INVITE to the focus. W hen S-CSCF receives INVITE from participant, S-CSCF shall check conference URI in INVITE and shall generate ACID if present. S-CSCF shall insert the ACID to P-Service-Charging ID-Vector of INVITE when S-CSCF sends INVITE to the focus.

A.2.6 Requesting the Focus to add a new resource to a conference

When the S-CSCF receives REFER from participants, S-CSCF shall insert the ACID saved locally for this session, and send REFER to S-CSCF and Focus. When the Focus initiates INVITE to new participant, the Focus shall insert the said ACID which is received from S-CSCF to INVITE when the Focus sends INVITE to new participant.

A.2.7 Adding a 3rd party using conference URI

When the S-CSCF receives REFER from participants, S-CSCF shall insert the ACID saved locally for this session, and send REFER to new participant. When the new participant initiates INVITE to the Focus, the Focus shall insert the said ACID received from S-CSCF to INVITE when the Focus sends INVITE to new participant.

A.2.8 Adding a 3rd party using dialog identifier

When the Focus receives JOIN with dialogue identifier from new participants, the Focus shall insert the ACID saved locally for the session related to this dialog identifier, and send 200 OK to new participant.

A.2.9 Changing user agents within a conference

When the Focus receives REPLACE with dialogue identifier from new UA, but the same participants, the Focus shall insert the ACID saved locally for the session related to this dialog identifier, and send 200 OK to new participant.

A.2.10 Bringing a point to point dialog into a conference

Focus shall send re-INVITE with a different conference URI and the ACID saved locally for the session related to this dialog identifier to the requesting participant.

A.2.11 Generation of ICID for non SIP request

For the conference service, on receiving the non SIP request (ex. XCAP for Ut interface) at P-CSCF or on initiating the non SIP request at AS, ICID shall be generated and inserted into the relevant xml parameter of message and sent to the next entities.

Annex B (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Mar 2004	S_23	SP-040144	--	--	Submitted to TSG SA#23 for Information	1.0.0	