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Abstract of document:

This is a Technical Specification on the MBMS offline and online charging that specifies the architecture, scenarios, the structure and content of the CDRs for offline charging as well as the charging events for online charging.

The work is done against the WIDs contained in SP-040779 (Work Item ID: CH) and in SP-040778 (Charging Management for Service Charging; Work Item ID: CH-SC), both approved at SA#26, Dec 2004.

Changes since last presentation to TSG SA Meeting:

New.

Outstanding Issues:

Message flows for MBMS online charging are missing.

Definitions of the MBMS specific Diameter Attribute Value Pairs (AVP) are not yet described.

Descriptions of the CDR generation processes and CDR contents, for subscribers and service providers, are not yet included.

Contentious Issues:

None.

3GPP TS 32.273 V1.0.0 (2005-03)

Technical Specification

**3rd Generation Partnership Project;
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Contents

Foreword

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

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

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

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

1 Scope

The present document 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 TSs that specify:

- the content of the CDRs per domain / subsystem / service (offline charging);

- the content of real-time charging messages per domain / subsystem / service (online charging);

- the functionality of online and offline charging for those domains / subsystems / services;

- the interfaces that are used in the charging framework to transfer the charging information (i.e. CDRs or charging events).

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

The present document specifies the Offline and Online Charging description for the Multimedia Broadcast and Multicast Service (MBMS), based on the functional stage 2 description in 3GPP TS 23.246 [200]. This charging description includes the offline and online charging architecture and scenarios specific to MBMS, as well as the mapping of the common 3GPP charging architecture specified in TS 32.240 [1] onto MBMS. It further specifies the structure and content of the CDRs for offline charging, and the charging events for online charging. The present document is related to other 3GPP charging TSs as follows:

- The common 3GPP charging architecture is specified in TS 32.240 [1];

- The parameters, abstract syntax and encoding rules for the CDRs are specified in TS 32.298 [51];

- A transaction based mechanism for the transfer of CDRs within the network is specified in TS 32.295 [54];

- The file based mechanism used to transfer the CDRs from the network to the operator's billing domain (e.g. the billing system or a mediation device) is specified in TS 32.297 [52];

- The 3GPP Diameter application that is used for MBMS offline and online charging is specified in TS 32.299 [50].

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]-[19] Void.

[20] 3GPP TS 32.260: "Telecommunication management; Charging management; IP Multimedia Subsystem (IMS) charging".

[21]-[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] 3GPP TS 32.272: "Telecommunication management; Charging management; Push-to-Talk over Cellular (PoC) charging".

[33]-[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) parameter description".

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

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

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

[55]-[69] Void.

[70]   3GPP TS 23.125: "Overall High Level Functionality and Architecture Impacts of Flow Based Charging; Stage 2"

[71]-[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 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description".

[201]   3GPP TS 22.146: "Multimedia Broadcast/Multicast Service; Stage 1"

[202]   3GPP TS 22.246: "Multimedia Broadcast/Multicast Service (MBMS) user services; Stage 1"

[203]   3GPP TS 26.346: "Multimedia Broadcast/Multicast Service; Protocols and Codecs"

[204]   3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)"

[205]-[299] Void.

d)   Relevant ITU Recommendations

[300]   ITU-T Recommendation D.93: "Charging and accounting in the international land mobile telephone service (provided via cellular radio systems)".

[301]-[309] Void.

[310]   ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[311]-[329] Void.

[330]   ITU-T Recommendation Q.767: "Application of the ISDN user part of CCITT signalling System No.7 for international ISDN interconnections".

[331]-[349] Void.

[350]   ITU-T Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[351]   ITU-T Recommendation X.121: "International numbering plan for public data networks".

[352]-[399] Void.

e)   Relevant IETF RFCs

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

[401]   IETF RFC 3588 (2003): "Diameter Base Protocol"

[402]   IETF Internet-Draft "Diameter Credit Control Application" v06

Editor's note: The reference shall be replaced with the RFC number, once assigned.

[403] IETF RFC 1350: "The TFT Protocol (Revision 2)"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions given in 3GPP TR 21.905 [100], 3GPP TS 32.240 [1], 3GPP TS 23.246 [200], and the following apply:

2G- / 3G-: prefixes 2G- and 3G- refer to functionality that supports only GSM or UMTS, respectively, e.g. 2G-SGSN refers only to the GSM functionality of an SGSN.

accounting: process of apportioning charges between the Home Environment, Serving Network and Subscriber.

Advice of Charge (AoC): real-time display of the network utilisation charges incurred by the Mobile Station. The charges are displayed in the form of charging units. If a unit price is stored by the MS then the display may also include the equivalent charge in the home currency.

AoC service: combination of one or more services, both basic and supplementary, together with a number of other charging relevant parameters to define a customised service for the purpose of advice of charge.

billing: function whereby CDRs generated by the charging function(s) are transformed into bills requiring payment.

Billing Domain: part of the operator network, which is outside the core network, that receives and processes CDR files from the core network charging functions. It includes functions that can provide billing mediation and billing or other (e.g. statistical) end applications. It is only applicable to offline charging (see "Online Charging System" for equivalent functionality in online charging).

CDR field categories: the CDR fields are defined in the present document. CDR fields may be operator provisionable and are divided into the following categories:

- **Mandatory (M):** field that shall always be present in the CDR.

- **Conditional (C):** field that shall be present in a CDR if certain conditions are met.

- **Operator Provisionable: Mandatory (O_M):** field that, if provisioned by the operator, shall always be present in the CDR.

- **Operator Provisionable: Conditional (O_C):** field that, if provisioned by the operator, shall be present in a CDR if certain conditions are met.

chargeable event: activity utilizing telecommunications network infrastructure and related services for:

- user to user communication (e.g. a single call, a data communication session or a short message); or

- user to network communication (e.g. service profile administration); or

- inter-network communication (e.g. transferring calls, signalling, or short messages); or

- mobility (e.g. roaming or inter-system handover); and

- that the network operator may want to charge for.

charged party: user involved in a chargeable event who has to pay parts or the whole charges of the chargeable event, or a third party paying the charges caused by one or all users involved in the chargeable event, or a network operator.

charging: function within the telecommunications network and the associated OCS/BD components whereby information related to a chargeable event is collected, formatted, transferred and evaluated in order to make it possible to determine usage for which the charged party may be billed (offline charging) or the subscribers account balance may be debited (online charging).

Charging Data Record (CDR): a formatted collection of information about a chargeable event (e.g. time of call set-up, duration of the call, amount of data transferred, etc) for use in billing and accounting. For each party to be charged for parts of or all charges of a chargeable event a separate CDR shall be generated, i.e. more than one CDR may be

generated for a single chargeable event, e.g. because of its long duration, or because more than one charged party is to be charged.

charging function: entity inside the core network domain, subsystem or service that is involved in charging for that domain, subsystem or service.

Fully qualified Partial CDR (FQPC): partial CDR that contains a complete set of the fields specified in the present document. This includes all the mandatory and conditional fields as well as those fields that the PLMN operator has provisioned to be included in the CDR. The first Partial CDR shall be a Fully qualified Partial CDR.

GPRS: packet switched bearer and radio services for GSM and UMTS systems.

GTP': GPRS protocol used for CDR transport. It is derived from GTP with enhancements to improve transport reliability necessary for CDRs.

NOTE: This protocol is not used for tunnelling.

inter-system change: change of radio access between different radio access technologies such as GSM and UMTS.

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

near real time: near real time charging and billing information is to be generated, processed, and transported to a desired conclusion in less than 1 minute.

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 bearer/session/service control is required.

Online Charging System: the entity that performs real-time credit control. Its functionality includes transaction handling, rating, online correlation and management of subscriber account balances.

packet switched domain: domain within GSM / UMTS in which data is transferred in packet switched mode. Corresponds to the term "GPRS".

partial CDR: CDR that provides charging information on part of a subscriber session. A long session may be covered by several partial CDRs. Two formats are considered for Partial CDRs. One that contains all of the necessary fields; the second has a reduced format.

real time: real time charging and billing information is to be generated, processed, and transported to a desired conclusion in less than 1 second.

Reduced Partial CDR (RPC): partial CDRs that only provide mandatory fields and information regarding changes in the session parameters relative to the previous CDR.

EXAMPLE: Location information is not repeated in these CDRs if the subscriber did not change its location.

settlement: payment of amounts resulting from the accounting process.

subscriber: entity (associated with one or more users) that is engaged in a subscription with a service provider. The subscriber is allowed to subscribe and unsubscribe services, to register a user or a list of users authorised to enjoy these services, and also to set the limits relative to the use that associated users make of these services.

successful call: connection that reaches the communication or data transfer phase e.g. the "answered" state for speech connections. All other connection attempts are regarded as unsuccessful.

tariff period: part of one (calendar) day during which a particular tariff is applied. Defined by the time at which the period commences (the switch-over time) and the tariff to be applied after switch-over.

tariff: set of parameters defining the network utilisation charges for the use of a particular bearer / session / service.

3.2 Abbreviations

For the purposes of the present document, the abbreviations defined in 3GPP TR 21.905 [50], 3GPP TS 32.240 [1], 3GPP TS 23.246 [200] and the following apply:

ABNF	Augmented Backus-Naur Form
ACA	Accounting Answer
ACR	Accounting Request
AF	Application Function
AMF	Account Balance Management Function
AoC	Advice of Charge
AVP	Attribute Value Pair
BCF	Bearer Charging Function
BCSM	Basic Call State Model
BD	Billing Domain
BMD	Billing Mediation Device
BM-SC	Broadcast Multicast Service Centre
BS	Billing System
CAI	Charge Advice Information
CCA	Credit Control Answer
CCR	Credit Control Request
CDF	Charging Data Function
CDR	Charging Data Record
CG	Charging Gateway
CGF	Charging Gateway Function
CSE	CAMEL Service Environment
CTF	Charging Trigger Function
DRP	Data Record Packet
ECF	Event Charging Function
ECUR	Event Charging with Unit Reservation
EDP	Event Detection Point
FCI	Furnish Charging Information
FQPC	Fully Qualified Partial CDR
FTAM	File Transfer, Access and Management
GTP'	The GPRS protocol used for CDR transport. It is derived from GTP with enhancements to improve transport reliability necessary for CDRs.
IEC	Immediate Event Charging
IHOSS:OSP	Internet Hosted Octet Stream Service: Octet Stream Protocol
M-CDR	Mobility management generated - Charging Data Record
OCS	Online Charging System
PT	Protocol Type (Field in GTP' header)
RF	Rating Function
RPC	Reduced Partial CDR
SCI	Subscriber Controlled Input or Send Charging Information
SCUR	Session Charging with Unit Reservation
TAP	Transferred Account Procedure
TDP	Trigger Detection Point
TID	Tunnel IDentifier
TLV	Type, Length, Value (GTP header format)
TMGI	Temporary Mobile Group Identifier
TV	Type, Value
VAS	Value Added Service
VASP	Value Added Service Provider

3.3 Symbols

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

Bmb	Reference point for the CDR file transfer from the MBMS CGF to the BD.
Bo	Reference point for the CDR file transfer from the OCF CGF to the BD.
Bp	Reference point for the CDR file transfer from the GPRS CGF to the BD.
Bx	Reference point between any (generic) 3GPP domain, subsystem or service CGF and the BD.

Ga   Reference point for CDR transfer between a CDF and the CGF.
Gi   Interface between the Packet-Switched domain and an external packet data network.
Gn   Interface between two GSNs within the same PLMN.
Gp   Interface between two GSNs in different PLMNs.
kbit/s   Kilobits per second. 1 kbit/s = 2^{10} bits per second.
Mbit/s   Megabits per second. 1 Mbit/s = 2^{20} bits per second.
Rf   Offline charging reference point between a BM-SC and the CDF.
Ro   Online charging reference point between a BM-SC and the OCS.

4 Architecture Considerations

4.1 High level MBMS architecture

The high level MBMS architecture is as defined in 3GPP TS 23.246 [200].

The following sections detail only service level charging. MBMS related aspects of bearer level charging is defined in TS 32.251 [11].

Editor's Note: Bearer level charging aspects of MBMS need to be defined in TS 32.251

Editor's Note: To include an architecture diagram once stage 2 is stabilised.

4.2 MBMS offline charging architecture

Figure 4.1 depicts the MBMS offline charging architecture. As defined in 3GPP TS 32.240 [1], the BM-SC contains an integrated CTF that generates charging events that are passed to the CDF via the Rf reference point.

```
                                                    ┌──────────────────┐
                                                    │  Billing Domain  │
                                                    └────────┬─────────┘
                                                             ┼ Bmb
 ┌──────────┐     Rf    ┌──────────┐     Ga    ┌──────────┐
 │  BM-SC   │─────┼─────│   CDF    │─────┼─────│   CGF    │
 └──────────┘           └──────────┘           └──────────┘
```
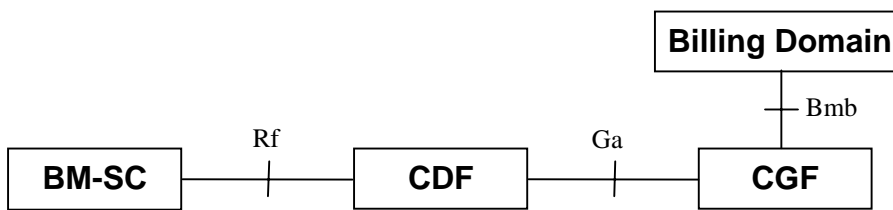
Figure 4.1 – Charging architecture for MBMS offline charging

4.3 MBMS online charging architecture

Figure 4.2 depicts the MBMS online charging architecture.

```
 ┌──────────┐     Ro    ┌──────────┐
 │  BM-SC   │─────┼─────│   OCS    │
 └──────────┘           └──────────┘
```
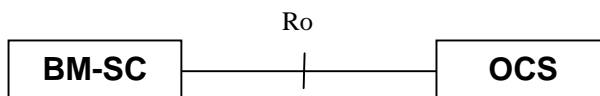
Figure 4.2 – Charging architecture for MBMS online charging

For online charging, the BM-SC utilises the Ro interface and the protocol and application towards the OCS is as specified in TS 32.299 [50] and this specification.

5 MBMS charging principles and scenarios

5.1 MBMS charging principles

5.1.1 General principles

A Multimedia Broadcast and Multicast Service consists of an MBMS User service, as defined in 3GPP TS 22.246 [202] and 3GPP TS 26.346 [203], that is delivered over one or more MBMS bearer services, as defined in 3GPP TS 22.146 [201] and 3GPP TS 23.246 [200].

> Note: MBMS bearer service is referred in 3GPP TS 22.246 [202] as MBMS transport service.

The BM-SC shall collect charging information for mobile subscribers receiving services through MBMS and/or for content providers delivering content through MBMS. Transactions involving the content provider (or VASP) shall be possible.

The BM-SC collects charging related information, such as:

- Identification of the source of content

- Type of user service (streaming, download or carousel)

- Type of bearer service used to deliver content (broadcast or multicast)

- Identification of subscribers receiving service

- Delivery notification from individual subscribers

> Editor's Note: Carousel services need further definition in stage 2 TS 23.246 and TS 26.346, before it can be progressed in this specification.

The following table shows the parties to be charged for the different MBMS bearer services used as identified by 3GPP TS 22.246 [202] and 22.146 [201].

Table 5.1: Charging requirements for service delivery

Service Aspects	MBMS Bearer Service used	
	Multicast (one or more)	Broadcast (one or more)
User Service (Content)	Receiving subscriber	Receiving subscriber
Bearer Service (Transport)	Content provider and/or receiving subscriber	Content provider

The user service, as shown in Table 5.1, shall be charged either by subscription (out of scope of this specification) or as a one time event charge (e.g. key management). Charging associated with the user service may be treated independently from charging associated with the transport of the user service.

Charging for the bearer service may be based on the session information (e.g. QoS, media type, and service area) and one of the following, as described in 3GPP TS 22.146 [201]:

- Session duration (time from the MBMS Session Start procedure to MBMS Session Stop procedure as defined in TS 23.246 [200])

- Volume of data of a session

- Duration of time whilst a subscriber is registered to receive a session (or from Join to Leave)

- Volume of data transferred whilst a subscriber is registered to receive a session (from Join to Leave)

> Editor's Note: It is necessary to define relationship between bearer service and session.

Table 5.2 shows the applicability of the accounting measurements to the different bearer services used.

Table 5.2: Applicability of accounting measurements

Accounting measurement	Applicable to (Yes / No)	
	Broadcast Service	Multicast Service
Session Duration	Yes	Yes
Volume of data of a session	Yes	Yes
Duration of time whilst a subscriber is registered to receive a session	No	Yes
Volume of data transferred whilst a subscriber is registered to receive a session	No	Yes

5.1.2 Triggers for generation of charging information

Editor's Note: The following list is not complete and needs further explanation.

– Bearer service initiation/termination

– Key management

5.2 MBMS offline charging scenarios

5.2.1 Basic principles

As described in section 5.1, charging may be based on events (such as key management) or based on MBMS sessions. However, as large numbers of users are expected to use services delivered using MBMS, generation of charging information should be performed in a manner that ensures the charging entities and billing domain are not overloaded.

Editor's Note: How this is achieved is FFS. One way is to collect all offline charging information for one service into one record. This may not be possible for user services that require confirmation of successful receipt or charging models based on registration to a multicast group.

Charging information shall be generated for subscribers and/or for content providers.

5.2.2 Rf message flows

5.2.2.1 Broadcast Service

5.2.2.1.1 User service charging

A MBMS user service that is delivered using a broadcast bearer may be Event charged or Session charged. As there is no 3GPP specified signalling for a UE to activate or deactivate the broadcast service, it is MBMS user service dependent (e.g. key management) when the Accounting Request is triggered. The Event based and Session based offline charging flows are as defined in 3GPP TS 32.299 [50].

5.2.2.1.2 Session Start

Where charging for the content provider is applied, the following procedure applies as shown in figure 5.1.

Figure 5.1: Rf interaction during Broadcast Session Start Procedure for a broadcast bearer

1) The BM-SC performs the MBMS Session Start procedure as described in 3GPP TS 23.246 [200]

2a) On receiving the first MBMS Session Start Response from any GGSN, the BM-SC sends an Accounting Request

2b) The remainder of the MBMS Session Start procedure may occur in parallel with the Accounting Request procedure in 2a.

The full details of the MBMS Session Start procedure for the broadcast bearer are described in 3GPP TS 23.246 [200].

5.2.2.1.3 Session Stop

The following procedure in figure 5.2 shows the charging interaction during the MBMS Session Stop procedure for a broadcast bearer.

Figure 5.2: Rf interaction during MBMS Session Stop procedure for a broadcast bearer

1) The BM-SC performs the MBMS Session Stop procedure as described in 3GPP TS 23.246 [200]

2a) On receiving a Session Stop Response from any GGSN, the BM-SC sends a Accounting Request.

2b) The remainder of the MBMS Session Stop procedure occurs in parallel with the Accounting Request procedure in 2a.

The full details of the MBMS Session Stop procedure for the broadcast bearer are described in 3GPP TS 23.246 [200].

5.2.2.1.4 BM-SC initiated Registration and De-Registration

BM-SC initiated Registration and De-Registration are handled through O&M towards the GGSNs (and subsequent nodes) and therefore Rf interactions (Accounting Request (Start) and Accounting Request (Stop) respectively) may be triggered when the Registration and De-Registration is triggered through O&M. These Rf interactions should only occur for sessions that have already started.

5.2.2.2 Multicast Service

5.2.2.2.1 Session Start

The following procedure in figure 5.3 shows the charging interaction during the MBMS Session Start procedure for a multicast bearer.
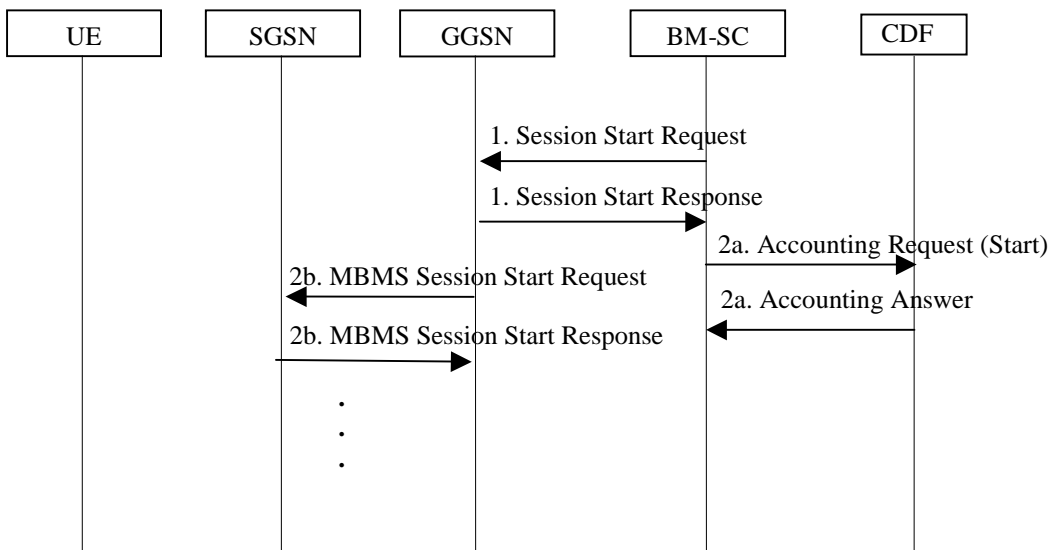

Figure 5.3: Rf interaction during MBMS Session Start procedure for a multicast bearer

1) The BM-SC performs the MBMS Session Start procedure as described in 3GPP TS 23.246 [200]

2a) On receiving the first Session Start Response from any GGSN, the BM-SC sends an Accounting Request. The accounting request may be for subscriber and/or content provider charging. For subscriber charging, the Accounting Request shall apply only to subscribers that have already performed multi-cast service activation as described in 3GPP TS 23.246 [200]. It shall be possible to send one Accounting Request message for multiple subscribers of the same multicast service, but the procedure in the BM-SC to group subscribers is implementation dependent

2b) The remainder of the MBMS Session Start procedure occurs in parallel with the Accounting Request procedure in 2a.

The full details of the MBMS Session Start procedure for the multicast bearer are described in 3GPP TS 23.246 [200].

5.2.2.2.2 Session Stop

The following procedure in figure 5.4 shows the charging interaction during the MBMS Session Stop procedure for a multicast bearer.
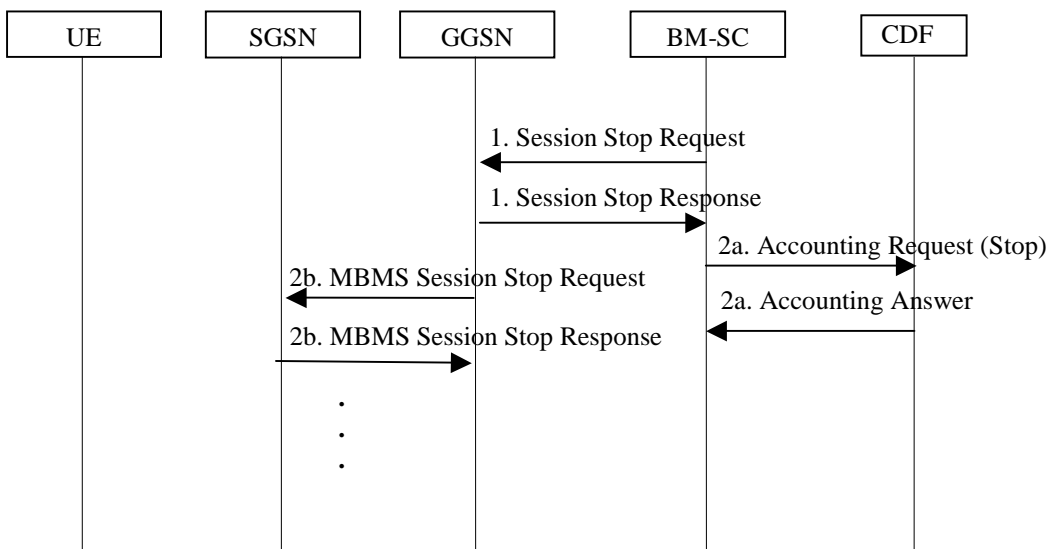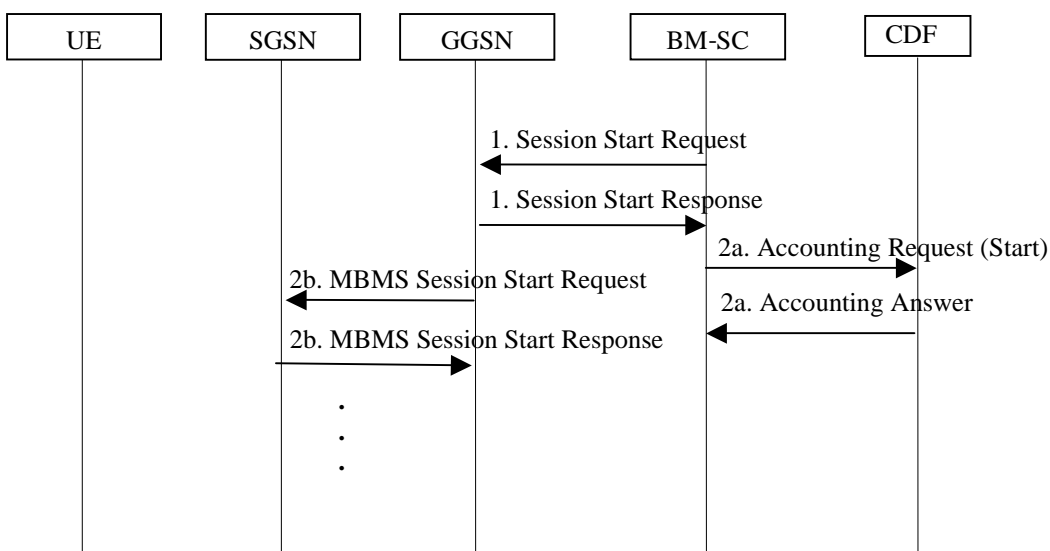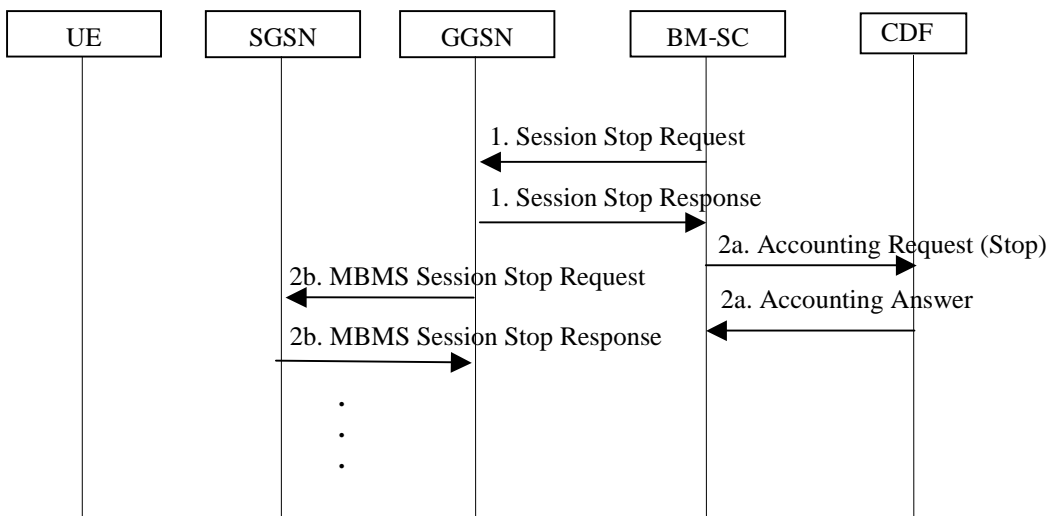
Figure 5.4: Rf interaction during MBMS Session Stop procedure for a multicast bearer

1) The BM-SC performs the MBMS Session Stop procedure as described in 3GPP TS 23.246 [200]

2a) On receiving the first Session Stop Response from any GGSN, the BM-SC sends a Accounting Request. For subscriber charging, it shall be possible to send one Accounting Request message for multiple or all subscribers of the same multicast service, that are still active, and is implementation and service dependent.

2b) The remainder of the MBMS Session Stop procedure occurs in parallel with the Accounting Request procedure in 2a.

The full details of the Session Stop procedure for the multicast bearer are described in 3GPP TS 23.246 [200].

5.2.2.2.3   BM-SC initiated MBMS De-registration

The following procedure in figure 5.5 shows the charging interaction during the BM-SC initiated MBMS De-registration procedure for a multicast bearer for an already started session.
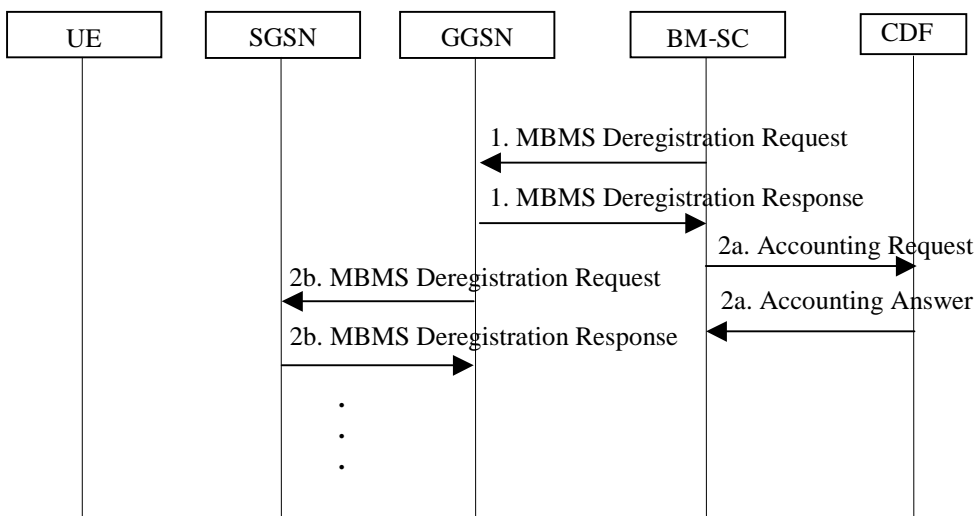
Figure 5.5: Rf interaction during BM-SC initiated MBMS Deregistration procedure for a multicast bearer

1) The BM-SC performs the MBMS Deregistration procedure as described in 3GPP TS 23.246 [200]

2a) On receiving an MBMS Deregistration Response from the GGSN, the BM-SC sends a Accounting Request. If the Deregistration is to all GGSNs previously receiving the session, the Accounting Request shall be a "Stop", otherwise, the Accounting Request shall be "Interim".

2b) The remainder of the MBMS Deregistration procedure occurs in parallel with the Accounting Request procedure in 2a.

The full details of the MBMS Deregistration procedure for the multicast bearer are described in 3GPP TS 23.246 [200].

5.2.2.2.4 UE Activation

The following procedure in figure 5.6 should only apply to subscriber's that activate the multicast service after the session has already started.
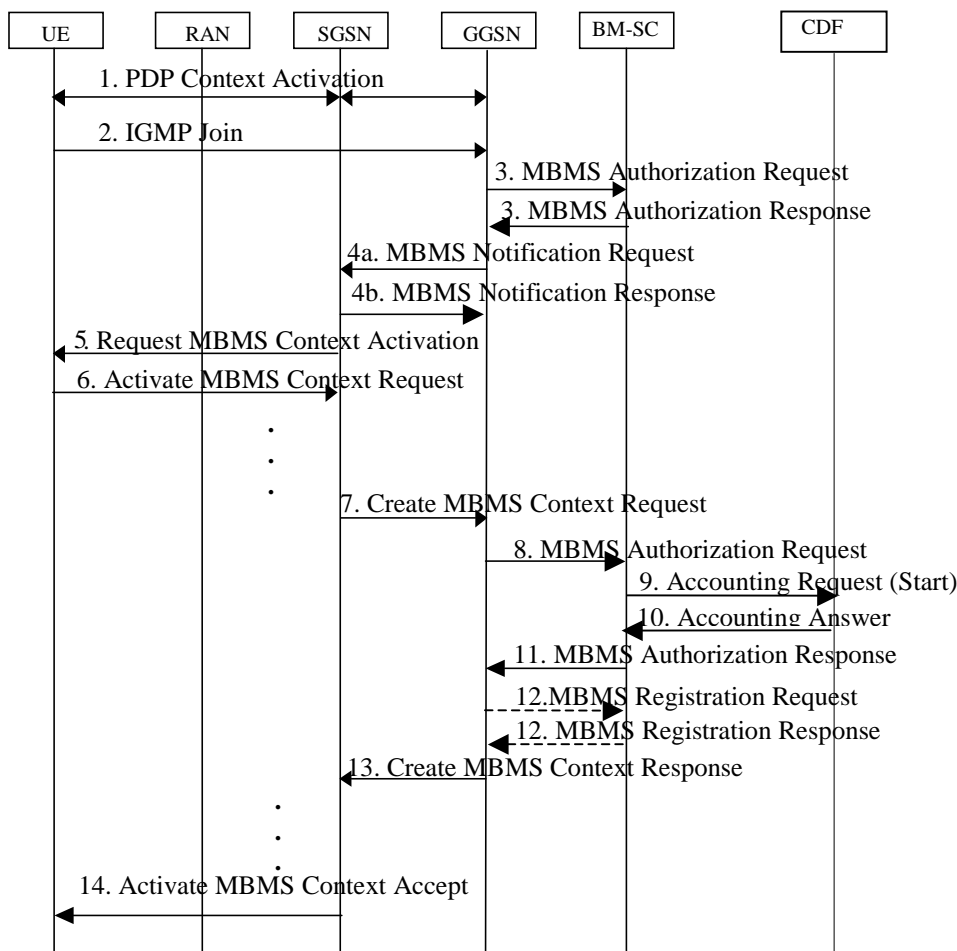
Figure 5.6: Rf interaction during MBMS Multicast Service Activation procedure for a multicast bearer

Full details of the activation procedure are described in the MBMS Multicast Service Activation procedure in 3GPP TS 23.246 [200].

5.2.2.2.5 UE Deactivation

The following procedure in figure 5.7 should only apply to subscriber's that deactivate the multi-cast service before the session has stopped, i.e. before the MBMS Session Stop procedure is invoked.
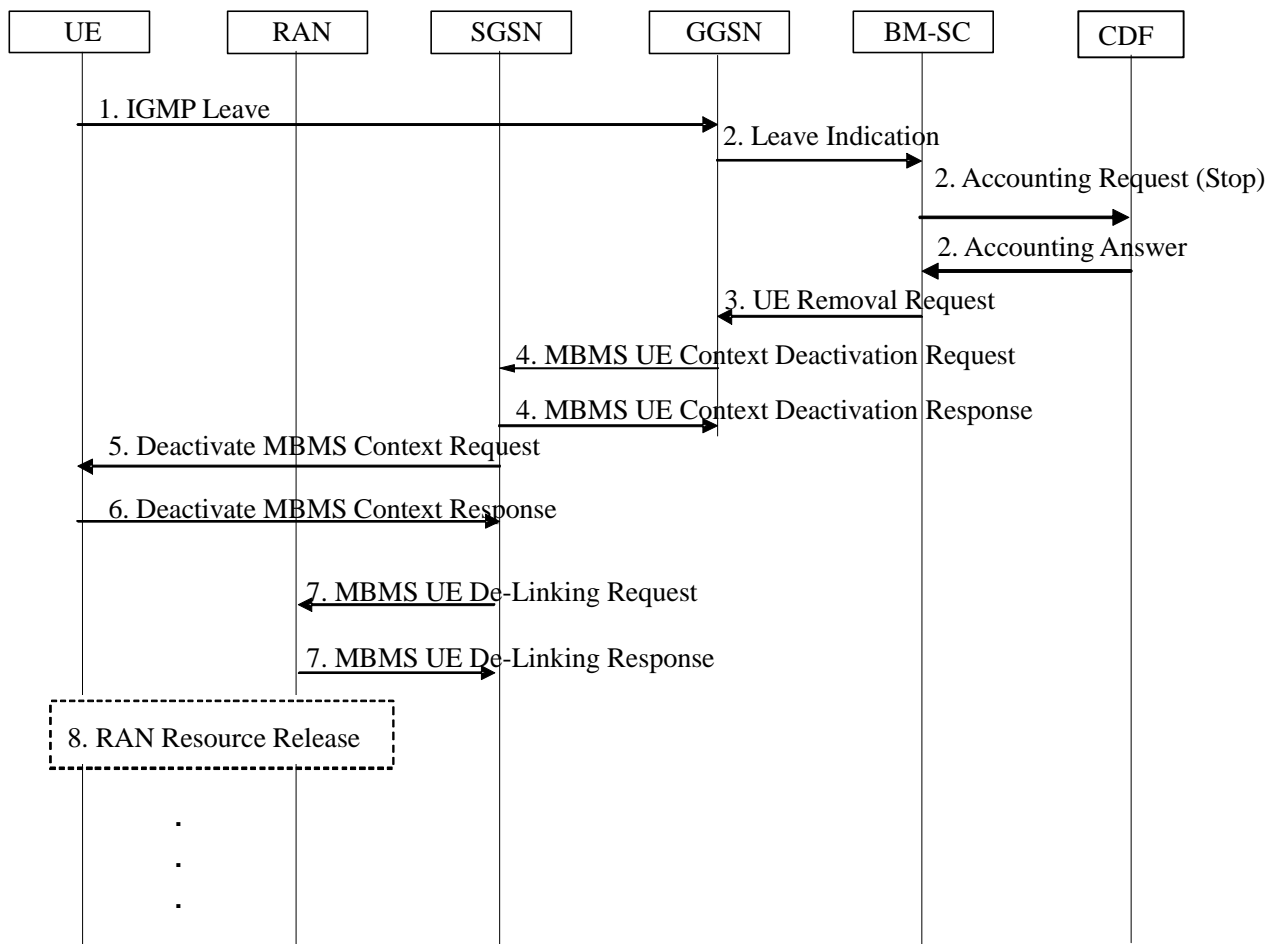
Figure 5.7: Rf interaction during MBMS Multicast Service Deactivation procedure for a multicast bearer

Full details of the deactivation procedure are described in the MBMS Multicast Service Deactivation procedure in 3GPP TS 23.246 [200].

5.2.3 CDR generation

5.2.3.1 CDRs related to MBMS subscribers

Editor's Note: This section will contain information about generation of CDRs for the purpose of subscriber charging.

5.2.3.2 CDRs related to content provider

Editor's Note: This section will contain information about generation of CDRs for the purpose of content provider charging.

5.2.4 Ga record transfer flows

5.2.5 B$_{mb}$ CDR file transfer

5.3 MBMS online charging scenarios

5.3.1 Basic principles

MBMS online charging uses the credit control application as specified in 3GPP TS 32.299 [50] and this specification.

Online charging of content providers is not supported in this release of this specification.

The type of online interaction used is dependent on the user service type, bearer type and whether delivery notification is required. Table 5.3 shows this dependency

Table 5.3: Online interaction dependency on MBMS service parameters

User Service Type	Bearer Service Type	Delivery Notification	Online Interaction
Key Management	N/A	N/A	IEC
Streaming	Broadcast	N/A	FFS
Streaming	Multicast	N/A	SCUR
Download	Broadcast	Required	ECUR or SCUR
Download	Multicast	Required	FFS
Download	Broadcast	Not required	FFS
Download	Multicast	Not required	FFS

It is not possible to perform charging transactions in a load efficient manner as in offline charging (see section 5.2). Therefore, one online charging interaction is necessary for each user.

5.3.2 Ro message flows

6 Definition of charging information

6.1 Data description for MBMS offline charging

6.1.1 Rf message contents

6.1.1.1 Summary of Offline Charging Message Formats

The BM-SC generates accounting information that can be transferred to the CDF. For this purpose, the MBMS Accounting application employs the *Accounting-Request* (ACR) and *Accounting-Answer* (ACA) messages from the Diameter base protocol. The request can be of type start, stop, interim and event. The accounting request message includes all charging information and the answer is just an acknowledgement of the request message. Detailed information about the Diameter offline charging application is described in TS 32.299 [50].

The following sub clauses describe the different AVPs used in the accounting messages.

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	BM-SC	CDF	ACR
Accounting-Answer	CDF	BM-SC	ACA

6.1.1.2 Structure for the Accounting Message Formats

6.1.1.2.1 Accounting-Request Message

Table 6.2 illustrates the basic structure of a Diameter ACR message as used for MBMS offline charging.

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

AVP	Type	Category	Description
Session-Id	Value	M	Described in Diameter Base Protocol [401]
Origin-Host	Value	M	Described in Diameter Base Protocol [401]
Origin-Realm	Value	M	Described in Diameter Base Protocol [401]
Destination-Realm	Value	M	Described in Diameter Base Protocol [401]
Accounting-Record-Type	Value	M	Described in Diameter Base Protocol [401]
Accounting-Record-Number	Value	M	Described in Diameter Base Protocol [401]
Acct-Application-Id	Value	FFS	Described in Diameter Base Protocol [401]
Vendor-Specific-Application-Id	Value	FFS	Described in Diameter Base Protocol [401]
User-Name	Value	FFS	Described in Diameter Base Protocol [401]
Accounting-Sub-Session-Id	Value	-	Described in Diameter Base Protocol [401]
Acct-Session-Id	Value	-	Described in Diameter Base Protocol [401]
Acct-Multi-Session-Id	Value	-	Described in Diameter Base Protocol [401]
Acct-Interim-Interval	Value	O_C	Described in Diameter Base Protocol [401]
Accounting-Realtime-Required	Value	-	Described in Diameter Base Protocol [401]
Origin-State-Id	Value	O_C	Described in Diameter Base Protocol [401]
Event-Timestamp	Value	O_C	Described in Diameter Base Protocol [401]
Proxy-Info	Multiple	-	Described in Diameter Base Protocol [401]
Route-Record	Multiple	-	Described in Diameter Base Protocol [401]
AVP	Multiple	-	Described in Diameter Base Protocol [401]
Service-Information	Grouped	O_C	Described in TS 32.299 [50]
PS-Information	Grouped	O_C	Described in TS 32.251 [11]
IMS-Information	Grouped	O_C	Described in TS 32.260 [20]
MBMS-Information	Grouped	O_C	Described in subclause 6.3

NOTE: For AVP of type "Grouped" only the group AVP is listed in table 6.2. Detailed descriptions of the AVPs are provided according to "Description" column.

Editor's Note: It is FFS whether the IMS-Information AVP can be used to carry media information about the MBMS user service (currently described using SDP). Also PS-Information AVP is expected to be used to carry information according data volume and duration of the session, if available.

Editor's Note: The use of User-Name AVP is FFS, as this may need to be replaced to identify multiple users to optimise the signalling. Therefore, the use of a vendor specific application id is FFS also.

6.1.1.2.2 Accounting-Answer Message

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

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

AVP	Type	Category	Description
Session-Id	Value	M	Described in Diameter Base Protocol [401]
Result-Code	Value	M	Described in Diameter Base Protocol [401]
Origin-Host	Value	M	Described in Diameter Base Protocol [401]
Origin-Realm	Value	M	Described in Diameter Base Protocol [401]
Accounting-Record-Type	Value	M	Described in Diameter Base Protocol [401]
Accounting-Record-Number	Value	M	Described in Diameter Base Protocol [401]
Acct-Application-Id	Value	FFS	Described in Diameter Base Protocol [401]
Vendor-Specific-Application-Id	Value	FFS	Described in Diameter Base Protocol [401]
User-Name	Value	FFS	Described in Diameter Base Protocol [401]
Accounting-Sub-Session-Id	Value	-	Described in Diameter Base Protocol [401]
Acct-Session-Id	Value	-	Described in Diameter Base Protocol [401]
Acct-Multi-Session-Id	Value	-	Described in Diameter Base Protocol [401]
Error-Reporting-Host	Value	-	Described in Diameter Base Protocol [401]
Acct-Interim-Interval	Value	O_C	Described in Diameter Base Protocol [401]
Accounting-Realtime-Required	Value	-	Described in Diameter Base Protocol [401]
Origin-State-Id	Value	O_C	Described in Diameter Base Protocol [401]
Event-Timestamp	Value	O_C	Described in Diameter Base Protocol [401]
Proxy-Info	Multiple	-	Described in Diameter Base Protocol [401]
AVP	Multiple	-	Described in Diameter Base Protocol [401]

6.1.2 Ga message contents

6.1.3 CDR description on the B_{mb} interface

Editor's Note: < This clause shall contain one subclause for each CDR type specified for XXX. These subclauses shall contain a tabular representation of the CDR, including a brief description for each parameter. Note that a more complete description and the ASN.1 description of the CDRs and their parameters shall be provided in TS 32.298. >

6.2 Data description for MBMS online charging

6.2.1 Ro message contents

6.2.1.1 Summary of Message Formats

MBMS Online Charging uses the approach based on a series of "interrogations" as defined by Diameter Credit Control Application [402]:

- First interrogation,

- Zero, one or more intermediate 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 (CCR) and Credit-Control-Answer (CCA) messages defined in TS 32.299 [50]. The CCR triggers the rating of the MBMS service and reserves units on the user's account. The CCA is a response including any reserved units or an error code if the user is out of credit. Detailed information about the diameter online charging application is described in TS 32.299 [50].

The CCR for the "intermediate 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.

The following sub clauses describes the different AVPs used in the credit control messages

Table 6.5 describes the use of these messages for online charging.

Table 6.4: Online Charging Messages Reference Table

Command-Name	Source	Destination	Abbreviation
Credit-Control-Request	BM-SC	OCS	CCR
Credit-Control-Answer	OCS	BM-SC	CCA

6.2.1.2 Structure for the Credit Control Message Formats

6.2.1.2.1 Credit-Control-Request Message

Table 6.6 illustrates the basic structure of a Diameter CCR message from the BM-SC as used for MBMS online charging.

Table 6.5: Credit-Control-Request (CCR) Message Contents

AVP	Type	Category	Description
Session-Id	value	M	Described in Diameter Base Protocol [401]
Origin-Host	value	M	Described in Diameter Base Protocol [401]
Origin-Realm	value	M	Described in Diameter Base Protocol [401]
Destination-Realm	value	M	Described in Diameter Base Protocol [401]
Auth-Application-Id	value	M	Described in Diameter Base Protocol [401]
Service-Context-Id	value	M	Described in Diameter Credit Control Application [402]
CC-Request-Type	value	M	Described in Diameter Credit Control Application [402]
CC-Request-Number	value	M	Described in Diameter Credit Control Application [402]
Destination-Host	value	O_C	Described in Diameter Base Protocol [401]
User-Name	value	O_C	Described in Diameter Base Protocol [401]
CC-Sub-Session-Id	value	O_M	Described in Diameter Credit Control Application [402]
Acct-Multi-Session-Id	value	O_C	Described in Diameter Credit Control Application [402]
Origin-State-Id	value	O_C	Described in Diameter Base Protocol [401]
Event-Timestamp	value	O_C	Described in Diameter Base Protocol [401]
Subscription-Id	Multiple-grouped	O_C	Described in Diameter Credit Control Application [402]
Service-Identifier	Value	O_C	Described in Diameter Credit Control Application [402]
Termination-Cause	value	O_C	Described in Diameter Base Protocol [401]
Requested-Service-Unit	grouped	O_C	Described in Diameter Credit Control Application [402]
Requested-Action	value	O_C	Described Diameter Credit Control Application [402]
Used-Service-Unit	Multiple-grouped	O_C	Described in Diameter Credit Control Application [402]
Multiple-Services-Indicator	value	O_C	Described in Internet-Draft, Diameter Credit Control Application [402]
Multiple-Services-Credit Control	Multiple-grouped	O_C	Described in Diameter Credit Control Application [402]
Service-Parameter-Info	Multiple-Grouped	O_C	Described in Diameter Credit Control Application [402]
CC-Correlation-Id	value	O_C	Described in Diameter Credit Control Application [402]
User–Equipment-Info	Multiple-Grouped	O_C	Described in Diameter Credit Control Application [402]
Service-Information	Grouped	O_C	Described in TS 32.299 [50]
PS-Information	Grouped	O_C	Described in TS 32.251 [11]
IMS-Information	Grouped	O_c	Described in TS 32.260 [20]
MBMS-Information	Grouped	O_C	Described in subclause 6.3

The full description of the AVPs is specified in TS 32.299 [50].

Editor's Note: It is FFS whether the IMS-Information AVP can be used to carry media information about the MBMS user service (currently described using SDP).

6.2.1.2.2 Credit-Control-Answer Message

Table 6.7 illustrates the basic structure of a Diameter CCA message as used for the BM-SC. This message is always used by the OCS as specified below, independent of the receiving BM-SC and the CCR request type that is being replied to.

Table 6.6: Credit-Control-Answer (CCA) Message

AVP	Type	Category	Description
Session-Id	Value	M	Described in Diameter Base Protocol [401]
Result-Code	Value	M	Described in Diameter Base Protocol [401]
Origin-Host	Value	M	Described in Diameter Base Protocol [401]
Origin-Realm	Value	M	Described in Diameter Base Protocol [401]
Auth-Application-Id	Value	M	Described in Diameter Base Protocol [401]
CC-Request-Type	Value	M	Described in Diameter Credit Control Application [402]
CC-Request-Number	Value	M	Described in Diameter Credit Control Application [402]
User-Name	Value	O_C	Described in Diameter Base Protocol [401]
CC-Session-Failover	Value	O_C	Described in Diameter Credit Control Application [402]
CC-Sub-Session-Id	Value	O_M	Described in Diameter Credit Control Application [402]
Acct-Multi-Session-Id	Value	O_C	Described in Diameter Base Protocol [401]
Origin-State-Id	Value	O_C	Described in Diameter Base Protocol [401]
Event-Timestamp	Value	O_C	Described in Diameter Base Protocol [401]
Granted-Service-Unit	grouped	O_C	Described in Diameter Credit Control Application [402]
Multiple-Services-Credit-Control	Multiple-grouped	O_C	Described in Diameter Credit Control Application [402]
Final-Unit-Indication	Grouped	O_C	Described in Diameter Credit Control Application [402]
Check-Balance-Result	Value	O_C	Described in Diameter Credit Control Application [402]
Credit-Control-Failure-Handling	Value	O_C	Described in Diameter Credit Control Application [402]
Direct-Debiting-Failure-Handling	Value	O_C	Described in Diameter Credit Control Application [402]
Validity-Time	Value	O_C	Described in Diameter Credit Control Application [402]
Redirect-Host	Multiple-value	O_C	Described in Diameter Base Protocol [401]
Redirect-Host-Usage	Value	O_C	Described in Diameter Base Protocol [401]
Redirect-Max-Cache-Time	Value	O_C	Described in Diameter Base Protocol [401]
Proxy-Info	Multiple-grouped	O_C	Described in Diameter Base Protocol [401]
Route-Record	Multiple-Value	O_C	Described in Diameter Base Protocol [401]
Failed-AVP	Multiple-grouped	O_C	Described in Diameter Base Protocol [401]
AVP	Multiple-value	O_C	Described in Diameter Base Protocol [401]

6.3 MBMS charging specific parameters

6.3.1 Definition of the MBMS-Information AVP

The use of the Attribute Value Pairs (AVPs) that are defined in the Diameter Base [401] and DCCA [402] is available in the Diameter application specification TS 32.299 [50].

AVPs that are used for MBMS charging are provided within the Service-Information AVP. MBMS specific charging information is provided within the MBMS-Information-AVP.

```
MBMS-Information-AVP        ::=   <AVP Header: xxx>
                                 { TMGI }
                                 { MBMS-Session-Identifier }
                                 { MBMS-Service-Type }
```

{ MBMS-Service-Area }
{ MBMS-User-Service-Type }
[File-Repair-Supported]
[Repetition-Counter]
[Required-MBMS-Bearer-Capabilities]

Editor's Note: The list of information required is not complete.

The detailed structure of the MBMS-Information AVP can be found in table 6.4.

The AVP header bit denoted as 'M', indicates whether support of the AVP is required. The AVP header bit denoted as 'V', indicates whether the optional Vendor-ID field is present in the AVP header. For further details, see Diameter Base [401].

Table 6.7: Structure of the MBMS-Information AVP

AVP Name	AVP Code	Defined in	Value Type	AVP Flag rules			
				Must	May	Should not	Must not
TMGI		[204]	OctetString	M,V	P		
MBMS-Session-Identifier							
MBMS-Service-Type		[204]	Enumerated	M,V	P		
MBMS-Service-Area		[204]	OctetString	M,V	P		
MBMS-User-Service-Type			Enumerated	M,V	P		
File-Repair-Supported			Enumerated	M,V	P		
Repetition-Counter			Unsigned32	M,V	P		
Required-MBMS-Bearer-Capabilities		[204]	UTF8String	M,V	P		

Editor's Note: MBMS-Session-Identifier AVP is expected to be defined in 3GPP TS 29.061 [204].

6.3.2 MBMS-User-Service-Type AVP

Editor's Note: Used to indicate that a user service is a download or streaming service. Details are tbd.

6.3.3 File-Repair-Supported AVP

Editor's Note: Used to indicate whether point to point file repair is supported for the user service. Details are tbd.

6.3.4 Repetition-Counter AVP

Editor's Note: Used to indicate whether the session is a repetition of a previously transmitted session and if the number of times it has been repeated. Details are tbd.

Annex A (informative): Change history

<table>
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