ETSI TS 132 260 V16.2.0 (2020-11)

**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Charging management;
IP Multimedia Subsystem (IMS) charging
(3GPP TS 32.260 version 16.2.0 Release 16)**

Reference

RTS/TSGS-0532260vg20

Keywords

GSM,LTE,UMTS

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Foreword

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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:

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1 Scope

The present document is part of a series of Technical Specifications (TSs) that specify charging functionality and charging management in GSM/UMTS networks. The GSM/UMTS core network charging architecture and principles are specified in document 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 TS 32.240 [1].

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 TS 23.228 [200]. This charging description includes the offline and online charging architecture and scenarios specific to IMS, as well as the mapping of common 3GPP charging architecture specified in TS 32.240 [1] onto IMS. 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 these CDR types 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 IMS offline and online charging is specified in TS 32.299 [50].

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

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

2 References

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

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

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

[2] Void.

[3] - [10] Void.

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

[12] - [34] Void.

[35] 3GPP TS 32.275: "Telecommunication management; Charging management; MultiMedia Telephony (MMTel) charging".

[36] 3GPP TS 32.276: "Telecommunication management; Charging management; Voice Call Service (VCS) charging".

[37] - [39] Void.

[40] 3GPP TS 32.280: "Telecommunication management; Charging management; Advice of Charge (AoC) service".

[41] 3GPP TS 32.281: "Telecommunication management; Charging management; Announcement service".

[42] - [44] Void.

[45] 3GPP TS 32.290: "Telecommunication management; Charging management; 5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".

[46] 3GPP TS 32.291: "Telecommunication management; Charging management; 5G system; Charging service, stage 3".

[47] - [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 Records (CDR) file format and transfer".

[53] Void.

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

[55] - [99] Void.

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

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

[102] Void.

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

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

[105] - [199] Void.

[200] 3GPP TS 22.228: "Service requirements for the Internet Protocol (IP) multimedia core network subsystem (IMS); 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: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[205] 3GPP TS 29.229: "Cx and Dx interfaces based on the Diameter protocol; Protocol details".

[206] 3GPP TS 29.658: "SIP Transfer of IP Multimedia Service Tariff Information; Protocol specification".

[207] 3GPP TS 33.203: "3G security; Access security for IP-based services".

[208] 3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP network layer security".

[209] 3GPP TS 33.310: "Network Domain Security (NDS); Authentication Framework (AF)".

[210] 3GPP TS 24.292: "IP Multimedia (IM) Core Network (CN) subsystem Centralized Services (ICS); Stage 3".

[211] 3GPP TS 29.079: "Optimal media routeing within the IP Multimedia Subsystem (IMS); Stage 3".

[212] 3GPP TS 23.167: "IP Multimedia Subsystem (IMS) emergency sessions".

[213] 3GPP TS 23.203: "Policy and charging control architecture".

[214] 3GPP TS 29.214: "Policy and charging control over Rx reference point".

[215] 3GPP TS 29.328: "IP Multimedia (IM) Subsystem Sh Interface; Signalling flows and message contents".

[216] 3GPP TS 23.237: "IP Multimedia Subsystem (IMS) Service Continuity; Stage 2".

[217] 3GPP TS 24.237: "IP Multimedia (IM) Core Network (CN) subsystem IP Multimedia Subsystem (IMS) service continuity; Stage 3".

[218] 3GPP TS 24.337: "IP Multimedia Subsystem (IMS) inter-UE transfer; Stage 3".

[219] 3GPP TS 23.292: "IP Multimedia Subsystem (IMS) centralized services; Stage 2".

[220] 3GPP TS 24.628: "Common Basic Communication procedures using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification".

[221] 3GPP TS 23.503:"Policy and Charging Control Framework for the 5G System; Stage 2".

[222] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[223] – [299] Void.

[300] - [399] Void.

[400] Void.

[401] Void.

[402] IETF RFC 4006 (2005): "Diameter Credit-Control Application".

[403] IETF RFC 2806 (2000): "URLs for Telephone Calls".

[404] IETF RFC 3261 (2002): "SIP: Session Initiation Protocol".

[405] IETF RFC 2486 (1999): "The Network Access Identifier".

[406] IETF RFC 7315 (2014): "Private Header (P-Header) Extensions to the Session Initiation Protocol (SIP) for the 3rd-Generation Partnership Project (3GPP)".

[407] Void.

[408] Void.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions given in TR 21.905 [100], TS 32.240 [1], and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [100].

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

Billing Domain: Part of the operator network, which is outside the core network that receives and processes charging information from the core network charging functions. It includes functions that can provide billing mediation and billing end applications.

charged party: user involved in a chargeable event that 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 whereby information related to a chargeable event is formatted and transferred in order to make it possible to determine usage for which the charged party may be billed.

Charging Data Record (CDR): record generated by a Network Element for the purpose of billing a subscriber for the provided service. It includes fields identifying the user, the session and the Network Elements as well as information on the network resources and services used to support a subscriber session. In the traditional circuit domain, CDR has been used to denote "Call Detail Record", which is subsumed by "Charging Data Record" hereafter.

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

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

partial CDR: CDR that provides 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.

3.2 Symbols

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

Bi	Reference point for the CDR file transfer from the IMS CGF to the BD.
Ga	Reference point for CDR transfer between a CDF and CGF.
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 IMS-GWF and the OCS

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [100] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [100].

5GS	5G System
ABNF	Augmented Backus-Naur Form
ACA	Accounting-Answer
ACR	Accounting-Request
AS	Application Server
ATCF	Access Transfer Control Function