

ETSI TS 132 251 V14.2.0 (2017-04)



**Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Charging management;
Packet Switched (PS) domain charging
(3GPP TS 32.251 version 14.2.0 Release 14)**



Reference

RTS/TSGS-0532251ve20

Keywords

GSM,LTE,UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2017.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M logo is protected for the benefit of its Members

GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

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

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Foreword.....	2
Modal verbs terminology.....	2
Foreword.....	8
1 Scope	9
2 References	9
3 Definitions, symbols and abbreviations	12
3.1 Definitions	12
3.2 Symbols.....	14
3.3 Abbreviations	15
4 Architecture considerations	18
4.0 General	18
4.1 High-level EPS architecture	18
4.2 PS domain offline charging architecture	19
4.3 PS domain online charging architecture.....	21
5 PS domain charging principles and scenarios	22
5.1 PS charging principles.....	22
5.1.0 General.....	22
5.1.1 Requirements	23
5.1.2 Charging information.....	24
5.1.3 Identifiers and correlation.....	26
5.1.4 UE Presence in Presence Reporting Area (PRA).....	27
5.1.4.1 Single Presence Reporting Area (PRA).....	27
5.1.4.2 Multiple Presence Reporting Areas (PRAs).....	27
5.1.5 3GPP PS Data Off	28
5.2 PS domain offline charging scenarios	29
5.2.1 Basic principles.....	29
5.2.1.0 General	29
5.2.1.1 IP-CAN bearer charging	30
5.2.1.2 MM context charging	31
5.2.1.3 Flow Based bearer Charging (FBC).....	32
5.2.1.4 SMS charging.....	35
5.2.1.5 LCS charging	35
5.2.1.6 MBMS context charging for GPRS	36
5.2.1.6A MBMS context charging for EPS.....	36
5.2.1.7 IP Flow Mobility (IFOM) charging	37
5.2.1.7A Network-Based IP Flow Mobility (NBIFOM) charging.....	37
5.2.1.8 Sponsored data connectivity charging.....	38
5.2.1.9 Application Based Charging (ABC)	39
5.2.1.9.0 Introduction	39
5.2.1.9.1 Charging per application	39
5.2.1.9.2 Charging per TDF session	41
5.2.1.10 Charging per IP-CAN session.....	42
5.2.1.10.0 General	42
5.2.1.10.1 IP-CAN bearer charging.....	42
5.2.1.10.2 Flow Based Charging (FBC)	45
5.2.2 Rf message flows.....	49
5.2.2.0 General	49
5.2.2.1 Triggers for charging events from S-GW.....	49
5.2.2.2 Triggers for charging events from P-GW.....	49
5.2.2.3 Triggers for charging events from ePDG	49
5.2.2.4 Triggers for charging events from MME	50
5.2.2.5 Triggers for charging events from TDF	50

5.2.2.6	Triggers for charging events from P-GW when charging per IP-CAN session is active	50
5.2.2.7	Triggers for charging events from TWAG	50
5.2.3	CDR generation	52
5.2.3.0	Introduction	52
5.2.3.1	Triggers for S-CDR charging information collection	53
5.2.3.1.0	General	53
5.2.3.1.1	Triggers for S-CDR charging information addition.....	53
5.2.3.1.2	Triggers for S-CDR closure.....	54
5.2.3.2	Triggers for M-CDR charging information collection	55
5.2.3.2.0	General	55
5.2.3.2.1	Triggers for M-CDR charging information addition	55
5.2.3.2.2	Triggers for M-CDR closure	55
5.2.3.3	Triggers for SGW-CDR charging information collection	56
5.2.3.3.0	Introduction	56
5.2.3.3.1	Triggers for SGW-CDR charging information addition.....	56
5.2.3.3.2	Triggers for SGW-CDR closure.....	58
5.2.3.4	Triggers for PGW-CDR charging information collection.....	59
5.2.3.4.0	Introduction	59
5.2.3.4.1	Triggers for PGW-CDR charging information addition.....	60
5.2.3.4.2	Triggers for PGW-CDR closure	61
5.2.3.5	Triggers for SMS-CDR charging information collection.....	62
5.2.3.6	Triggers for LCS-CDR charging information collection	62
5.2.3.7	Triggers for S-MB-CDR and G-MB-CDR charging information collection for MBMS context charging for GPRS	63
5.2.3.7.1	Triggers for S-MB-CDR and G-MB-CDR charging information creation.....	63
5.2.3.7.2	Triggers for S-MB-CDR and G-MB-CDR charging information addition	63
5.2.3.7.3	Triggers for S-MB-CDR and G-MB-CDR closure.....	63
5.2.3.7A	Triggers for MBMS-GW-CDR charging information collection for MBMS context charging for EPS.....	64
5.2.3.7A.1	Triggers for MBMS-GW-CDR charging information creation	64
5.2.3.7A.2	Triggers for MBMS-GW-CDR charging information addition.....	64
5.2.3.7A.3	Triggers for MBMS-GW-CDR closure	64
5.2.3.8	Triggers for ePDG-CDR charging information collection	65
5.2.3.8.0	Introduction	65
5.2.3.8.1	Triggers for ePDG-CDR charging information addition	65
5.2.3.8.2	Triggers for ePDG-CDR closure	65
5.2.3.9	Triggers for TDF-CDR charging information collection	67
5.2.3.9.1	Triggers for TDF-CDR charging information creation	67
5.2.3.9.2	Triggers for TDF-CDR charging information addition	67
5.2.3.9.3	Triggers for TDF-CDR closure	69
5.2.3.10	Triggers for PGW-CDR charging information collection when IP-CAN session charging is active.....	70
5.2.3.10.1	General	70
5.2.3.10.2	Triggers for PGW-CDR charging information addition when IP-CAN session charging is active	70
5.2.3.10.3	Triggers for PGW-CDR closure when charging per IP-CAN session charging is active.....	73
5.2.3.11	Triggers for TWAG-CDR charging information collection.....	74
5.2.3.11.0	Introduction	74
5.2.3.11.1	Triggers for TWAG-CDR charging information addition.....	74
5.2.3.11.2	Triggers for TWAG-CDR closure	74
5.2.4	Void	75
5.2.5	Ga record transfer flows	75
5.2.6	Bp CDR file transfer	75
5.3	PS domain online charging scenarios.....	76
5.3.1	Basic principles.....	76
5.3.1.0	General	76
5.3.1.1	IP-CAN bearer charging	76
5.3.1.2	Flow Based bearer Charging	77
5.3.1.3	PS Furnish Charging Information procedure	80
5.3.1.4	Support of Failure Situations.....	80
5.3.1.5	Application Based Charging (ABC)	81
5.3.1.5.0	Introduction	81

5.3.1.5.1	Charging per application	81
5.3.1.5.2	Charging per TDF session	82
5.3.1.6	Charging per IP-CAN session	83
5.3.1.6.0	General	83
5.3.1.6.1	IP-CAN bearer charging	83
5.3.1.6.2	Flow Based Charging (FBC)	83
5.3.1.7	Sponsored data connectivity charging	86
5.3.1.8	Network-Based IP Flow Mobility (NBIFOM) charging	86
5.3.2	Ro message flows	87
5.3.2.0	General	87
5.3.2.1	Triggers for IP-CAN bearer online charging	87
5.3.2.1.1	Void	87
5.3.2.1.2	Void	87
5.3.2.2	Triggers for FBC online charging	88
5.3.2.2.0	Introduction	88
5.3.2.2.1	Triggers for starting and stopping an FBC Credit-Control session	89
5.3.2.2.2	Triggers for providing interim information for an FBC Credit-Control session	89
5.3.2.2A	Triggers for ABC online charging	90
5.3.2.2A.0	Introduction	90
5.3.2.2A.1	Triggers for starting and stopping an ABC Credit-Control session	91
5.3.2.2A.2	Triggers for providing interim information for an ABC Credit-Control session	91
5.3.2.2B	Triggers for TDF session online charging	92
5.3.2.2C	Triggers for P-GW when charging per IP-CAN session is active	92
5.3.2.2C.1	General	92
5.3.2.2C.2	Triggers for starting and stopping an FBC Credit-Control session when charging per IP-CAN session is active	92
5.3.2.2C.3	Triggers for providing interim information for an FBC Credit-Control session when charging per IP-CAN session is active	93
5.3.2.3	PS Furnish Charging Information procedure	94
5.3.2.4	Support of Failure Situations	94
6	Definition of charging information	96
6.1A	Rf message content	96
6.1A.0	General	96
6.1A.1	Summary of offline charging message formats	96
6.1A.2	Structure for the charging data message formats	96
6.1A.2.0	General	96
6.1A.2.1	Charging Data Request message	97
6.1A.2.2	Charging Data Response message	97
6.1B	CDR content description on Bp interface	98
6.1B.0	General	98
6.1.1	IP-CAN bearer charging data in SGSN (S-CDR)	99
6.1.2	IP-CAN bearer charging data in S-GW (SGW-CDR)	101
6.1.3	FBC IP-CAN bearer charging data in P-GW (PGW-CDR)	104
6.1.4	Mobile Station mobility management data in SGSN (M-CDR)	110
6.1.5	SMS-MO data in SGSN/MME (S-SMO-CDR)	111
6.1.6	SMS-MT data in SGSN/MME (S-SMT-CDR)	112
6.1.7	Mobile Terminated location request (LCS-MT-CDR)	113
6.1.8	Mobile originated Location request (LCS-MO-CDR)	114
6.1.9	Network induced Location request (LCS-NI-CDR)	115
6.1.10	MBMS bearer context charging data in SGSN (S-MB-CDR)	116
6.1.11	MBMS bearer context charging data in GGSN (G-MB-CDR)	117
6.1.12	MBMS bearer context charging data in MBMS GW (MBMS-GW-CDR)	118
6.1.13	IP-CAN bearer charging data in ePDG (ePDG-CDR)	119
6.1.14	ABC data in TDF (TDF-CDR)	121
6.1.15	IP-CAN bearer charging data in TWAG (TWAG-CDR)	123
6.2	Data description for PS online charging	125
6.2.1	Message contents	125
6.2.1.1	Summary of online charging message formats	125
6.2.1.2	Structure for the Debit / Reserve Units operation message formats	125
6.2.1.2.0	General	125
6.2.1.2.1	Debit / Reserve Units Request message	125

6.2.1.2.2	Debit / Reserve Units Response message	126
6.2.2	Void	126
6.3	PS charging specific parameters.....	127
6.3.1	Definition of PS charging information.....	127
6.3.1.0	General	127
6.3.1.1	PS charging information assignment for Service Information	127
6.3.1.1a	"SMS over MME Charging" information assignment for Service Information	128
6.3.1.2	Definition of the PS information	129
6.3.1.3	Multiple Unit Operation information when charging per IP-CAN session is active.....	134
6.3.2	Detailed message format for offline charging.....	136
6.3.3	Detailed message format for online charging	140
6.4	Void.....	143
6.5	Bindings for EPC offline charging	143
Annex A (normative): Charging characteristics		148
A.1	General	148
A.2	Charging Characteristics in Gn/Gp SGSN	152
A.3	Charging Characteristics in S4-SGSN	154
A.4	Charging Characteristics in MME.....	154
A.5	Charging Characteristics in S-GW	155
A.6	Charging Characteristics in P-GW	155
A.7	Charging Characteristics in TDF.....	156
Annex B (normative): Tx expiration; Failure Handling procedure and session failover mechanism description		157
Annex C (informative): Bibliography.....		160
Annex D (normative): Fixed Broadband Access		161
D.1	General	161
D.2	Architecture considerations.....	161
D.2.1	High level architecture	161
D.2.2	PS domain offline charging architecture	161
D.2.3	PS domain online charging architecture.....	161
D.3	PS domain charging principles and scenarios	162
D.3.1	PS charging principles.....	162
D.3.1.0	General.....	162
D.3.1.1	Requirements	162
D.3.1.1.1	Requirements for IP-Edge [PCEF].....	162
D.3.1.1.2	Requirements for TDF	162
D.3.1.2	Charging information.....	163
D.3.2	PS domain offline charging scenarios	165
D.3.2.1	Basic principles.....	165
D.3.2.1.0	General	165
D.3.2.1.1	IP-CAN session charging	165
D.3.2.1.2	Flow-based bearer charging	166
D.3.2.1.3	TDF/Application Based Charging.....	167
D.3.2.2	Rf message flows	168
D.3.2.2.0	General	168
D.3.2.2.1	Triggers for charging events from IP-Edge [PCEF].....	168
D.3.2.2.1.0	General	168
D.3.2.2.1.1	Triggers for charging information addition	168
D.3.2.2.1.2	Triggers for charging information closure.....	168
D.3.2.2.2	Triggers for charging events from TDF	168
D.3.2.2.2.0	Introduction	168
D.3.2.2.2.1	Triggers for charging information addition	168

D.3.2.2.2.2	Triggers for charging information closure	169
D.3.2.3.2	TDF-CDR charging information collection	169
D.3.2.3.2.0	Introduction	169
D.3.2.3.2.1	TDF-CDR charging information addition	169
D.3.2.3.2.2	TDF-CDR closure	169
D.3.2.3	CDR generation	170
D.3.2.3.0	General	170
D.3.2.3.1	IPE-CDR charging information collection	170
D.3.2.3.1.0	General	170
D.3.2.3.1.1	IPE-CDR charging information addition	170
D.3.2.3.1.2	IPE-CDR closure	171
D.3.2.4	Ga record transfer flows	171
D.3.2.5	Bp CDR file transfer	171
D.3.3	PS domain online charging scenarios	172
D.3.3.1	Basic principles	172
D.3.3.1.0	Introduction	172
D.3.3.1.1	IP-CAN session charging	172
D.3.3.1.2	Flow Based bearer Charging	172
D.3.3.1.3	TDF/Application Based Charging	172
D.3.3.2	Ro message flows	173
D.3.3.2.0	Introduction	173
D.3.3.2.1	Triggers for online charging	173
D.3.3.2.1.1	Triggers for starting and stopping a Credit-Control session	173
D.3.3.2.1.2	Triggers for providing interim information for a Credit-Control session	173
D.3.3.2.2	PS Furnish Charging Information procedure	173
D.3.3.2.3	Support of Failure Situations	173
D.4	Definition of charging information	174
D.4.1	Data description for PS offline charging	174
D.4.1.1	Rf message contents	174
D.4.1.2	CDR description on the Bp interface	174
D.4.1.2.1	FBC IP-CAN session charging data in IP-Edge [PCEF] (IPE-CDR)	174
D.4.1.2.2	Application Based Charging data in TDF (TDF-CDR)	176
D.4.2	Data description for PS online charging	177
D.4.2.1	Ro message contents	177
D.4.3	PS Charging specific parameters	177
D.4.3.1	Definition of PS charging information	177
D.4.3.2	Detailed message format for offline charging	178
D.4.3.3	Detailed message format for online charging	178
D.4.4	Bindings for offline charging	178
D.5	Charging Characteristics	179
Annex E (Informative): Inter-PLMN dedicated profile		180
E.1	General	180
E.2	Principles	180
E.3	Message content	180
E.3.1	General	180
E.3.2	Debit / Reserve Units messages	180
E.3.3	Re-authorization triggers	182
E.3.4	Service information used for PS charging	183
E.4	Fixed broadband access	184
Annex F (informative): Change history		185
History		193

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 Technical Specifications (TSs) specifying charging functionality and charging management in Packet Switched networks (GSM/UMTS, EPS). The 3GPP core network charging architecture and principles are specified in TS 32.240 [1], which provides an umbrella for other charging management documents that specify:

- the content of the CDRs per domain / 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 the charging TSs is defined in TS 32.240 [1].

The present document specifies the offline and online charging description for the Packet Switched (PS) domain based on the functional stage 2 description in TS 23.060 [201], TS 23.401 [208] and TS 23.402 [209].

The offline and online charging description for the PS domain encompasses also fixed broadband access in the convergent scenario deployment (i.e. both the fixed broadband access network and Evolved Packet Core (EPC) owned by a single operator) based on the functional stage 2 description in the corresponding Annex of TS 23.203 [215].

This charging description includes the offline and online charging architecture and scenarios specific to the PS domain, as well as the mapping of the common 3GPP charging architecture specified in TS 32.240 [1] onto the PS domain.

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 PS domain offline and online charging is specified in TS 32.299 [50].

Note that a CAMEL based prepaid function and protocol is also specified for the PS domain (TS 23.078 [206] and TS 29.078 [202]). CAMEL entities and functions are outside the scope of the present document.

All terms, definitions and abbreviations used in the present document, which are common across 3GPP TSs, are defined in TR 21.905 [100]. Those that are common across charging management in PS 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.