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| **3GPP TSG-SA5 Meeting #140-e *S5-216303rev1*****e-meeting, 15 - 24 November 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **32.277** | **CR** | **0033** | **rev** | **-** | **Current version:** | **16.0.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |

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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |
|  |
| ***Title:***  | Introduction of 5G ProSe charging and high-level architecture |
|  |  |
| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | SA5 |
|  |  |
| ***Work item code:*** | 5G\_ProSe\_CH |  | ***Date:*** | 2021-11-1 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | To support 5G ProSe charge,new terms and high-leve architecture for 5G needs to be introduced. |
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| ***Summary of change:*** | Introduce 5G ProSe service Node, with service based interface in the converged charging architecture. |
|  |  |
| ***Consequences if not approved:*** | No charging for ProSe over 5GS |
|  |  |
| ***Clauses affected:*** | 1, 2, 3.1, 3.2, 3.3, 4.1.1(new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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| **1st modified section** |

1 Scope

The present document is part of a series of documents that specify charging functionality and charging management in 3GPP networks. The 3GPP core network charging architecture and principles are specified in 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 and converged charging);

- the content of real-time charging messages per domain / subsystem / service (online and converged 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,online and converged charging description for the Proximity-based Services (ProSe), based on the stage 2 description of ProSe in TS 23.303 [238] and TS 23.304 [xx]. This charging description includes the offline,online and converged charging architecture and scenarios specific to the ProSe, as well as the mapping of the common 3GPP charging architecture specified in TS 32.240 [1] onto the ProSe. 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 ProSe offline and online charging is specified in TS 32.299 [50].

- The services, operations and procedures of charging, using Service Based Interface are specified in TS 32.290 [yy].

- The charging service of 5G system is specified in TS 32.291 [zz].

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

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| **Next modified section** |

# 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] - [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] - [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] - [49] Void.

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

[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] Void.

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

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

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

[55] - [99] Void.

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

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

[102] - [199] Void.

[200] - [236] Void.

[237] 3GPP TS 24.002: "GSM - UMTS Public Land Mobile Network (PLMN) Access Reference Configuration".

[238] 3GPP TS 23.303: "Proximity-based services (ProSe); Stage 2".

[xx] 3GPP TS 23.304: "Proximity based Services (ProSe) in the 5G System (5GS)".

[239] Void.

[240] 3GPP TS 33.303: "Proximity-based Services (ProSe); Security aspects".

[241] - [499] Void.

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# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [100] 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].

**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. When the term/prefix is omitted, reference is made independently from the GSM or UMTS functionality.

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

**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 telecommunication 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).

**chargeable event:** activity utilizing telecommunication network resources 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.

As a minimum, a chargeable event characterises the resource / service usage and indicates the identity of the involved end user(s).

**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 subscriber's account balance may be debited (online charging).

**Charging Data Record (CDR):** formatted collection of information about one or more chargeable event(s) (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 the chargeable event(s) a separate CDR should 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 event:** set of charging information forwarded by the CTF towards the CDF (offline charging) or towards the OCS (online charging). Each charging event matches exactly one chargeable event.

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

**Credit Control:** mechanism which directly interacts in real-time with an account and controls or monitors the charges, related to the service usage. Credit control is a process of: checking if credit is available, credit reservation, deduction of credit from the end user account when service is completed and refunding of reserved credit not used.

**domain:** part of a communication network that provides network resources using a certain bearer technology.

**EPC-level ProSe Discovery:** A ProSe Discovery procedure by which the EPC determines the proximity of two ProSe-enabled UEs and informs them of their proximity.

**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 should be a Fully qualified Partial CDR.

**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.

**GSM only:** qualifier indicating that this clause or paragraph applies only to a GSM system. For multi-system cases this is determined by the current serving radio access network.

**in GSM,...:** qualifier indicating that this paragraph applies only to GSM System.

**in UMTS,...:** qualifier indicating that this paragraph applies only to UMTS System.

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

**Local PLMN**: A PLMN which is not the serving PLMN, and in whose radio resources the monitoring UE is authorized by the HPLMN to engage in ProSe Direct Discovery.

**middle tier 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 3GPP 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.

**Model A:** involves one UE announcing "I am here"

**Model B:** involves one UE asking "who is there" and/or "are you there"

**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 (OCS):** the entity that performs real-time credit control. Its functionality includes transaction handling, rating, online correlation and management of subscriber account balances.

**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 provisioned fields (FQPC); the second has a reduced format (RPC).

**ProSe Direct Discovery:** A procedure employed by a ProSe-enabled UE to discover other ProSe-enabled UEs in its vicinity by using only the capabilities of the two UEs with E-UTRA or NR technology.

**ProSe Discovery:** A process that identifies that a UE that is ProSe-enabled is in proximity of another, using E-UTRA (with or without E-UTRAN) or EPC.

**ProSe-enabled Public Safety UE:** A UE that the HPLMN has configured to be authorized for Public Safety use, and which is ProSe-enabled and supports ProSe procedures and capabilities specific to Public Safety.

**ProSe Function:** The ProSe Function is the logical function that is used for network related actions required for ProSe. The ProSe Function plays different roles for each of the features of ProSe. In this version of the specification it is assumed that there is only one logical ProSe Function in each PLMN that supports Proximity Services.
The ProSe Function contains three main sub-functions: Direct Provisioning Function (DPF), Direct Discovery Name Management Function, and EPC-level Discovery Function. The ProSe Function provides the necessary charging functionality for usage of ProSe.

**ProSe identifier:** An identifier used to indicate the ProSe Application associated with the ProSe operation in ProSe Direct Discovery and ProSe Direct Communication. A ProSe identifier can be associated with one or more ProSe applications, and a ProSe application can be associated with one or more ProSe identifier(s). For ProSe Direct Discovery, ProSe identifier is equivalent to "Application ID" defined in 23.303 [240].

Editor's note: For ProSe Direct Communication, ProSe identifier is to be determined.

**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 authorized to enjoy these services, and also to set the limits relative to the use that associated users make of these services.

**user:** entity, not part of the 3GPP System, that uses network resources by means of a subscription. The user may or may not be identical to the subscriber holding that subscription.

**User Equipment (UE):** device allowing a user access to network services. For the purpose of 3GPP specifications the interface between the UE and the network is the radio interface. A User Equipment can be subdivided into a number of domains, the domains being separated by reference points. Currently defined domains are the USIM and ME Domains. The ME Domain can further be subdivided into several components showing the connectivity between multiple functional groups. These groups can be implemented in one or more hardware devices. An example of such a connectivity is the TE – MT interface. Further, an occurrence of a User Equipment is an MS for GSM as defined in TS 24.002 [237].

**5G ProSe-enabled UE:** A UE that supports 5G ProSe requirements and associated procedures.

**5G ProSe Direct Discovery:** A procedure employed by a 5G ProSe-enabled UE to discover other 5G ProSe-enabled UEs in its vicinity based on direct radio transmissions between the two UEs with NR technology.

**5G ProSe Direct Communication:** A communication between two or more UEs in proximity that are 5G ProSe-enabled, by means of user plane transmission using NR technology via a path not traversing any network node.

**5G ProSe UE-to-Network Relay:** A 5G ProSe-enabled UE that provides functionality to support connectivity to the network for 5G ProSe Remote UE(s).

**5G ProSe Remote UE:** A 5G ProSe-enabled UE that communicates with a DN via a 5G ProSe UE-to-Network Relay.

## 3.2 Symbols

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

Bpr Reference point for CDR file transfer between ProSe CGF and the BD.

Bx Reference point for CDR file transfer between any (generic) 3G domain, subsystem or service CGF and the BD.

Ga Reference point for CDR transfer between a CDF and the CGF.

Nchf Service based interface exhibited by CHF.

PC3 Reference point between UE and the ProSe Function.

PC3ch Subset of PC3 specific to usage information collection for charging purposes.

PC5: The reference point between ProSe-enabled UEs used for control and user plane for 5G ProSe Direct Discovery, ProSe Direct Communication and ProSe UE-to-Network Relay.

Npc2: The reference point between the ProSe Application Server and the 5G DDNMF. It is used to define the interaction between ProSe Application Server and 5G DDNMF for 5G ProSe Direct Discovery.

Npc4: The reference point between the UDM and 5G DDNMF. It is used to provide subscription information in order to authorise 5G ProSe Direct Discovery request.

Npc6: The reference point between the 5G DDNMF in the HPLMN and the 5G DDNMF in a Local PLMN (5G ProSe Direct Discovery). This reference point is used for HPLMN control of ProSe service authorization.

Npc7: The reference point between the 5G DDNMF in the HPLMN and the 5G DDNMF in the VPLMN. It is used for HPLMN control of ProSe service authorization.

Npc8: The reference point between the PCF and the 5G DDNMF. It is used to define the interactions between the 5G DDNMF and the PCF to e.g. get a PDUID from the PCF.

Rf Offline charging reference point between a ProSe Functionand the CDF.

Ro Online charging reference point between a ProSe Functionand 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].

3G 3rd Generation

3GPP 3rd Generation Partnership Project

5G DDNMF 5G Direct Discovery Name Management Function

APN Access Point Name

AVP Attribute Value Pair

BD Billing Domain

CDF Charging Data Function

CDR Charging Data Record

CGF Charging Gateway Function

CHF Charging Function

CTF Charging Trigger Function

CTF (AMC) Charging Trigger Function (Accounting Metrics Collection)

CTF (ADF) Charging Trigger Function (Accounting Data Forwarding)ECUR Event Charging with Unit Reservation

E-UTRA Evolved Universal Terrestrial Radio Access

E-UTRAN Evolved Universal Terrestrial Radio Access Network

FQPC Fully Qualified Partial CDR

GTP GPRS Tunnelling Protocol

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

HPLMN Home PLMN

HSS Home Subscriber Server

IE Information Element

IEC Immediate Event Charging

IMS IP Multimedia Subsystem

IMSI International Mobile Subscriber Identity

IP Internet Protocol

IPv4 Internet Protocol version 4

IPv6 Internet Protocol version 6

ISDN Integrated Services Digital Network

MCC Mobile Country Code (part of IMSI)

ME Mobile Equipment

MNC Mobile Network Code (part of IMSI)

MSISDN Mobile Station ISDN number

NE Network Element

OCS Online Charging System

PLMN Public Land Mobile Network

ProSe Proximity-based Services

PS Packet-Switched

PFI PC5 QoS Flow Identifier

PQI PC5 5QI

QoS Quality of Service

RAN Radio Access Network

SCUR Session Charging with Unit Reservation

SIM Subscriber Identity Module

TR Technical Report

TS Technical Specification

UE User Equipment

UMTS Universal Mobile Telecommunications System

USIM User Service Identity Module

VPLMN Visited PLMN

WLAN Wireless LAN

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| **Next modified section** |

## 4.1.1 High level 5G ProSe architecture

The high level 5G ProSe architecture is as defined in TS 23.304 [xx] clause 4.2.

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| NOTE: As defined in TS 23.303 [238], the ProSe Function consists of Direct Provisioning Function (DPF), Direct Discovery Name Management Function (DDNMF) and EPC-level Discovery Function. In 5GS, the 5G DDNMF takes the role of "ProSe Function", DPF is replaced by PCF, and EPC-level Discovery Function is not supported.**End of change** |