**3GPP TSG-SA5 Meeting #141-e *S5-221671***

**e-meeting, 17 -26 January 2022**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **32.240** | **CR** | **0439** | **rev** | **-** | **Current version:** | **17.4.0** |  |
|  | | | | | | | | |
| *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** |

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|  | | | | | | | | | | |
| ***Title:*** | Charging architecture for additional roaming scenarios and actors | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Vodafone | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | CHROAM | | | | |  | ***Date:*** | | | 2022-01-17 |
|  |  | | | |  | |  | | |  |
| ***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 can be 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:*** | | Addition of charging principles for Edge Computing in Local Breakout and MVNO charging | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Addition of new reference point between vSMF and hCHF  Addition of charging principles for local breakout scenario  Addition of charging principles wih MVNO involved  Referencing Edge Computing charging principles | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Charging for LBO services is incomplete | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2,3.3  5.5.3.x, (new), 5.5.3.y(new) , 6.z(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:*** | |  | | | | | | | | |

***First change***

# 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] - [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] Void.

[13] 3GPP TS 32.253: "Telecommunication management; Charging management; Control Plane (CP) data transfer domain charging".

[14] 3GPP TS 32.254: "Telecommunication management; Charging management; Exposure function Northbound Application Program Interfaces (APIs) charging".

[15] 3GPP TS 32.255: "Telecommunication management; Charging management; 5G Data connectivity domain charging; stage 2".

[16] 3GPP TS 32.256: "Telecommunication management; Charging management; 5G connection and mobility domain charging; stage 2".

[17] - [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] 3GPP TS 32.273: "Telecommunication management; Charging management; Multimedia Broadcast and Multicast Service (MBMS) charging".

[34] 3GPP TS 32.274: "Telecommunication management; Charging management; Short Message Service (SMS) charging".

[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 Charging".

[37] 3GPP TS 32.277: "Telecommunication management; Charging management; Proximity-based Services (ProSe) Charging".

[38] 3GPP TS 32.278: "Telecommunication management; Charging management; Monitoring Event charging".

[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] - [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] Void.

[56] 3GPP TS 32.293: "Telecommunication management; Charging management; Proxy Function".

[57] 3GPP TS 32.290: "Telecommunication management; Charging management; 5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".

[58] 3GPP TS 32.291: "Telecommunication management; Charging management; 5G system; Charging service, stage 3".

[59] - [69] Void.

[70] 3GPP TS 28.201: "Charging management; Network slice performance and analytics charging in the 5G System (5GS); Stage 2".

[71] 3GPP TS 28.202: "Charging management; Network slice management charging in the 5G System (5GS); Stage 2".

[72] - [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] - [206] Void.

[207] 3GPP TS 23.078: "Customized Applications for Mobile network Enhanced Logic (CAMEL); Stage 2".

[208] 3GPP TS 23.203: "Policy and charging control architecture".

[209] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[210] Void.

[211] 3GPP TS 24.229: "Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[212] 3GPP TS 23.272: "Circuit Switched (CS) fallback in Evolved Packet System (EPS); Stage 2".

[213] 3GPP TS 24.002: "GSM - UMTS Public Land Mobile Network (PLMN) access reference configuration".

[214] 3GPP TS 23.502:"Procedures for the 5G System".

[215] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[216] 3GPP TS 28.533: "Management and orchestration; Architecture framework".

[217] 3GPP TS 23.548: “5G System Enhancements for Edge Computing”.

[x] 3GPP TS 23.558: “Architecture for enabling Edge Applications”.

[y] - [297] Void.

[298] EU Roaming regulation III; "Structural Solutions; High Level Technical Specifications".

[299] EU Roaming regulation III; "Interface & Protocol; Detailed Technical Specifications".

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

[301] - [399] Void.

[400] - [401] Void.

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

[403] - [499] Void.

[500] GSMA PRD BA.27: "Charging Principles".

***Next change***

## 3.3 Abbreviations

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

3G 3rd Generation

3GPP 3rd Generation Partnership Project

5GC 5G Core Network

5GS 5G System

5G DDNMF 5G Direct Discovery Name Management Function

ABMF Account Balance Management Function

AF Application Function

AMF Access and Mobility Management Function

AoC Advice of Charge

API Application Program Interfaces

APN Access Point Name

AS Application Server

BD Billing Domain

BGCF Breakout Gateway Control Function

BS Bearer Services

BSC Base Station Controller

BSS Base Station Subsystem

BTS Base Transceiver Station

CAMEL Customized Applications for Mobile network Enhanced Logic

CAP CAMEL Application Part

CCS Converged Charging System

CDF Charging Data Function

CDR Charging Data Record

CG Charging Gateway

CGF Charging Gateway Function

CHF Charging Function

CN Core Network

CP Control Plane

CS Circuit Switched

CSCF Call Session Control Function (I-Interrogating; E-Emergency; P-Proxy; and S-Serving)

CTF Charging Trigger Function

EATF Emergency Access Transfer Function

EBCF Event Based Charging Function

ECUR Event Charging with Unit Reservation

EIR Equipment Identity Register

EPC Evolved Packet Core

ePDG Evolved Packet Data Gateway

EPS Evolved Packet System

E-UTRAN Evolved Universal Terrestrial Radio Access Network

FQPC Fully Qualified Partial CDR

GGSN Gateway GPRS Support Node

GMLC Gateway MLC

GMSC Gateway MSC

GPRS General Packet Radio Service

GSM Global System for Mobile communication

gsmSCF GSM Service Control Function

gsmSSF GSM Service Switching Function

GSN GPRS Support Node (either SGSN or GGSN)

HLR Home Location Register

HPLMN Home PLMN

HSCSD High Speed Circuit Switched Data

IBCF Interconnect Border Control Function

ICS IMS Centralized Services

IE Information Element

IEC Immediate Event Charging

IETF Internet Engineering Task Force

IMEI International Mobile Equipment Identity

IMS GWF IMS GateWay Function

IMS IP Multimedia Subsystem

IMSI International Mobile Subscriber Identity

IP Internet Protocol

ISC IMS Service Control

ISDN Integrated Services Digital Network

ITU-T International Telecommunication Union - Telecommunications standardization sector

LAC Location Area Code

LAN Local Area Network

LCS Location Services

LRF Location Retrieval Function

LTE Long Term Evolution

MAP Mobile Application Part

MBMS Multimedia Broadcast and Multicast Service

ME Mobile Equipment

MGCF Media Gateway Control Function

MGW Media GateWay

MLC Mobile Location Center

MME Mobility Management Entity

MMI Man-Machine Interface

MMS Multimedia Messaging Service

MMSE Multimedia Messaging Service Environment

MMTel MultiMedia Telephony

MNO Mobile Network Operator

MnS Management Service

MO Mobile Originated

MOC MO Call

MRF Media Resource Function

MRFC MRF Controller

MS Mobile Station

MSC Mobile Services Switching Centre

MSISDN Mobile Station ISDN number

MT Mobile Terminated

MTC MT Call

MVNO Mobile Virtual Netork Operator

NE Network Element

NF Network Function

NWDAF Network Data Analytics Function

OCF Online Charging Function

OCS Online Charging System

OFCS Offline Charging System

OMR Optimal Media Routing

PCEF Policy and Charging Enforcement Function

PCF Policy Control Function

PCRF Policy and Charging Rules Function

PDG Packet Data Gateway

PDN Packet Data Network

PDP Packet Data Protocol, e.g. IP

PLMN Public Land Mobile Network

PoC Push-to-talk over Cellular

ProSe Proximity-based Services

PS Packet-Switched

PSPDN Packet-Switched Public Data Network

QoS Quality of Service

RF Rating Function

RNC Radio Network Controller

RNS Radio Network Subsystem

RPC Reduced Partial CDR

SBCF Session Based Charging Function

SCCP Signalling Connection Control Part

SCEF Service Capability Exposure Function

SCF Service Control FunctionSCS Services Capability Server

SCUR Session Charging with Unit Reservation

SGSN Serving GPRS Support Node

SIM Subscriber Identity Module

SMS Short Message Service

SMF Session Management Function

SSF Service Switching Function

TAP Transferred Account Procedure

TDF Traffic Detection Function

TR Technical Report

TRF Transit and Roaming Function

TS Technical Specification

TWAG Trusted WLAN Access Gateway

UE User Equipment

UMTS Universal Mobile Telecommunications System

UPF User Plane Function

USIM Universal SIM

VAS Value Added Service

VLR Visitor Location Register

VMSC Visited MSC

VPLMN Visited PLMN

WLAN Wireless LAN

***Next change***

### 4.4.3 Charging services Reference point

The common charging architectures are mapped into the specific domain/subsystem/service charging architectures in the respective middle tier TSs, which contain in their reference point representation, the following reference points:

**N28:** Reference point between PCF and CHF defined in TS 23.501[215]**.**

**N40:** Reference point between SMF and the CHF in the same PLMN defined in clause 4.2 of TS 32.255 [15].

**N41:** Reference point between AMF and CHF in HPLMN defined in clause 4.2.2 of TS 32.256 [16].

**N42:** Reference point between AMF and CHF in VPLMN defined in clause 4.2.2 of TS 32.256 [16].

**N44:** Reference point between NEF and CHF defined in clause 4.4 of TS 32.254 [14].

**N45:** Reference point between IMS Node and CHF defined in clause 4.4 of TS 32.260 [20].

**N46:** Reference point between SMS Node and CHF defined in clause 4.4 of TS 32.274 [34].

N47: Reference point between SMF and the CHF in different PLMNs defined in clause x.y of TS 32.255 [15].

***Next change***

#### 5.5.3.x Charging Principles for 5G Roaming architecture with Local Breakout

The 5G System roaming architecture with local breakout is specified in TS 23.501 [215]. The breakout point for both the control plane signalling and user plane traffic is in the VPLMN, i.e. the vSMF and vUPF respectively.

The VPLMN charging mechanism collects charging information related to the 5G data connectivity usage for each UE detected as in-bound roamer. The information collected include details of the services used by the visiting subscriber and it is conveyed to both the CHF in VPLMN and to the CHF in the HPLMN.

The CHF in the VPLMN uses the collected charging information for wholesale charging including service aware towards the HPLMN

The CHF in the HPLMN uses the collected charging information for retail charging towards the home subscriber while roaming.

Charging for Roaming with Local Breakout is covered by the 5G data connectivity domain converged charging architecture specified in TS 32.255 [15], using the SMF embedding the CTF.

***Next change***

#### 5.5.3.y Charging Principles for 5G non roaming Mobile Virtual Network Operators charging

For scenarios in which subscribers have a subscription with an MVNO which allows usage of 5G data connectivity while in the home MNO, the MNO shall be able to collect charging information related to 5G data connectivity usage for each MVNO, for wholesale. The MVNO deploys their own billing and charging (CHF), but no other NFs.

The charging mechanism in the MNO collects charging information related to the 5G data connectivity usage for each UE and conveys this charging information to the MVNO for each UE.

The MVNO uses the charging information collected for retail charging (MVNO to subscriber). Charging for MVNO scenario is covered by the 5G data connectivity domain converged charging architecture specified in TS 32.255 [15].

N47 reference point is also used when an additional actor (i.e. MVNO) performs retail charging for its own subscribers. In such a case N47 is the reference point between SMF in the MNO and CHF in the MVNO.

***Next change***

## 6.z 5G Edge Computing services charging

Edge Computing support in 5GS is defined in TS 23.501[215], TS 23.502[214] and TS 23.548[x]. The architecture for enabling Edge Applications is specified in TS 23.558[y].

The charging principles for the Edge Computing domain are specified in TS 32.257 and TS 32.255[15].

The architecture of Edge Computing in Local Breakout roaming scenario is specified in TS 23.501 [215] and charging for Edge Computing in local breakout follows the principles in subclause 5.5.3.9.

***End of changes***