**3GPP TSG-SA2 Meeting #154 *S2-220xxxx***

**Toulouse, France, Nov 14 - 18, 2022 (revision of)**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **23.501** | **CR** | **0xxx** | **rev** | **-** | **Current version:** | **17.x.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 | **x** | Radio Access Network | **x** | Core Network | **X** |

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|  |
| ***Title:***  | Introduction of Mobile Base Station Relay |
|  |  |
| ***Source to WG:*** | Qualcomm Incoporated |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | DUMMY |  | ***Date:*** | 2022-11-04 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-18 |
|  | *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)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | The FS\_VMR study has concluded for normative work as documented in TR 23.700-05. This CR introduced the general description of the features to support the Mobile Base Station Relay (MBSR) operation in the 5GS.  |
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| ***Summary of change:*** | Add a new clause to describe the general system enhancements for the support of Mobile Base Station Relay operation in 5GS.  |
|  |  |
| ***Consequences if not approved:*** | Mobile Base Station Relay operation cannot be supported.  |
|  |  |
| ***Clauses affected:*** |  3.2; (new) 5.x.  |
|  |  |
|  | **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 is part of outcome of SI FS\_VMR and the WI code for the work is not assigned yet & will replace WI code DUMMY when available |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* Start of Changes \* \* \*

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] 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 [1].

5GC 5G Core Network

5G DDNMF 5G Direct Discovery Name Management Function

5G LAN 5G Local Area Network

5GS 5G System

5G-AN 5G Access Network

5G-AN PDB 5G Access Network Packet Delay Budget

5G-EIR 5G-Equipment Identity Register

5G-GUTI 5G Globally Unique Temporary Identifier

5G-BRG 5G Broadband Residential Gateway

5G-CRG 5G Cable Residential Gateway

5G GM 5G Grand Master

5G NSWO 5G Non-Seamless WLAN offload

5G-RG 5G Residential Gateway

5G-S-TMSI 5G S-Temporary Mobile Subscription Identifier

5G VN 5G Virtual Network

5QI 5G QoS Identifier

ADRF Analytics Data Repository Function

AF Application Function

AKMA Authentication and Key Management for Applications

AnLF Analytics Logical Function

AMF Access and Mobility Management Function

AS Access Stratum

ATSSS Access Traffic Steering, Switching, Splitting

ATSSS-LL ATSSS Low-Layer

AUSF Authentication Server Function

BMCA Best Master Clock Algorithm

BSF Binding Support Function

CAG Closed Access Group

CAPIF Common API Framework for 3GPP northbound APIs

CH Credentials Holder

CHF Charging Function

CN PDB Core Network Packet Delay Budget

CP Control Plane

DAPS Dual Active Protocol Stacks

DCCF Data Collection Coordination Function

DCS Default Credentials Server

DL Downlink

DN Data Network

DNAI DN Access Identifier

DNN Data Network Name

DRX Discontinuous Reception

DS-TT Device-side TSN translator

EAC Early Admission Control

ePDG evolved Packet Data Gateway

EBI EPS Bearer Identity

EUI Extended Unique Identifier

FAR Forwarding Action Rule

FN-BRG Fixed Network Broadband RG

FN-CRG Fixed Network Cable RG

FN-RG Fixed Network RG

FQDN Fully Qualified Domain Name

GBA Generic Bootstrapping Architecture

GEO Geostationary Orbit

GFBR Guaranteed Flow Bit Rate

GIN Group ID for Network Selection

GMLC Gateway Mobile Location Centre

GPSI Generic Public Subscription Identifier

GUAMI Globally Unique AMF Identifier

HMTC High-Performance Machine-Type Communications

HR Home Routed (roaming)

IAB Integrated access and backhaul

IMEI/TAC IMEI Type Allocation Code

IPUPS Inter PLMN UP Security

I-SMF Intermediate SMF

I-UPF Intermediate UPF

LADN Local Area Data Network

LBO Local Break Out (roaming)

LEO Low Earth Orbit

LMF Location Management Function

LoA Level of Automation

LPP LTE Positioning Protocol

LRF Location Retrieval Function

MBS Multicast/Broadcast Service

MBSR Mobile Base Station Relay

MBSF Multicast/Broadcast Service Function

MBSTF Multicast/Broadcast Service Transport Function

MB-SMF Multicast/Broadcast Session Management Function

MB-UPF Multicast/Broadcast User Plane Function

MEO Medium Earth Orbit

MFAF Messaging Framework Adaptor Function

MCX Mission Critical Service

MDBV Maximum Data Burst Volume

MFBR Maximum Flow Bit Rate

MICO Mobile Initiated Connection Only

MINT Minimization of Service Interruption

ML Machine Learning

MPS Multimedia Priority Service

MPTCP Multi-Path TCP Protocol

MTLF Model Training Logical Function

N3IWF Non-3GPP InterWorking Function

N5CW Non-5G-Capable over WLAN

NAI Network Access Identifier

NEF Network Exposure Function

NF Network Function

NGAP Next Generation Application Protocol

NID Network identifier

NPN Non-Public Network

NR New Radio

NRF Network Repository Function

NSAC Network Slice Admission Control

NSACF Network Slice Admission Control Function

NSAG Network Slice AS Group

NSI ID Network Slice Instance Identifier

NSSAA Network Slice-Specific Authentication and Authorization

NSSAAF Network Slice-specific and SNPN Authentication and Authorization Function

NSSAI Network Slice Selection Assistance Information

NSSF Network Slice Selection Function

NSSP Network Slice Selection Policy

NSSRG Network Slice Simultaneous Registration Group

NSWO Non-Seamless WLAN offload

NSWOF Non-Seamless WLAN offload Function

NW-TT Network-side TSN translator

NWDAF Network Data Analytics Function

ONN Onboarding Network

ON-SNPN Onboarding Standalone Non-Public Network

PCF Policy Control Function

PDB Packet Delay Budget

PDR Packet Detection Rule

PDU Protocol Data Unit

PEI Permanent Equipment Identifier

PER Packet Error Rate

PFD Packet Flow Description

PNI-NPN Public Network Integrated Non-Public Network

PPD Paging Policy Differentiation

PPF Paging Proceed Flag

PPI Paging Policy Indicator

PSA PDU Session Anchor

PTP Precision Time Protocol

PVS Provisioning Server

QFI QoS Flow Identifier

QoE Quality of Experience

RACS Radio Capabilities Signalling optimisation

(R)AN (Radio) Access Network

RG Residential Gateway

RIM Remote Interference Management

RQA Reflective QoS Attribute

RQI Reflective QoS Indication

RSN Redundancy Sequence Number

SA NR Standalone New Radio

SBA Service Based Architecture

SBI Service Based Interface

SCP Service Communication Proxy

SD Slice Differentiator

SEAF Security Anchor Functionality

SEPP Security Edge Protection Proxy

SMF Session Management Function

SMSF Short Message Service Function

SN Sequence Number

SNPN Stand-alone Non-Public Network

S-NSSAI Single Network Slice Selection Assistance Information

SO-SNPN Subscription Owner Standalone Non-Public Network

SSC Session and Service Continuity

SSCMSP Session and Service Continuity Mode Selection Policy

SST Slice/Service Type

SUCI Subscription Concealed Identifier

SUPI Subscription Permanent Identifier

SV Software Version

TA Tracking Area

TAI Tracking Area Identity

TNAN Trusted Non-3GPP Access Network

TNAP Trusted Non-3GPP Access Point

TNGF Trusted Non-3GPP Gateway Function

TNL Transport Network Layer

TNLA Transport Network Layer Association

TSC Time Sensitive Communication

TSCAI TSC Assistance Information

TSCTSF Time Sensitive Communication and Time Synchronization Function

TSN Time Sensitive Networking

TSN GM TSN Grand Master

TSP Traffic Steering Policy

TT TSN Translator

TWIF Trusted WLAN Interworking Function

UAS NF Uncrewed Aerial System Network Function

UCMF UE radio Capability Management Function

UDM Unified Data Management

UDR Unified Data Repository

UDSF Unstructured Data Storage Function

UL Uplink

UL CL Uplink Classifier

UPF User Plane Function

URLLC Ultra Reliable Low Latency Communication

URRP-AMF UE Reachability Request Parameter for AMF

URSP UE Route Selection Policy

VID VLAN Identifier

VLAN Virtual Local Area Network

W-5GAN Wireline 5G Access Network

W-5GBAN Wireline BBF Access Network

W-5GCAN Wireline 5G Cable Access Network

W-AGF Wireline Access Gateway Function

\* \* \* Next Changes \* \* \*

## 5.x Support for Mobile Base Station Relay (MBSR)

### 5.x.1 General

A MBSR acts as a relay between a UE and the 5G network, i.e. providing a NR access link to UEs and connected wirelessly (using NR) through a IAB-donor to the 5G Core. Such mobile base station relay is assumed to be moving, e.g. mounted on a moving vehicle, and serve UEs that can be located inside or outside the vehicle (or entering/leaving the vehicle).

The MBSR uses the IAB architecture as defined in clause 5.35, and operates as an IAB node (with a IAB-UE and gNB-DU) when integrated with the serving PLMN. Additionally, the following limitation applies to MBSR:

- the MBSR is not applicable to NR satellite access in this release;

- the MBSR has a single hop to the IAB-donor node;

- NR Uu is used for the radio link between a MBSR and served UEs, and between MBSR and IAB-donor node.

- the mobile base station may connect to an IAB-donor node of a PLMN or an SNPN.

Regulatory requirements (e.g. emergency services, priority services) are supported when UEs access 5GS via a MBSR. LCS framework as defined in TS 23.273 [87] is used for providing the location service to the served UEs, with additional enhancements described in clause 5.x.5.

Roaming of the MBSR is supported, i.e. a MBSR can integrated with a VPLMN’s IAB-donor node. The corresponding enhancements to support MBSR roaming are described in clause 5.x.4.

CAG mechanism as defined in clause 5.30 can be used for the control of UE’s access to the MBSR. Optional enhancements to the CAG mechanism for MBSR use are described in clause 5.x.6.

### 5.x.2 Configuration of the MBSR

Editor’s Note: The description of the MBSR configuration will be added based on updated conclusion of TR 23.700-05 clause 8.1.

### 5.x.3 Mobility support of UEs served by MBSR

#### 5.x.3.1 UE mobility between a fixed cell and MBSR cell

The procedure of Inter-gNB-DU Mobility as defined in TS 38.401 [42] or the handover procedure using the Xn/N2 reference points as defined in the TS 23.502 [3] can be used.

For UEs in RRC\_IDLE and RRC\_INACTIVE state when a MBSR goes out-of-service, procedure for cell (re-)selection as specified in TS 38.304 [50] for RRC\_IDLE and RRC\_INACTIVE is used.

For UEs in RRC Connected state, if the MBSR goes out-of-service due to e.g. MBSR moves to an area where the MBSR is not allowed to provide the relay service, the procedure for IAB node release as specified in TS 38.401 [42] is used.

#### 5.x.3.2 UE mobility between MBSR cells

Similar to the behaivors described in 5.x.3.1, UEs use existing procedures defined in TS 38.401 [42], TS 23.502 [3], or TS 38.304 [50] to handle the mobility between MBSR cells.

#### 5.x.3.3 UE mobility when moving together with a MBSR cell

Editor’s Note: The description of the support of enhancements for UE mobility when moving together with a MBSR will be added based on updated conclusion of TR 23.700-05 clause 8.3.

### 5.x.4 Roaming support for MBSR

Editor’s Note: The description of the MBSR roaming support will be added based on updated conclusion of TR 23.700-05 clause 8.4.

### 5.x.5 Location Service Support of UEs served by MBSR

The following legacy behaviours for KI#5 are applied to KI#5:

- Target UE performs location measurements and SRS transmission as a legacy Rel-17 UE.

- The Target UE reports the cell-IDs of all the TRP/gNB/eNB the UE performed DL positioning measurements on.

- The MBSR includes it's cell-ID in the reported UL positioning measurement that it performed on the Target UE.

- The UDM of MSBR holds MBSR subscription data and stores an updated record that includes the MBSR’s GPSI, SUPI, serving AMF ID of MBSR.

For Key Issue #5 (Support of location services for UEs accessing via a mobile base station relay), the followings are taken as initial conclusion:

- The AMF serving the UE provides the cell-ID of the cell that the Target UE is connected to the LMF in the location request (legacy behaviour) and indicates if possible that the cell-ID belongs to a MBSR. The AMF serving UE also provides LMF with the IAB-UE ID of the MBSR so that the LMF initiates the positioning procedure for MBSR.

Editor's note: How the AMF serving UE obtains the IAB-UE ID of the MBSR e.g. from gNB or NRF, will be discussed in the normative phase.

Editor's note: It is FFS whether the AMF provides more parameters related to the MBSR to the LMF.

- The LMF uses the Target UE reported cell-IDs to derive whether the cell-ID corresponds to a MBSR. There can be more than one MBSR in the measurement report.

- The LMF can learn that a new integrated MBSR TRP at a gNB is mobile and its MBSR IAB UE ID (GPSI) via TRP information exchange towards the gNB with the cell Id of the TRP. this is triggered by OAM.

Editor's note: It is FFS what information will be provided from MBSR to LMF (e.g. depends on the responses from RAN WGs on the options to support location report for MBSR).

- To aid the LMF to estimate the accuracy of the UE location estimation, the MBSR velocity information and time for obtaining its location measurement data should be obtained by the LMF when available.

- Options for the LMF to derive the location and velocity of the MBSR.

- The LMF can derive the location of the MBSR by either triggering the AMF serving the MBSR (as per solution#7 alternative using UDM, solution #14, solution#18 ), or the gNB serving the MBSR (as per solution#7 alternative using MO-LR case) or by requesting the GMLC to derive the location of the MBSR (UE) (as per solution#8 DL positioning).

- When the LMF of the UE needs to obtain the MBSR location information, it can use NRPPa procedure for TRP location query that triggers the MBSR to perform MO-LR (as per solution #8 UL positioning);

Editor's note: It is FFS whether the NRPPa procedure for TRP location needs to be enhanced to include velocity estimation.

- When MBSR is involved in providing the positioning measurements for the UE (and the LMF knows it from info obtained e.g. from TRP info exchanges), the MBSR location information may be provided by the MBSR via NG-RAN to the LMF via NRPPa (as per solution #15);

Editor's note: It is FFS whether all these options for LMF to derive the location of MBSR would be supported.

- As the timing of the location estimations for the Target UE and MBSR(s) is important for the quality of the location estimation of the Target UE, the LMF needs to reduce the timing offset of the positioning measurements, e.g. using scheduled location time as defined in TS 23.273 [4], and compensate for the potential time difference of the positioning measurements, e.g. taking velocity of MBSR into account.

- Privacy check:

- If the MBSR acts as a UE for the positioning, the UE privacy check procedure needs to be performed.

- If the positioning of the MBSR is performed for the UE served by the MBSR, the privacy check procedure is skipped. The mechanism to skip the privacy check can be determined during the normative phase based on the conclusion of the procedure that the LMF obtains the location of MBSR.

### 5.x.6 Providing cell ID/TAC of MBSR for services

Editor’s Note: The description of how to providing the MBSR cell ID/TAC for certain services will be added based on RAN WG feedbacks and updated conclusion of TR 23.700-05 clause 8.6.

### 5.x.7 Control of UE access to MBSR

CAG Identifier is used to control the access of UE via MBSR (i.e. mobile IAB-node) and existing CAG mechanism defined in clause 5.30.3 can be used for managing UE’s access to MBSR:

- When the MBSR is allowed to operate as an IAB node for a PLMN, the MBSR is configured, either during the communication with the serving PLMN OAM or (pre-)configuration mechanism, with a CAG identifier which is unique within the scope of this PLMN. If the MBSR is (pre-)configured with the PLMN list in which the MBSR is allowed to operate as MBSR, the corresponding CAG Identifier per PLMN is also configured in the MBSR.

- NG-RAN and 5GC support the UE access control based on the CAG identifier associated with the MBSR cell and the allowed CAG identifiers for the UE that supports CAG functionality.

- For the UE that does not support CAG functionality, NG-RAN and 5GC are allowed to use not only CAG mechanism but also the other existing mechanism e.g. forbidden Tracking Area, to manage its access to MBSR.

Editor’s Note: If CAG ID associated with MBSR and CAG ID associated with private network are both broadcasted, how to apply access control in this case will be added.

- Extra information (e.g. time duration and location information) may be provided together with the CAG Identifier(s) for the MBSR(s) that the UE can access. The enhanced Allowed CAG list will be provided to UE and AMF for enforcement, to make sure that UE not accessing the MBSR cell outside of the time duration or geographic area. For example, if the time when a certain CAG is allowed for a UE is up or UE is out of the geographic area, the CAG for the UE is revoked from the network.

Editor’s Note: Further description on the efficient UE configuration approach based on time and location based information may be added.

NOTE : Control of the MBSR access to the serving network is based on normal mobility restriction management based on subscription data form MBSR (i.e. IAB-UE).

\* \* \* End of Changes \* \* \*