**3GPP TSG-SA WG2#146E e-meetings S2-210xxxx**

**Elbonia, 16 – 27 August 2021 *(was S2-2104664, S2-2102683r13, merges S2-2102284)***

**Source: Qualcomm, Ericsson, LG Electronics, AT&T, FirstNet**

**Title: 5MBS interworking with eMBMS**

**Document for: Approval**

**Agenda Item: 8.9**

**Work Item / Release: 5MBS / Rel-17**

*Abstract of the contribution: This document proposes the architecture and the mobility procedure for 5MBS interworking with eMBMS.*

# 1 Introduction

The conclusions for KI#9 in TR 23.757 read as follows:

*For 5MBS multicast, in order to minimize the interruption of public safety services upon transition between NR/5GC and E-UTRAN/EPC the following applies:*

*For a 5MBS multicast session two scenarios are considered:*

*- the same service is provided via eMBMS and 5MBS. For this scenario Solution 43, which is a service based solution not needing the execution of an intermediate unicast handover, is adopted as baseline for the normative phase. This solution can be based on RRC release with redirection to redirect the UE towards the appropriate cells/frequency range.*

*NOTE 1: If the UE has other DRBs/QoS flows established before switching to EPS, the source RAN can also initiate handover.*

*NOTE 2: Solution 43 applies also to the 5MBS broadcast case.*

*- the same service is not provided via eMBMS and 5MBS. In this case, for the normative phase the following steps are adopted for 5MBS to EPS mobility:*

*- the 5MBS data shared delivery is switched to individual delivery during inter-system handover.*

*- the 5GS-EPS interworking solution of TS 23.501 [2] clause 5.17.2 is executed with an inter-system handover with MBS QoS flow(s) mapped to unicast QoS flow(s) in its associated PDU Session.*

*- After the inter-system handover has occurred, regular EPS procedures apply as the same service is not provided via eMBMS.*

*NOTE: If some further update is needed, it can be done in the normative phase.*

*- The PGW-C+SMF obtains the MBS session context when UE joins 5G MBS.*

*- After a possible subsequent EPS to 5MBS mobility, the PGW-C+SMF can again apply shared delivery to the UE.*

*For an eMBMS session started in EPS and subsequent EPS to 5MBS mobility, the following steps are adopted for the normative phase:*

*- Before EPS to 5MBS mobility, the application may trigger the switching the multicast data receiving from eMBMS to unicast bearer as defined in TS 23.468 [5].*

*- the 5GS-EPS interworking solution of TS 23.501 [2] clause 5.17.2 is executed with an inter-system handover.*

*- the UE can join the 5MBS multicast service after EPS to 5MBS mobility.*

In SA2#144E two editor's notes were added in S2-2102683r11/12/13:

Editor’s Note: What is the configuration granularity at the UE side, i.e. whether it is TA/PLMN/RAT level same eMBMS service is provided at the EPS network, is FFS.

Editor’s Note: How the SMF+PGW-C know UE go to the area where same service is provided via the eMBMS is FFS.

For the former, it is proposed to assume that at the UE side, the configuration granularity is per TMGI. This means that the UE know, on a per-TMGI basis, of whether the same service is provided via 5MBS and eMBMS or not.

For the latter, there is no need to add any explanation because of the NOTE already proposed at the beginning of clause 7.4.1, which reads:

*NOTE: It is assumed that the source network knows, based on configuration, that the same service is provided in the target network i.e. the EPC network neighbouring the 5GC network support the same eMBMS service.*

Therefore, it is proposed to:

**Proposal 1: In clause 7.4.1, remove the two editor's notes a note to state that the configuration granularity in the UE is per-TMGI.**

In addition, this paper proposes the architecture for 5G MBS, corrects the first part clause 6.8 by aligning it with the conclusion of the FS\_5MBS TR and adds clause 7.4.1 to described inter-system mobility at service layer.

NOTE: Clause 6.8 was mistakenly approved in SA2#143E and the second part of it will be addressed in another paper.

# 2 Text proposal

It is proposed to capture the following changes in TS 23.247 which are based on a modified version of S2-2102682r13:

>>>>BEGINNING OF CHANGES<<<<

## 5.2 General architecture for interworking with LTE

Interworking between MBS and eMBMS at service layer functionality applies in cases where the same Multicast/Broadcast service is provided via eMBMS and 5MBS.Figure 5.2-1 depicts the system architecture for interworking between E-UTRAN/EPC eMBMS and MBS at service layer, with collocated BM-SC and MBSF/MBSTF functionalities.

**Figure 5.2-1: MBS-eMBMS interworking system architecture at service layer**

The BM-SC+MBSF/MBSTF exposes common Nmb3/Nmb6/xMB-C/MB2-C and Nmb4/xMB-U/MB2-U reference points to the NEF and/or AF/AS. A common TMGI is used towards the AF/AS. The TMGI is also used as identifier for transport over E-UTRAN/EPC.

NOTE: MB2-C/U are both legacy reference points and 5GS reference points.

>>>>NEXT CHANGE<<<<

## 6.8 Interworking with MBMS over E-UTRAN for public safety services

In order to minimize the interruption of services, upon mobility for MBS service from NR/5GC to E-UTRAN/EPC and vice versa, the following applies.

- If the same multicast service is provided via eMBMS in E-UTRAN and 5MBS, interworking is supported at service layer.

- The UE is always configured with a common TMGI regardless of whether the UE is discovering and joining the MBMS/MBS service via E-UTRAN or NR. When the UE camps on NR, the UE establishes an MBS session context using the MBS context ID = TMGI. When the UE camps on E-UTRAN, the UE uses procedures as defined in TS 23.246 [8] for MBMS reception for the TMGI.

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In order to minimize the interruption of services, upon mobility from E-UTRAN/EPC to NR/5GC, the following applies:

- Before EPS to 5GS mobility, the application may trigger the switching the service receiving from eMBMS to Individual MBS traffic delivery over EPS. The AF provides the MBS Session ID (i.e. the TMGI or multicast IP address) as part of service information to PCF to trigger EPS bearer resource allocation for the service. Based on the received MBS Session ID, the SMF+PGW-C link the established EPS bearer(s) with the indicated MBS session.

- If the UE receives the service via the Individual MBS traffic delivery over EPS, the Individual MBS traffic delivery over EPS is switched to 5GC Individual MBS traffic delivery method during handover from EPS to 5GS procedure. After handover, the SMF+PGW-C switches the 5GC Individual MBS traffic delivery method to 5GC shared MBS traffic delivery method if the target NG-RAN supports 5G MBS.

- If the UE receives the service via eMBMS in source E-UTRAN, after handover from EPS to 5GS, the UE may join the 5MBS Session directly without reporting the UE is out of eMBMS service to AF.

>>>>NEXT CHANGE<<<<

## 7.4 MBS procedures for inter System Mobility

### 7.4.1 Inter-system mobility with interworking at service layer

For inter-system mobility with interworking at service layer, the UE is instructed to switch between 5MBS and eMBMS:

NOTE 1: It is assumed that the source network knows, based on configuration, that the same service is provided in the target network i.e. the EPC network neighbouring the 5GC network support the same eMBMS service.

NOTE 2: It is assumed that the UE is configured, per TMGI, of whether the same service is provided over 5MBS and eMBMS or not.

- Mobility from 5MBS to eMBMS.

When moving to E-UTRAN/EPC, the UE initiates procedures as defined in TS 23.246 [8] to receive MBMS service for the TMGI(s).When moving to E-UTRAN/EPC, the MBS session context is removed locally at the UE without the need for explicit SM.

If the UE has one or more unicast PDU Sessions (including, but not limited to, the PDU Session used for MBS and for another service (e.g., Public Safety service) with the QoS Flow(s) for the other service), moving to EPS, and if the handover procedure from 5GS to EPS using N26 interface described in clause 4.11.1.2.1 of TS 23.502 [6] is used.

- For the PDU Session used also for MBS, the SMF+PGW-C removes the UE from the multicast session context(s), if it exists, upon receiving a Modify Bearer Request of the PDU Session from the SGW (i.e., step 14a of clause 4.11.1.2.1 of TS 23.502 [6]).

- For 5GS to EPS Idle mode mobility using N26 interface the AMF gets notified from HSS+UDM and then releases the PDU Session(s) not expected to be transferred to EPC (see TS 23.502 [6], clause 4.11.1.3.2, in Step 15-15c).

- For 5GS to EPS Idle mode mobility with no N26, when the UE moves to the EPS and performs E-UTRAN EPS attach, according to TS 23.502 [6] clause 4.11.2.4.1, step 8, if the UE does not maintain registration in 5GC, upon reachability time-out, the AMF may implicitly detach the UE and release the possible remaining PDU Session(s) in 5GC.The SMF/PGW-C removes the UE from the multicast session context(s), if it exists, upon receiving a tracking area update from the UE.

- Mobility from eMBMS to 5MBS.

When the UE has moved to NR/5GC it triggers the multicast context and multicast flow setup/modification via PDU Session Modification procedures as defined in clause 6.8 to receive 5G MBS transport for the TMGI(s).

>>>>END OF CHANGES<<<<