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

**Elbonia, 16 – 27 August 2021 *(was S2-2104665)***

**Source: Qualcomm Incorporated, Ericsson, AT&T, FirstNet**

**Title: 5MBS interworking with eMBMS at transport layer**

**Document for: Approval**

**Agenda Item: 8.9**

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

*Abstract of the contribution: This document analyses the issues of the transport layer based interworking approach and proposes a way forward.*

# 1 Discussion and proposal

The transport layer based interworking solution with eMBMS proposed in SA2#144E and SA2#145E (see S2-2102578, S2-2103549, S2-2104393) introduces some impacts and drawbacks which make it unnecessarily complex.

- For the 5MBS-to-EPS interworking, it introduces the principle of providing IP Multicast traffic over a unicast EPS bearer. While this can work within 5GS, its extension to EPS requires the following aspects to be addressed:

- When the UE moves to EPS, it needs to receive a unidirectional UL-TFT for the EPS bearer generated when UE was in 5GS. While it is possible to support a unidirectional UL TFT, as defined in clause 15.3.3.4 of TS 23.060:

*“For services with no uplink IP flows, dummy uplink packet filter can be provided by the network to avoid that the UE uses the PDP context for uplink traffic that is expected on the PDP context without any uplink packet filter. For example that can be done by assigning the remote port "9", which is the "discard" port, i.e. the following packet filter can be used:*

*- Packet Filter Identifier = 5;*

*- Packet Filter Direction = uplink only; and*

*- Remote port = 9 (the discard port).”.*

**This, however, is not described in the current solution and should be clarified in the solution description.**

- The interworking nodes, i.e., SMF+PGW-C, UPF+PGW-U, PCF have to support this functionality, and they are part of 5GS. However, the only way for the MME to select the nodes that support this functionality is by using a dedicated APN, since no other information is available in EPS to determine the capability of interworking nodes.

 **This, however, is currently not described and introduces limitations to the applicability of the solution.**

- The 5MBS-to-EPS interworking, contrary to the conclusion and the evaluation captured in TR 23.757 (see Excerpts 1 and 2 below), requires impacts on EPS (which is out of scope) since

- it **requires updates in the PCO exchanged between EPS UE and CN** to indicate that a certain EPS bearer is associated to the 5MBS PDU session at 5MBS-to-EPS handover.

- it requires the **UE to send a Request Bearer Resource Modification message to the MME** (potentially preceded by a service request procedure if the UE is in idle) with a new purpose. *De facto*, this implies that EPS networks that want to support the transport layer interworking with 5MBS needs to be updated.

Excerpt 1: Clause 6.41.4 of TR 23.757 (impact of transport layer based solution)

*SMF:*

*- The SMF supports to transfer the service data to UE via unicast bearer or individual MBS delivery based on indication from AF.*

*- The SMF supports to change the delivery of the service data from via shared MBS delivery to via unicast bearer during the handover from 5GS to EPS.*

*- The SMF supports to indicate AF multicast IP address is used for deliver the service data via unicast bearer or individual MBS delivery.*

*- The SMF supports to release resource for service delivery via unicast bearer based on AF indication.*

*PCF:*

*- The PCF supports to indicate the SMF to transfer the service data via unicast bearer or individual MBS delivery based on request from AF, or indicate the SMF to release resources for service delivery via unicast bearer based on request from AF.*

*AF:*

*- The AF supports to transfer the service data via multicast IP address or unicast UE IP address based on SMF indication.*

*- The AF supports to indicate the 5GC to release resource for service delivery via unicast bearer.*

*- The AF supports to indicate the 5GC to transfer the service data via individual MBS delivery.*

Excerpt 2: Clause 8.10 of TR 23.757 (Conclusions for Key Issue #9)

*- 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.*

- The solution part for EPS-to-5GS interworking **requires GCS AS behaviour updates** with respect to the existing behaviour described in TS 23.468. The existing behaviour assumes that when the same service provided over unicast becomes available over eMBMS in step 1 of TS 23.468 clause 5.3.2 the GCS AS signals to the UE that a certain TMGI is available to deliver that service. Now, with the new proposal, the assumption is that such TMGI is NOT for eMBMS and the GCS AS needs to indicate to the UE that such TMGI is used over 5MBS. This implies that the GCS AS needs to update its logic and associate the service with the specific access/CN.

- **The solution is 'asymmetric'**, meaning that the steps for 5GS-to-EPS interworking are not the same as those for the EPS-to-5GS one. While for 5GS-to-EPS interworking service continuity is based on the usage of *individual delivery* of a 5MBS session extended to EPS, in the other direction service continuity is based on a regular unicast HO/idle mode mobility. It is unclear why different approaches have to be used for different directions of the HO/mobility.

**In summary, the transport layer based interworking solution with EPS, as proposed:**

**- requires impacts to EPS which is out of scope,**

**- contains multiple unresolved issues (mostly on the EPS side), and**

**- requires unnecessary GCS AS behaviour impacts, and in general increases AS complexity to support eMBMS/5MBS interworking.**

Given the analysis above, and based on the general design principle of minimum impacts to existing system and the operator imperative that new solutions should aim to have no impact to existing deployment, it is proposed the following:

**Proposal: to remove the existing/partial description of the transport layer based 5MBS-EPS interworking captured in clause 6.8 of TS 23.247 and not to implement such mechanism in this Release.**

# 2 Text proposal

It is proposed to capture the following changes in TS 23.247:

>>>>BEGINNING OF CHANGES<<<<

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

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

- If the same multicast service is provided via eMBMS in target E-UTRAN, the session context for multicast service transferring is not handover to E-UTRAN during mobility from 5GS to EPS, i.e. the EPS bearer context associated with the MBS session is not transferred to EPS network. UE releases the related EPS bearer(s) and the associated MBS session context locally. After handover, the UE is connected to the target E-UTRAN, the UE starts to receive the service via eMBMS.

- If the same multicast service is not provided via eMBMS in target E-UTRAN, during handover from 5GS to EPS procedure, the 5GC shared MBS traffic delivery method is switched to Individual MBS traffic delivery over EPS. The unicast QoS flow(s) corresponding to the multicast QoS flow(s) of the MBS session are mapped to EPS bearer(s).

>>>>END OF CHANGES<<<<