**3GPP TSG-WG SA2 Meeting #152E e-meeting S2-2206096**

**Elbonia, August 17 – 26, 2022**

**Source: Huawei, HiSilicon**

**Title: KI#2 and KI#3: Evaluation and Conclusion**

**Document for: Approval**

**Agenda Item: 9.9**

**Work Item / Release: FS\_VMR / Rel-18**

*Abstract: Evaluation and Conclusion for KI#2 and KI#3.*

# 1. Discussion

This contribution proposes the evaluation and conclusion for KI#2 and KI#3.

# 2. Text Proposal

It is proposed to capture the following changes into TR 23.700-05 V1.0.0.

\* \* \* \* First change \* \* \* \*

7.2 Evaluations for KI#2

Editor's note: Further evaluation need to be considered.

There are four solutions addressing Key Issue#2 Efficient mobility for UEs connecting to/disconnecting from mobile base station relay, i.e. solution# 3, solution#4, solution#5, and solution#11.

Among the solutions:

- Solution #3 addresses only KI#2, and reuses the existing procedures for different scenarios of per UE mobility, including UE mobility between MBSRs, UE mobility between MBSR and macro base station. Solution#3 does not have any normative impact, although further verification by RAN WGs is needed. Solution#3 does not address any optimization for the mobility of a group of UEs.

- Solution #11 addresses KI#2. It proposes to reuse the mechanism for NTN scenario that MBSR broadcast service time for influencing cell reselection and handover before MBSR is out of service in order to reduce service interruption. The use of such mechanism for MBSR instead of NTN operation needs verification by RAN WGs.

The solutions have RAN impact as following and need RAN coordination:

1) Solution #11 requires NG-RAN to enable the MBSR (IAB-DU) broadcasting time event information that is received by the MBSR (IAB-UE) via NAS message.

## 7.3 Evaluations for KI#3

There are six solutions addressing Key Issue#3, Efficient mobility and service continuity when served by mobile base station relay, i.e. solution#4, solution#5, solution#12, solution#13, solution #16, and solution #17:

- Solution #4 and #5 addresses both KI#2 and KI#3. Solution #4 assumes that the TACs potentially will be broadcasted by the MBSR are provided to the UE by the AMF of the UE served by the MBSR, so that the UEs do not need to perform mobility registration when the MBSR changes TACs. In order to support UE mobility management without the mobility registration, some special contexts are created on NG-RAN associated with the MBSR, and in the AMF serving the UEs. These contexts are connected using a new identifier "Link ID". With solution#4, the donor gNB is able to support AMF-UE relocation for all the UEs served by this AMF with one N2 signalling. i.e., when UE moves with MBSR, the NG-RAN proxies the UE idle mobility and NG-RAN triggers the UE handover due to MBSR mobility. Solution#4 works with legacy UEs when the UE is served by the MBSR, no mobility registration is performed and therefore 5G-GUTI is not updated even if the UE context transfer is triggered among AMFs. CT WGs and SA3 evaluation is required to confirm that the UE context management at AMF is not broken. Support of the new context at donor gNB and AMF and their maintenance during MBSR mobility requires verification by CT WGs and RAN3.

- Solution #5 is based on solution #4 to enhance idle mobility and handover to support mobile terminated services. Solution#5 further creates a special context in AMF serving the MBSR, and associate it with the context in AMF-UE using the Link ID. Interactions between AMF-UE and AMF-MBSR are introduced to maintain the binding of the Link ID. and AMFs are enhanced to redirect the UE paging message from AMF-UE to AMF-MBSR. The AMF-MBSR forwards the paging message to NG-RAN serving the MBSR so that it can be broadcasted by MBSR. The paging forwarding by AMFs needs verification by CT WGs and RAN3.

- Solution #12 address KI#3. It proposes to use a full migration approach with a 2-step handover procedure for reducing the service interruption, firstly MBSR handover is performed without F1 anchor change, then UE handover is triggered. With this solution, the UEs served by MBSR would still experience mobility event even if they remain connected to the same MBSR. Other the other hand, Solution#12 does enhance the existing Xn and N2 handover procedures to support group UE handover and therefore reduces corresponding signalling over Xn and N2. Overall, the principle of this solution is to aggregate the information of group UEs in a single message to support bulk handling in 5GC. When group UEs are accessing the same IAB-node, the commonality is that group UEs share the same user location and AMF. The support of group mobility procedure requires verification of RAN WG3. The solution#12 does not address the IDLE mode mobility aspect when the UEs move together with the MBSR. Additionally, delivery of the RRC messages to the connected UEs requires F1-C connectivity between the source IAB-donor-CU and the migrating MBSR. This F1-C connectivity may have to be carried via the CN if the source IAB-donor-CU and the target IAB-donor do not have Xn and/or IP connectivity. This should be coordinated with RAN WGs.

- Solution #13 address KI#3. It proposes to adopt a partial migration approach that besides the CU of gNB handles the MBSR mobility, a central CU that acts as F1 anchor for as long as practically possible to shield the MBSR mobility from the UEs it serves, which saves the AN signalling for mobility. This requires some discussion and adoption in RAN WGs. An interaction with RAN3 is required to consolidate this approach. The feasibility to support IAB mobility based on the Rel-17 IAB partial migration should be discussed in the RAN WGs. In addition, R18 NR\_mobile\_IAB in RAN WGs only focuses on full migration (RP-213601). Given that the m-CU cannot cover all possible MBSR operation locations, additional handling from other solutions may needed to complement this solution.

- Solution #16 addressed KI#3. It proposes that the MBSR is configured by the donor gNB to broadcast the TAC of its serving cell. For a UE served by the MBSR, it would observe the TAC change when it moves together with the MBSR across different serving cells, even if it camps on the same MBSR cell. On the other hand, a UE would not be triggered to perform mobility registration when it camps on or leaves the MBSR cell temporarily. No signaling overhead caused by the Mobility Registration Update for the surrounding UEs.

- Solution #17 addressed KI#3. It proposes two options. Option#1 is that the MBSR uses a dedicated TAC, and the TAC remains the same when MBSR moves across different donor gNBs. The donor gNB will add or remove the TAC of the MBSR to UE's AMF(s) when the MBSR connects to leaves it. With this solution, the UE served by MBSR would not perform mobility registration, even when the MBSR changes donor gNBs. Option#2 is MBSR broadcasts a TAC which maintains unchanged within a certain service area. Once there is no N2 reference point between new IAB-donor gNB and AMF-UEs, the MBSR will change the TAC to broadcast during the full migration phase. This triggers the UEs camped on the MBSR to perform mobility registration. For idle UE, donor gNB-CU has no UE context. The TAC change cannot triggered by the new donor gNB-CU due to the absence of UE-AMF ID.

The solutions have RAN impact as following and need RAN coordination:

1) Solution #4 and #5 require NG-RAN to manage MBSR context with Link IDs sent by AMFs via NGAP messages, one Link ID identifies one AMF that serves a group of UEs camp on the MBSR, as well as require NG-RAN to initiate an NGAP message to new AMF with Link ID(s) for AMF relocation when needed.

2) Solution #12 requires NG-RAN to support full migration approach with group handover for UEs. The potential F1-C connectivity via CN needs coordination with RAN WGs.

3) Solution #13 requires NG-RAN to support a partial migration approach with a central CU (m-CU) together with a local CU (gNB-CU).

4) Solution #16 and #17 need RAN confirmation of the feasibility of updating the UE-AMF regarding the TAC supported by the MBSR via NGAP.

\* \* \* \* Second change \* \* \* \*

## 8.2 Conclusions for KI#2

Editor's note: This clause includes interim conclusions, and needs further study.

For KI#2 (UEs moving to/from MBSR), the interim conclusions are as follows:

* In case of UE mobility between MBSRs (i.e. from one MBSR cell to another MBSR cell), the legacy procedure of Inter-gNB-DU Mobility as defined in the TS 38.401 [6] or the legacy handover procedure using the Xn/N2 reference points as defined in the TS 23.502 [5] is used.
* In case of UE mobility between MBSR and IAB-donor (i.e. from one MBSR cell to another IAB-donor’s cell), the legacy procedure of Inter-gNB-DU Mobility as defined in the TS 38.401 [6] or the legacy handover procedure using the Xn/N2 reference points as defined in the TS 23.502 [5] is used.

Editor's note: The above interim conclusion is subject to feedback of RAN WGs and will be revisited as per the feedback.

## 8.3 Conclusions for KI#3

Editor's note: This clause includes interim conclusions, and needs further study.

For KI#3, the interim conclusions are as follows:

* During MBSR's mobility, the TAC broadcasted by the MBSR is the same as the TAC of the cell where the IAB-UE is located. When the IAB-UE enters to a new TA, the cell broadcasting information is updated accordingly.
* The UE's mobility management is performed using the legacy mechanism as defined in the TS 23.501 [2] and TS 23.502 [5].
* No signaling overhead caused by the Mobility Registration Update for the surrounding UEs regardless of connecting to or disconnecting from a MBSR.

Editor's note: The above interim conclusion and support of group mobility are subject to feedback of RAN WGs and will be revisited as per the feedback.

\* \* \* \* End of changes \* \* \* \*