**3GPP TSG-RAN WG3 Meeting #122 R3-23xxxx**

**Chicago, IL, November 13 - 17, 2023**

**Agenda item:** 13.2

**Source:** Qualcomm Incorporated

**Title:** SoD for CB: # IAB-node\_mobility

**Document for:** Discussion

# 1 Introduction

This document captures the following CB discussion:

**CB: # IAB-node\_mobility**

* **Discuss remaining proposals, if any**
* **Agree TPs**

The discussion focuses on the remaining issues 7, 9, 10, and 14 of the mIAB offline discussion. The Annex includes company views and summary of these issues from the prior mIAB offline email discussion, for reference.

**The deadline is today, Thu Nov 16, 18:30 local time.**

# 2 Proposals

The following is proposed:

…

# 3 Discussion

## Issue 4: “Authorized” indication by MT’s CU to DU’s CU

We have the following WA:

**WA: MT’s CU sends an NGAP indication to AMF as part of an existing procedure, to indicate that the IAB MT can be deregistered. If possible, capture the WA in the TP to TS38.413**

We first need to identify an existing NGAP procedure. Then we can finalize the TP.

**Q4: Please propose an NGAP procedure where this indication should be included.**

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| ***Company*** | ***Comments*** |
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## Issue 7: DU migration issues

**This issue relates to the scenario where both, OAM and DU’s CU concurrently send DU migration triggers containing different target CUs.**

**In the offline F2F discussion, two options were discussed on how to resolve such a conflict. In the following offline email discussion, a few companies emphasized that such conflicting triggers would not occur in a properly operated network, where the decision on DU migration is configured via proper match up of the mIAB-nodes’ and the CUs’ OAMs.**

**Therefore, we will first decide whether there is an issue that requires further RAN3 discussion:**

**Q7a: Should RAN3 consider the scenario where DU-migration triggers are concurrently provided by both, the IAB-node’s OAM and the source mIAB-DU’s CU, and where this may result in conflicting DU migration indications?**

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| ***Company*** | ***Yes/No ?*** | ***Comments*** |
| **MITRE** | **Yes** | **If both kinds of triggers are allowed, it is logical to consider a conflict also.** |
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**Q7b: In case Q7a is supported, which of the following options should be considered to resolve such conflicting triggers:**

**Option 1: Based on OAM configuration, the (source) mIAB-DU indicates in its F1 Setup Request message that OAM-triggered DU migration is preferred. The DU’s CU can overwrite this preference in the F1 Setup Response message with an indication that it itself will trigger DU migration.**

**Option 2: Both, OAM and source mIAB-DU’s CU can trigger DU migration. In case the trigger is first received from the CU, the mIAB-node ignores OAM-based triggers until DU migration has completed. In case the trigger is first received from OAM, the mIAB-node ignores CU-based triggers until DU migration has completed, and it reports the gNB-ID of target DU’s CU to the source DU’s CU in the MIAB F1 Setup Outcome Notification.**

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| ***Company*** | ***Option 1/2 ?*** | ***Comments*** |
| **MITRE** | **2** | **Option 2 is a simpler approach.** |
| **Canon** | **Option 1** | **The advantage of option 1 is that the expected behavior is well defined right after F1 setup.**  |
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## Issue 10: Concurrent DU/MT migration

**Offline discussion had converged that when MT migration occurs during DU migration, both DUs’ CUs need to be updated with the gNB-ID of mIAB-MT's target CU and mIAB-MT's new BAP address. Issue 10 contained a proposal to capture this fact in 38.401. To make this a little easier, the moderator proposes a simple way to add this to step 3 in Section 8.YY.1 on Migration of mobile IAB-MT via Xn handover:**

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| 3. The mIAB-DU passes the gNB ID of the target RRC-terminating IAB-donor-CU and the mIAB-node’s BAP address allocated by the target RRC-terminating IAB-donor-CU to the F1-terminating IAB-donor-CU via F1AP. In case the migration of the mobile IAB-MT occurs during DU migration, each logical mIAB-DU passes this information to its respective F1-terminating IAB-donor-CU. |

**Q 10: Do you agreed to add to step 3 in Section 8.YY.1 on Migration of mobile IAB-MT via Xn: “In case the migration of the mobile IAB-MT occurs during DU migration, each logical mIAB-DU passes this information to its respective F1-terminating IAB-donor-CU.”**

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| ***Company*** | ***Yes/No ?*** | ***Comments*** |
| **MITRE** | **Yes** | **We believe this explicit clarification is needed because two logical mIAB-DUs is a new concept for Rel 18. The accompanying Figure is modified from Rel 17 and shows only one donor F1-terminating CU and therefore may be considered incomplete. It is not suggested to change the Figure because it refers to steps from the Rel 17 Figure (where two logical IAB-DUs don’t exist). A textual note is both necessary and sufficient. We are also fine with the compromise rewording of the sentence to (as proposed by Huawei) “In case the mIAB node has two active logical mIAB-DUs, each logical mIAB-DU passes this information to its respective F1-terminating IAB-donor-CU.”** |
| **Canon** | **Yes** | **The interest is to clearly mention that concurrent MT/DU migrations is supported and what has to be done for that purpose.** |
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## Issue 9: Served- cell/neighbor-cell indication

**R3-237432 (Nokia) proposes: Introduce a new attribute for Served Cell Information NR and Neighbour Information NR IEs to indicate that the cell is a mobile IAB cell**.

**The issue is to avoid handover of mIAB-MTs to mIAB-DUs since mIAB-DUs are not supposed to have child nodes.**

**The contribution argues that while it is possible for the mIAB-DU’s CU to reject handover requests for (m)IAB-MTs to mIAB-DUs, it would be preferable to even avoid such handover request. The mIAB-DU’s CU can further not indicate in the present cause values for HO request rejection that the target cell belongs to a mIAB-DU. While it would be possible for the (m)IAB-MT’s to only report non-mobile-IAB cells in its measurement report, RAN2 agreed that the mIAB-MT was not mandated to receive system information of the neighbor cells when reporting measurements, and therefore, it would not be able to eliminate mIAB-DU cells from such a report.**

**In offline discussion, Huawei pointed out that the Served Cell Information NR included the** Broadcast PLMN Identity Info List NR, which includes the “mobile IAB-node supported” indicator for **suitable mIAB parent cells. Mobile IAB handover could therefore be restricted to these parent cells avoiding the need for Nokia’s proposal. The Moderator emphasizes that this approach only applies to served cells but not the neighbor cells since the Neighbour Information NR IE does not contain this Broadcast PLMN Identity Info List NR IE.**

**Q 9: Do you agree to proposal in R3-237432: Introduce a new attribute for Served Cell Information NR and Neighbour Information NR IEs to indicate that the cell is a mobile IAB cell.**

**In case you agree to this proposal, should we adopt the corresponding TP to 38.423 in R3-237432?**

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| ***Company*** | ***Yes/No ?******If Yes, adopt TP?*** | ***Comments*** |
| **Qualcomm** | **Yes****TP can be adopated** | **This is not only about making MT handovers more efficient.** **The support of moving cells within a stationary network is a novelty in 3GPP. It may introduce other issues, e.g., such as PCI collision/confusion, as discussed during the WI.****ANR management should have knowledge about the mobility status of neighbor cells.** |
| **MITRE** | **Yes, adopt TP** |  |
| **Canon** | **Yes** | **Not only useful for handover but also to improve the tracking of mobile cells.** **Note: in section 8.4.2.2 of TP in R3-237432, the term “UPDATE” is missing in the NG-RAN NODE CONFIGURATION UPDATE message name.** |
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## Issue 14: mobile IAB supported indication in the NGAP NG SETUP RESPONSE message

R3-237199 (ZTE) proposes:**A mobile IAB supported IE is introduced in the NG SETUP RESPONSE message to indicate the capability of AMF, so that the IAB donor can select an AMF that supports mobile IAB as specified in TS 23.501.**

Such indicator is included for Rel-16/17 IAB in the NG SETUP RESPONSE message for the analogue purpose.

**Q 14: Do you agree that a mobile IAB supported IE is introduced in the NG SETUP RESPONSE message to indicate the mIAB capability of AMF?**

**In case you agree to this proposal, should we adopt the corresponding TP to 38.413 in R3-237199?**

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| ***Company*** | ***Yes/No ?******If Yes, adopt TP?*** | ***Comments*** |
| **MITRE** | **Yes, adopt TP** |  |
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# 4 Annex: Replies/summary from mIAB offline email discussion in R3-237801

Issue 7: DU migration issues

**Proposal 7a: RAN3 to decide how to resolve reception of DU migration triggers from OAM and from the source DU’s CU with these triggers hold conflicting information about the target DU’s CU (potentially SoH):**

* **Option 1: Based on OAM configuration, the (source) mIAB-DU indicates in its F1 Setup Request message that OAM-triggered DU migration is preferred. The DU’s CU can overwrite this preference in the F1 Setup Response message with an indication that it itself will trigger DU migration.**
* **Option 2: Both, OAM and source mIAB-DU’s CU can trigger DU migration. In case the trigger is first received from the CU, the mIAB-node ignores OAM-based triggers until DU migration has completed. In case the trigger is first received from OAM, the mIAB-node ignores CU-based triggers until DU migration has completed, and it reports the gNB-ID of target DU’s CU to the source DU’s CU in the MIAB F1 Setup Outcome Notification.**

**[Xiaomi] we think both options work, we slightly prefer option 2 which is more flexible.**

**[ZTE] For option 2, I wonder whether we need to add new IEs in the MIAB F1 Setup Outcome Notification message. As we know, the NCGI of target logical DU cell is already included in the Activated Cells Mapping List IE. If we assume Xn is always available, the source DU's CU can derive the gNB ID according to the NCGI.**

**[Lenovo]: prefer to use option 1 which has less impacts. And the indication in the F1 setup request may be also omitted, and only DU’s CU to configure the trigger entity in the F1 setup response message.**

[Huawei]: For option 2, In case the trigger is first received from the CU, the mIAB-node should also report the gNB-ID of the target DU's CU to the OAM. This is important to allow the OAM to provide the suitable configuration(e.g. the NCGI) to the IAB-DU. And regarding ZTE's comment, the gNB-ID of the target DU's CU is necessary to be included in the MIAB F1 Setup Outcome Notification, because the NCGI of the targt cell is optional, and the target cell is a totally new cell, which may not have been informed to the source DU's CU(in such case, the source DU's CU cannot derive the gNB ID from the NCGI of the target DU's cell).

Accordingly, we propose the following update to option 2

Option 2: Both, OAM and source mIAB-DU’s CU can trigger DU migration. In case the trigger is first received from the CU, the mIAB-node ignores OAM-based triggers until DU migration has completed, and report the gNB-ID of the target DU's CU to the OAM. In case the trigger is first received from OAM, the mIAB-node ignores CU-based triggers until DU migration has completed, and it reports the gNB-ID of target DU’s CU to the source DU’s CU in the MIAB F1 Setup Outcome Notification.

[Samsung] Do we need explicitly mention the information reported to the OAM in our specification? In legacy, we also face the case, i.e., how does OAM know which gNB-CU is connected by the gNB-DU? However, in legacy specification, we didn’t mention anything on information reported by the gNB-DU

[Nokia]: not ok for 7a/7b. The issue is invalid. OAM configure either IAB, or configure DU’s CU. so the issue does not happen. Please clarify why both IAB and DU’s CU are configured with different information. OAM configuration is based on operator’s network planning. Even the issue happens, how can DU’s CU make the decision to overwrite the IAB’s indicaton/Operator’s network planning decision (Option 1)?

 **E///: same view as Nokia.**

**Proposal 7b: Capture RAN3’s decision for P7a in BL CRs to 38.473 and 38.401, section on DU migration.**

**[Xiaomi] Xiaomi is volunteer to prepare the 38.473 TP (R3-237385 can be revised) if we can down-select in this meeting.**

[Huawei]: Xiaomi's 38.473 TP in R3-237385 can be the baseline for option 1, and if RAN3 selects option 2, we want to recommend Huawei's F1AP TP R3-237612 as baseline.

 **E///: see our comment for P7a**

CATT: Option 2 is preferred, but it’s not clear what the “comes first” means and what’s the motivation to report gNB-ID of target DU’s CU. Instead, the F1 setup failure cause can be reported if the mIAB-node does not follow the CU instruction, so that the source CU will not trigger again. Propose following revised Option 2:

**“In case CU triggers Du migration when there is no OAM configuration, the mIAB-node follows CU triggered DU migraiton. In case the CU-based trigger is received when there is already OAM configuration, the mIAB-node ignores CU-based triggers, and it reports cause of F1 setup failure to the source DU’s CU in the MIAB F1 Setup Outcome Notification.**

*The Moderator believes that RAN3 needs to first converge that there is an issues, and if this is confirmed, we need to discuss the solution.*

***Proposal 7a: RAN3 to decide whether it is possible that triggers for DU-migration may be concurrently provided by both, the IAB-node’s OAM and the source mIAB-DU’s CU, and that this may result in conflicting DU migration indications (potentially SoH).***

***Proposal 7b: In case RAN3 has decided that such conflicting DU migration indications may exist, RAN3 to select between the following two options to resolve such conflicting DU migration indications (potentially SoH):***

***Option 1: Based on OAM configuration, the (source) mIAB-DU indicates in its F1 Setup Request message that OAM-triggered DU migration is preferred. The DU’s CU can overwrite this preference in the F1 Setup Response message with an indication that it itself will trigger DU migration.***

***Option 2: Both, OAM and source mIAB-DU’s CU can trigger DU migration. In case the trigger is first received from the CU, the mIAB-node ignores OAM-based triggers until DU migration has completed. In case the trigger is first received from OAM, the mIAB-node ignores CU-based triggers until DU migration has completed, and it reports the gNB-ID of target DU’s CU to the source DU’s CU in the MIAB F1 Setup Outcome Notification.***

**Proposal 7c: For DU migration, capture in BL CR to 38401 in section on DU migration, that the MT’s CU might receive traffic offload requests for a UE from the target CU, while it still holds traffic offload from the source CU for the same UE, and that the MT’s CU can identify by implementation that such traffic offload from two CUs is due to DU migration.**

[Huawei]: How can this proposal work？there is no UE information in the TMM procedure, the MT's CU cannot realize that the traffic offload request is for which UE. only the source donor CU and target donor CU  know the UE information. So, we propose the following revised version:

* Proposal 7c: For DU migration, capture in BL CR to 38401 in section on DU migration, that , for the UE HO, the target DU's CU may not initiate TMM procedure to MT’s CU, since the MT's CU still holds traffic offload from the source CU for the same UE.

[Samsung] We think HW’s point is valid. How to identify the UE at the MT’s CU? For HW’s new proposal, we also have concern. If the target DU’s CU does not initiate the TMM procedure, how to configure the mIAB-DU? For P7c, we may need further discussion.

**[MITRE]: This was discussed in the offline session. When UEs are handing over between source and target DU’s CUs, each donor CU may independently perform TMM with MT’s CU (with their specific traffic profiles). This is a transitionary phase for traffic profiles and F1-U tunnels. However, on the MT’s CU side, the traffic profiles can be aggregated and the backhaul need not be duplicated because eventually both logical DUs are collocated with the same MT (sharing the BAP address and MT’s CU’s gNB-ID?). How the MT’s CU handles this, is left to the implementation. However, since this is a new requirement on MT’s CU for Rel-18 while we are still using Rel-16/17 TMM messages, we need to capture this in Stage-2 procedures for mIAB.**

 **E///: we do not understand why this scenario is considered at all, especially since the proposal is to solve this by implementation.**

**CATT: Ok with P7c. And propose following revision to the last sentence:**

**“**the MT’s CU can identify the two TMM requests from two donor-CUs target to the same UE.”

**[Lenovo]: as mentioned during the offline discussion, in case failure of CU-based triggering IAB-DU migration, source F1-terminating IAB-donor-CU may need to be aware of the failure cause and minimum waiting time for F1 setup failure. So companies are kindly invited to provide views on proposal 7-d as below:**

**Proposal 7d: In case failure of CU-based triggering IAB-DU migration, source F1-terminating IAB-donor-CU may need to be aware of the failure cause and minimum waiting time for F1 setup procedure.**

[Huawei]: more clarification on the motivation is needed: What kind of cause value to be added？Will there be any different reactions for the source F1 terminating donor if receiving different cause value?

 [Samsung] Now, the “failure” has been indicated to the DU’s source CU. The purpose of detailed cause may need further clarification.

**CATT: We are OK to consider the failure cause of F1 setup.**

*The Moderator believes that P7c is not sufficiently clear. Since P7c solely proposes a stage-2 mechanism that is based on implementation, it is not critical to the completion of the WI and can be discussed in the next meeting.*

Issue 10: Concurrent DU/MT migration

**Proposal 10a: Capture in BL CR to 38401 that in case the mIAB-MT migration occurs concurrently with an ongoing mIAB-DU migration, both the source and the target mIAB-DUs should update their respective donor CUs with the gNB-ID of mIAB-MT's target CU and mIAB-MT's new BAP address.**

[Huawei]: This proposal is technically correct but the change is not needed.

we already captured the following step 3 for the MT partial migration procedure in 8.YY.1 of the BL CR for 38.401, and it is obvious that each logical IAB-DU will report the new BAP address to their corresponding F1 terminating donor CU, if their is two activated logical  IAB-DUs.

 3. The mIAB-DU passes the gNB ID of the target RRC-terminating IAB-donor-CU and the mIAB-node’s BAP address allocated by the target RRC-terminating IAB-donor-CU to the F1-terminating IAB-donor-CU via F1AP.
"What's the difference  already captured in the MT partial migration part.

[Samsung] Here, the thing to be emphasized is that the mIAB node will trigger two F1 UL messages, each of which is for different DU’s CU. The current step 3 only mention to mIAB-DU passes information to one IAB-donor CU.

[MITRE]: Like Samsung, we believe there is no harm in capturing this explicitly for the DU migration concurrent with MT migration. First, the Figure in BL CR for 38.401, 8.YY.1 does not indicate two mIAB-DUs may be involved (if there is no DU migration in progress, there may be only one active). Second, it shows only one F1-terminating IAB-donor-CU. The current text also uses singular terms. So, there is no acknowledgement in the current diagram/text that we have discussed concurrent MT/DU migration, and this section can be applied for both the standalone MT migration and concurrent MT/DU migration cases, with additional clarification.

 **E///: this scenario is not realistic**

The Moderator believes that P10 is not absolutely necessary since step 3 refers to the “mIAB-DU updates its CU…” which obviously implies that this should be done by each of the mIAB-DU’s on the IAB-node. We can keep P10 and have a brief discussion in the meeting:

***Proposal 10: Capture in BL CR to 38401 that in case the mIAB-MT migration occurs concurrently with an ongoing mIAB-DU migration, both the source and the target mIAB-DUs should update their respective donor CUs with the gNB-ID of mIAB-MT's target CU and mIAB-MT's new BAP address.***

Issue 9: Served- cell/neighbor-cell indication

**Proposal 9a: Introduce a new attribute for Served Cell Information NR and Neighbour Information NR IEs in XnAP to indicate that the cell is a mobile IAB cell.**

**[ZTE] If the target cell is a mobile IAB cell, the target cell will reject the HO request initiated for a mobile IAB node, so there seem to be no problem here. The benefit might be to reduce the initiation of handover of a mobile IAB node to another mobile IAB node, which seems to be an enhancement and OAM might be able to handle the work.**

[Huawei] The existing Xn procedures, e.g., Xn setup and NG-RAN node configuration update, can exchange the “mobile IAB support” broadcasted in each NG-RAN node’s serving cell, since the PLMN-IdentityInfoList will be included as Served Cell Information NR (in Broadcast PLMN Identity Info List NR IE). So, no need the explicit indication via such new attribute.

[Nokia]: For ZTE comments, how can source donor know the HO is rejected due to target cell is a mobile IAB cell? The HO may fail for many reasons. Even it is rejected for this purpose, there is no appropriate cause value to tell source donor. In addition, RAN3 never mandate to use a specific cause value. In a summary, current std cannot tell source CU that HO is rejected due to a mobile IAB cell.

For HW comments, the mobile IAB support indicator is not exchanged over Xn. It is included in RRC PLMN-IdentityInfoList, but not in XnAP.

**CATT: It’s not clear why the HO of UE should be rejected while the target cell is a mobile IAB cell.**

**Proposal 9b: Capture P9a, if agreed, in BL CR for 38.423 following TP in R3-237432**

 **[ZTE] We suggest to discuss the issue of sending mobile IAB supported indication from the AMF to the IAB donor, since we agreed that the IAB donor selects an AMF that support mobile IAB after receiving mobile IAB indication in msg5. And this is also aligned with the way we adopted in R16/17 IAB.  Please companies kindly provide views on proposal 10 as below:**

***Let’s discuss during the online session, time permitting.***

***Proposal 9a: Introduce a new attribute for Served Cell Information NR and Neighbour Information NR IEs in XnAP to indicate that the cell is a mobile IAB cell.***

**Proposal 14: Introduce a mobile IAB supported indication in the NGAP NG SETUP RESPONSE message.**

[Nokia]: was this discussed before and concluded?

 **E///: what special superpowers does an IAB-supporting AMF need, to be able to support mIAB as well?**

*The moderator disagrees with E///. The AMF needs to be upgraded to support mIAB. If it is not, it won’t do it. Let’s keep this proposal alive and discuss in session, time permitting.*

***Proposal 14: Introduce a mobile IAB supported indication in the NGAP NG SETUP RESPONSE message.***