**3GPP TSG-RAN WG3 Meeting #117-bis-eR3-225937**

**Online, October 10th – 18th 2022**

Agenda Item: 13.2

Source: Ericsson (moderator)

Title: CB # IAB2\_Mobility - Summary of email discussion

Document for: Approval

# Introduction

The deadline for providing replies to Phase 1 is **Wednesday, October 12th at 15.59 UTC.**

**Relevant papers:**

[Eri5345] The Migration Procedure for Mobile IAB-Nodes (Ericsson)

[QC5359] Topology adaptation for mobile IAB (Qualcomm Inc.)

[Fuj5434] Discussion on IAB-node mobility (Fujitsu)

[Fuj5435] Discussion on IAB full migration (Fujitsu)

[ZTE5439] Discussion on inter-donor migration in mobile IAB scenario (ZTE)

[Nok5454] IAB-DU migration based on dual-DU (Nokia, Nokia Shanghai Bell)

[Len5488] Discussion on mobile IAB-node inter-donor topology adaptation (Lenovo)

[Len5489] Inter-donor full migration procedure of mobile IAB-node (Lenovo)

[Hua5680] Discussion on partial migration for mobile IAB (Huawei)

[Hua5681] Discussion on full migration for mobile IAB (Huawei)

[Sam5714] Discussion on IAB-node mobility (Samsung)

[Sam5715] Discussion on full migration procedure (Samsung)

[Xmi5752] Discussion on IAB-node mobility (Xiaomi)

# For the Chairman notes

**TBW**

# Discussion

We continue discuss the general principles of mIAB mobility procedure and the aspects of mIAB-DU HO that do not directly depend on these general principles.

## Execution of multiple consecutive partial migrations

The RAN3#117-e agreements allow for consecutive partial migrations of an mIAB-node, with the Rel-17 solution as the baseline. In this case, the mIAB-DU does not change its donor-CU, while the mIAB-MT does. It needs to be discussed:

* Which entity decides upon triggers the inter-donor HO of mIAB-MT.
* Which entity triggers the inter-donor F1 transport migration for the mIAB-DU.

The issues were discussed in papers [Xmi5752], [ZTE5439] and [Hua5680].

**Potential proposal 1-1: The inter-donor HO of mIAB-MT is decided and triggered by the donor CU serving the mIAB-MT.**

**Q1-1: Do you agree to Potential proposal 1-1?**

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| **Company** | **Answer** | **Comment** |
| **Ericsson** | **Yes** | The CU serving the mIAB-MT knows best when it is time to hand over the mIAB-MT. |
| Huawei | Partially yes | We agree that the HO of mobile IAB-MT is initiated by the source donor CU serves the IAB-MT, but for the decision of the target donor, maybe the F1 terminating donor should also be involved, since it is better to consider the following aspects when select the target donor: Xn interface between the target donor and the F1 terminating donor, whether there is IP route between the F1 terminating CU and the target donor DU, whether the target donor is able to accept all the traffics served by the mobile IAB-node, etc.  |
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The Moderator also makes the following initial proposal:

**Potential proposal 1-2: For inter-donor partial migration, the donor CU serving the mIAB-DU decides and triggers the inter-donor F1 transport migration for the mIAB-DU.**

**Q1-2: Do you agree to Potential proposal 1-2?**

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| **Company** | **Answer** | **Comment** |
| **Ericsson** | **Yes** | This is in line with the Rel-17 principle of partial migration, where the F1 transport migration is initiated by the F1-terminating donor. |
| Huawei | Yes |  |
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However, to be able to trigger inter-donor F1 transport migration for the mIAB-DU, the donor CU serving the mIAB-DU needs to be notified about the imminent inter-donor HO of the co-located mIAB-DU. This issue was raised in [ZTE5439], [Sam5714], [Nok5454] and [Xmi5752]. The Moderator makes the following initial proposal, based on the proposal from [Nok5454]:

**Potential proposal 1-3: For inter-donor partial migration, the source donor CU for the inter-donor mIAB-MT HO informs the donor CU serving the mIAB-DU about the mIAB-MT HO.**

**Q1-3: Do you agree to Potential proposal 1-3?**

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| **Company** | **Answer** | **Comment** |
| **Ericsson** | **Yes** |  |
| Huawei | Depends  | If the target donor CU is selected by the source CU of the IAB-MT, the potential proposal 1-3 is agreeable. Otherwise, such notification may not necessary since the F1 terminating donor select the target donor CU, and it can inform the source CU of the IAB-MT to perform IAB-MT HO. |
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For setting up resources for inter-donor F1 transport migration, the donor CU serving the mIAB-DU and the target donor CU for the mIAB-MT HO need to coordinate. It needs to be discussed how does the two donor CUs “find each other” (as formulated in [Xmi5752]). Assuming the previous proposal is agreeable, the “contact details” of the target donor CU for the mIAB-MT HO can be provided to the donor CU serving the mIAB-DU by the source donor CU for the mIAB-MT HO.

**Q1-4: Which “contact details” of the target donor CU for the mIAB-MT HO are provided to the donor CU serving the mIAB-DU by the source donor CU for the mIAB-MT HO?**

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| **Company** | **Answer** |
| **Ericsson** | gNB ID of the target, IP address, mIAB-MT ID(s) |
| Huawei  | Suggest to focus the previous discussion first. From our view, the identifier of the target donor CU and the identifier of mobile IAB-node are needed, if the potential Proposal 1-3 is agreeable.  |
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Papers [QC5359] and [Fuj5434] discuss the use of Rel-17 F1 Transport Migration procedure to multiple subsequent partial migrations of mIAB-node. With respect to the previous question, there may exist Xn connectivity between the donor CU serving the mIAB-DU and the target donor CU for the mIAB-MT. [QC5359] proposes that, the donor CU serving the mIAB-DU and the target donor CU for the mIAB-MT HO can coordinate by directly exchanging Xn IAB Transport Migration messages.

**Q1-5: Do you agree that, for partial migration of mIAB-node, the donor CU serving the mIAB-DU and the target donor CU for the mIAB-MT HO can directly exchange Xn IAB Transport Migration messages, in case direct Xn connectivity exists (or is established) between the two donor CUs?**

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| **Company** | **Answer** | **Comment** |
| **Ericsson** | **Yes** | (If our understanding is right, the issue at hand is: which node should negotiate with the target for mIAB-MT HO the F1 transport migration for mIAB-DU traffic: the F1-terminating node or the source for the mIAB-MT HO? Our answer is based on that understanding.)The F1-terminating donor should negotiate F1 transport migration with the target donor CU for the mIAB-MT HO. |
| Huawei | Yes |  |
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[Len5488] proposes to reuse the IAB Transport Migration Management procedure, to release the resources under IAB-donor-CU2 and to set up the resources under IAB-donor-CU3 for offloaded traffic, for consecutive partial migrations of mobile IAB-node. The Moderator believes that this proposal is implied in Q1-5.

## Support for scenarios with no Xn/IP connectivity between donors

The support for these scenarios was discussed in [Eri5345], [QC5359], [Nok5454], [Hua5680], [Sam5714], [ZTE5439] and [Len5488]. The two key issues in the discussion are:

* Whether to support partial inter-donor migration via NGAP.
* Whether to support inter-donor mIAB-node migration via NGAP.

**Q2-1: Should RAN3 specify NG-based partial inter-donor migration for mIAB-nodes?**

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| **Company** | **Answer** | **Comment** |
| **Ericsson** | **Yes** | **Xn** is typically (albeit not always) **established between neighbour gNBs**. Lack of support for NG-based partial migration would mean that the mIAB-DU would need to be migrated between donors quite frequently. As soon as the mIAB-node leaves the radio coverage of the neighbour of the F1-terminating donor CU, the mIAB-DU will need to be migrated at every mIAB-MT inter-donor HO from that point onwards. |
| Huawei | See comments  | We tend to discuss the scenarios in separate way:1. **There is no IP route between the F1 terminating CU and the target donor DU**. Then partial migration should no longer be used and IAB-DU migration should be performed.
2. **There is no Xn interface between the F1-terminating CU and the target donor CU**. If using partial migration in this case, the Xn based HO can be performed for the IAB-MT, but how to perform the traffic migration to the target donor needs more discussion.
3. **There is no Xn interface between the source CU of IAB-MT and the target donor CU**. In this case, if we want to support partial migration, the NG based migration can be performed for the IAB-MT. How to perform the traffic migration to the target donor needs more discussion.

The scenario 1 and 2/3 may have some dependency. For example, not sure it is still valid that if there is no Xn interface between the two donors, but the source donor can have IP route towards the target donor DU. In addition, we think the **Scenario 2 and Scenario 3 may be possible, but should be deprioritized**, RAN3 can first focus on the case with Xn interface.  |
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**Q2-2: Should RAN3 specify NG-based inter-donor migration for mIAB-nodes?**

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| **Company** | **Answer** | **Comment** |
| **Ericsson** | **Yes** | **Xn connectivity between donor CUs cannot be ensured along the entire path** of the mIAB-node, so, inter-donor migration, including the inter-donor migration of the mIAB-DU should be supported.In addition, we think that the following options should be considered:* Xn-based forwarding, where a donor CU with an Xn connection to the mIAB-DU’s donor and the mIAB-MT’s donor can relay the XnAP messages between the donors.
* Using the mIAB-node as the relay for communication between the donors.
 |
| Huawei | See comment | This question is not clear to us, is it aims at the IAB-DU migration via NG interface? If there is no Xn interface between the source CU of IAB-MT and the target donor CU, IAB-MT may perform NG based HO, then the following issue should be solved: * If IAB-MT HO is performed before IAB-DU migration, how to maintain the F1 connection between the mobile IAB-DU and the source F1 terminating CU, after the IAB-MT’s HO and before the UE’s HO.
* If IAB-DU migration is performed before IAB-MT HO, how to establish and maintain the F1 connection between the mobile IAB-DU and the target donor CU, before the IAB-MT’s HO.

Based on the above understanding, we do not understand why to consider the Xn based forwarding or the mIAB as relay between donors. |
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## Details of mIAB-DU inter-donor migration and UE HO

Papers [Fuj5435], [QC5359], [Nok5454] and [Hua5681] discuss the migration of F1 connection of mIAB-DU and the HO of served UEs.

**Potential proposal 3-1: RAN3 to downselect between Alt1 and Alt2 for implementing two logical mIAB-DUs.**

**Q3-1: Do you agree to Potential proposal 3-1?**

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| **Company** | **Answer** | **Comment** |
| **Ericsson** | **Yes** | We have liaised RAN1, RAN2 an RAN4. **It is quite clear from the LS replies that Alt1 is less complex, with less spec impact**. There is no reason to ask the other WGs the same question again. |
| Huawei | Yes | Based on the response from other WGs, we see Alt 1 is a better choice. If needed, RAN3 can liaise RAN1 on how to implement Alt 1 after we have decision. |
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Before it starts handing over the served UEs towards the target donor, the source donor needs to know the IDs of the cells served by the second logical mIAB-DU.

**Q3-2: How should the source donor CU for mIAB-DU migration find out the cell IDs served by the second logical mIAB-DU?**

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| **Company** | **Answer** |
| **Ericsson** | **Via XnAP, from the target donor CU for mIAB-DU migration.** For mIAB-DU migration, similar to partial migration, the source CU should send a request asking the target CU to accept the mIAB-DU, indicating the necessary resources. Some kind of “mIAB-DU context” should be provided. In the response, the target CU can indicate to the source CU the NCGIs of cells served by the second logical mIAB-DU.  |
| Huawei | Not sure on the intention of this question, why the source CU should find out the cell ID of target logical DU? Is this for determining the target cell of UEs? If so, the source CU can know that from the UE’s measurement report as traditional way if the target cell is activated. Alternatively, if the two logical DUs have some cell configurations in common (e.g., with the same beam directions, the same slot configurations, and different carriers), the source cell served by source logical DU is 1-to-1 mapped to the target cell served by the target logical DU, then the UE’s target cell can be directly assigned by the mobile IAB-node or by the source CU after knowing the cell mapping relationship. |
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Before it starts handing over the served UEs towards the target donor, the source CU also needs to know that the second logical mIAB-DU established an F1 connection towards the target CU.

**Q3-3: How should the source donor CU for mIAB-DU migration learn that the second logical mIAB-DU has successfully established an F1 connection towards the target CU?**

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| **Company** | **Answer** |
| **Ericsson** | **Via XnAP, from the target donor CU for mIAB-DU migration.** Similar logic as in the previous answer - target CU can indicate to the source CU the NCGIs of cells served by the second logical mIAB-DU. This could serve as an implicit indication that the F1 has been established. |
| Huawei | After the target logical IAB-DU establishing F1 connection towards the target donor CU, **the mobile IAB node or the target CU can send notification to the source CU**, then the source CU can know the target F1 connection is ready.  |
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## mIAB-DU inter-donor migration

Whether an mIAB-DU can execute inter-donor migration, while the co-located mIAB-MT stays connected to the same donor CU before and after the mIAB-DU migration, is discussed in papers [Eri5345], [QC5359], [Xmi5752], [Len5488], [Sam5714] and [Hua5681].

**Q4: Can an mIAB-DU execute inter-donor migration while the co-located mIAB-MT stays connected to the same donor CU before and after the mIAB-DU migration?**

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| **Company** | **Answer** | **Comment** |
| **Ericsson** | **Yes** | * If mIAB-DU migration cannot be executed without an mIAB-MT HO, this would mean that the **CU serving the mIAB-MT decides about the migration of the F1 connection of the mIAB-DU**. **This does not make any sense at all**. The migration of the F1 connection shall exclusively be in the hands of the F1-terminating CU.
* Moreover, it may hold that the F1-terminating CU has a larger coverage than the RRC-terminating CU.
* We do not understand **how the decoupling introduces a new architecture**. Does Rel-17 partial migration introduce a new architecture? Of course not. Remember that we already agreed that the mIAB-MT and mIAB-DU can be served by different donors. Does that introduce a new architecture? No. The term “anchor CU” is just a term denoting the F1-terminating CU.
* If we tie the mIAB-DU migration to the mIAB-MT HO, the **mIAB-DU migration may fail because a new mIAB-MT HO may occur before mIAB-DU migration is over**. This is quite likely to happen in areas covered by small cells.
* Conversely, decoupling mIAB-DU migration from mIAB-MT HO enables the **decoupling of their respective failures** and **enables gradual HO of the served UEs**.
 |
| Huawei | Yes, but with comments | The IAB node migration is usually considered when the radio condition between the mobile IAB-MT and its source parent DU becomes poor because of moving, thus the mobile IAB-MT needs to perform HO, and the DU migration is performed because the MT has switched or will switch (depends on the sequence we used for supporting full migration).Considering that the sequence of full migration can be IAB-DU migration first or IAB-MT migration first, but it is hard to limit the time interval between the IAB-MT HO and the IAB-DU migration, in this sense, if IAB-DU migration is performed first, the IAB-MT can stay connected to same donor for some time. In a word, our view is: **an mIAB-DU execute inter-donor migration while the co-located mIAB-MT may stay connected to the same donor CU for a while after the mIAB-DU migration. The time interval is up to implementation.**  |
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