3GPP TSG-RAN WG3 #117-e R3-225153

Online, 15th -24th August, 2022

Agenda Item: 13.3

Source: Huawei (moderator)

Title: Summary of CB: # IAB3\_MobEnh

Document for: Approval

# Introduction

This paper is for the following offline discussion:

|  |
| --- |
| **CB: # IAB3\_MobEnh****- Discussions on support for legacy UEs****- Discussion on procedures for group mobility****- Discussion on RACH-less access for UEs served by the mobile IAB** **- Discussion on mobile IAB node capabilities exchange with other nodes****- Discussion on pre-storing F1AP and BAPAP configurations to facilitate mobility****- Discussion on user location information reported while a UE is connected to a mobile IAB node**(HW - moderator)Summary of offline disc [R3-225031](file:///C%3A%5CUsers%5Cs00539476%5CAppData%5CLocal%5CTemp%5CRar%24DIa11268.17365%5CInbox%5CR3-225031.zip) |

The following papers will be covered as assigned by the chair:

|  |  |  |
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| [R3-224233](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224233.zip) | Handling legacy UE in UAM using Mobile-IAB (KT Corp., LG Uplus, SK Telecom, ETRI) | discussion |
| [R3-224355](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224355.zip) | Discussion on group mobility for mobile IAB and Ues (Huawei) | discussion |
| [R3-224356](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224356.zip) | Discussion on RACH optimization for connected UE of mobile IAB (Huawei) | discussion |
| [R3-224378](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224378.zip) | Discussion on mobility enhancements (Nokia, Nokia Shanghai Bell) | discussion |
| [R3-224430](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224430.zip) | Mobility enhancements for mobile IAB-node and its served UE (Lenovo) | discussion |
| [R3-224431](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224431.zip) | (TP to TS 38.401) Support for group mobility of mobile IAB-node. (Lenovo) | other |
| [R3-224497](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224497.zip) | Enhancements for IAB-Node Mobility IAB (Ericsson) | discussion |
| [R3-224505](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224505.zip) | Enhancements for mobility of IAB-node and its served UEs (Qualcomm Inc.) | discussion |
| [R3-224706](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224706.zip) | Update of location information for cells of mobile IAB (Fujitsu) | discussion |
| [R3-224712](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224712.zip) | Reduction of UE migration in mobile IAB scenario (ZTE) | discussion |
| [R3-224713](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224713.zip) | Discussion on location update of UEs served by mobile IAB (ZTE) | discussion |
| [R3-224768](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224768.zip) | Discussion on group mobility (Xiaomi) | discussion |
| [R3-224827](file:///D%3A%5CRAN3%5CRAN3-117e%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224827.zip) | Discussion on mobility enhancements (samsung) | discussion |

Please give your feedback before Thursday, 18 August, 2022, 23:59 UTC. This is to allow we can discuss the summary for this CB in the mobile IAB online session in Monday 22 August, 2022.

Phase 2: Please give your feedback on the proposals before Tuesday, 23 August, 2022, 08:00 UTC.

# For the Chairman’s Notes

To capture the following proposal as agreements

**Proposal 1-1: For group mobility enhancement, RAN3 to discuss how to support signaling of information related to multiple UE contexts in a single message.**

**Proposal 1-2: RAN3 to discuss group signaling for handover preparation, path switch, and context release for all connected UEs of mobile IAB-node**

**Proposal 2: For full migration, RAN3 discuss the sharing of configuration and/ or UE context between two logical DUs in the mobile IAB-node.**

**Proposal 3: RAN3 discuss whether to allow pre-storing of some configurations (e.g. F1, BAP related) at the mobile IAB-node, and investigate which configurations are suitable for pre-storing.**

**Proposal 4-1: RAN3 to discuss whether to enable the donor CU know the “mobile” IAB-node. The potential solutions can be: mobile IAB-node indication via RRC, mobile IAB-node indication via capability information, mobile IAB-authorized notification from CN.**

**Proposal 4-2: RAN3 to discuss whether the target IAB-donor should know the migrating IAB-node is “mobile IAB-node” from the source IAB-donor.**

**Proposal 4-3: RAN3 to check with SA2 whether to introduce the “mobile IAB authorized” from CN to IAB-donor, for the mobile IAB-node.**

**Proposal 4-4: RAN3 inform RAN2 and SA2 to discuss whether to distinguish the on-board UEs and surrounding UEs.**

**Proposal 5: RAN3 wait for SA2 progress on the UE location issue.**

# Discussion

## Enhancement for Signaling reduction and service reduction

The contributions belong to this CB has raised various aspects for signaling reduction, based on the moderator’s understanding, the different solutions are grouped into four categories: group handover, context sharing between logical DUs, skip RACH for UEs, pre-storing configuration for mobile IAB.

### Group handover.

Considering that the target CU should consider the traffic load of the migrating IAB-DU’s served UEs to make the admission control decision. Moreover, when the target CU performs F1AP configuration in the target path, and it will be beneficial if the target CU has knowledge of all the UE’s traffic to be switched to its topology, otherwise, multiple F1AP signallings should be used if the target CU only configure target path for one UE’s traffic at one time. In [[R3-224355](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224355.zip) HW], it is proposed to support the group/combined HO at least for all connected UEs of a mobile IAB, and discuss whether to support the combined HO for mobile IAB-MT and the connected UEs.

Similarly, [[R3-224430](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224430.zip) Len] propose to define a group-based Handover Request and Handover Request Acknowledge in Xn interface for IAB-MT and all related served UEs, as well as a new non-UE associated F1AP procedure for group-based UE context setup of all served UE of mobile IAB-node.

From the aspect of signaling reduction and admission control at the target donor CU, [R3-224497 E///] also propose to discuss signalling for group handover of UEs served by an mIAB-node, where handover information pertaining to multiple UEs may be included in one message.

[R3-224768 Xiaomi] also propose some phases for group mobility, includes: group handover preparation phase, group handover execution phase, group path switch phase, and group context release.

[R3-224505 QC] mentions that group mobility enhancements refer to the bundling of UE-specific information for a group of UEs into a common message, and propose that group mobility enhancements should be considered after progress has been made with the baseline procedures.

Based on the common part of these papers, the moderator tries to give the following proposal,

**Proposal 1: For group mobility enhancement, RAN3 discuss how to support the bundling of UE information for UEs connected to the mobile IAB.**

Companies are invited to provide feedback on the following questions.

**Q1-1: Do you agree the proposal 1?**

**Q1-2: Do you think the combined HO for mobile IAB-MT and the connected UEs is necessary for the group mobility enhancement?**

**Q1-3: If you agree P1, do you think the following phases should be considered when design group based signaling: group handover preparation phase, group handover execution phase, group path switch phase, and group context release.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Reasons/Comments** |
| LG Uplus | Q1-1) Yes | We think group mobility feature is essential part. Handling the information of UEs between IAB-MT and donor-CU seems most critical to us. |
| Q1-2) No | If combined HO means simultaneous IAB-MT and UEs HO, it seems too risky to us. |
| Q1-3) Yes | 4-step phase would be fine as a baseline. Group handover execution phase might need to be refined. |
| **Ericsson** | **Q1-1) Yes, but see comment****Q1-2) No****Q1-3) Yes** | **Q1-1)** Provided that “bundling” means sending, within one message, information pertaining to multiple UEs.**Q1-2)** The **mDU and mMT handovers should be decoupled,** as we explained in R3-224496. |
| **Huawei** | Q1-1 YesQ1-2 Yes for full migrationQ1-3 Yes | Q1-2: If full migration is performed, we see the benefits of the combined handover for the IAB-MT and UEs, for the admission control in target donor CU, and the signalling reduction for configuring the target path. |
| **Qualcomm** | Q1-1 YesQ1-2 NoQ1-3: Yes to HO prep, path switch, context release.  | Q1-2: We already discussed full migration in Rel-17. In this discussion, we assumed that DU change was preceded by MT migration. Q1-3: Group handover for RRC-related signaling is in RAN2 scope. |
| Lenovo | Q1-1: YesQ1-2: YesQ1-3: see comments | For Q1-3, for handover execution phase and context release phase, separate procedures are needed for MT and UEs. |
| **Nokia** | Q1-1: NoQ1-2: NoQ1-3: No | **Please clarify what can be saved by bundling of UE information. This is different to the “group” signaling introduced in previous release that other information for the UEs are not changed, and only need to change the TNL address that is common for UEs. In this case, there are “Many” context are specific for each UE, e.g. handover request message. What can be saved by the bundling?** |
| **Fujitsu** | Q1-1: YesQ1-2: NoQ1-3: see comments | **Q1-2:** Whether to support the combined HO for mobile IAB-MT and the connected UEs should be determined after the baseline procedure is finished, since it may not be supported in some cases, e.g., the full migration procedure which is based on R17 partial migration.**Q1-3:** OK to consider the group signalling in different phases of handover procedure for UEs. Note that group handover execution cannot be supported by legacy UEs. |
| **Xiaomi** | **Q1-1, Yes** **Q1-2, No****Q1-3, Yes but** | **Q1-2,** we understand the intention is for admission control, but we think it’s better to let theIAB-MT perform handover at first and check with the target whether there are sufficient resources for the UEs served by IAB-node, if yes, then UE migration can be performed, if no, partial migration can be performed. **Q1-3,** except group handover execution phase, which should be in RAN2 scope, others are Ok. |
| **ZTE** | Q1-1: YesQ1-2: NoQ1-3: See comments | For Q1-2, it is suggested to clarify the meaning of combined HO of mobile IAB-MT and the connected UEs. we think the mobile IAB-MT and the connected UE should perform the HO execution separately.For Q1-3, it is suggested to remove the group HO execution phase. |
| **KT** | **Q1-1) Yes****Q1-2) No****Q1-3) Yes** | Event will be too frequent and complex. Prefer to leave only to mDU HO |
| **Samsung** | Q1-1: YesQ1-2: See commentsQ1-3: Yes to HO prep, path switch, context release  | Q1-2: We think source IAB-donor prefers to perform multiple consecutive partial migration until full migration is necessary. Combined HO for mobile IAB-MT and the connected UEs is only feasible when source IAB-donor decides to perform full migration directly.Q1-3: Agree with Qualcomm. |
| **AT&T** | Q1-1) YesQ1-2) NoQ1-3) Yes | On Q1-2) Mobile IAB-MT handover needs to happen before mobile IAB-DU migration so UEs connected to mobile IAB-DU cannot be grouped with mobile IAB-MT in a common group handover. |
| **MITRE** | Q1-1 YesQ1-2 NoQ1-3: Yes |  |
| **Verizon** | Q1-1 YesQ1-2 NoQ1-3: see comments. | Q1-3 needs further discussion and clarification. The path switch could be separated for date and control paths? |

**Summary：14 companies replied.**

For Q 1-1), 13 companies respond with “Yes”, while 1 company responds “no”, so we can see a clear majority agrees the proposal 1. The opponent has some concern on “what can be saved by bundling of UE information”. Since the proposal is high level and just suggest RAN3 to discuss how to support such bundling, we can discuss the signaling design and more details on what can be saved in future meeting, so the moderator would suggest to capture the following proposal.

**Proposal 1-1: For group mobility enhancement, RAN3 discuss how to support the bundling of UE information for UEs connected to the mobile IAB.**

For Q1-2), 3 companies are fine with the combined HO for the mobile IAB-MT and the connected UEs in case of full migration, while the rest 11 companies replied “no” to this question, we see majority companies tend to think the IAB-MT and the connected UEs perform HO separately. So, there is no proposal for the combined HO of IAB-MT and the UEs.

For Q1-3), 1 company replies “no” with similar concern on the Q1-1), 1 company think this need further discussion for path switch. 12 companies are fine with the group signaling design for at least the group handover preparation phase, group path switch phase, and group context release. Several companies doubt about the feasibility of group handover execution phase, and this is actually R2 scope, so the moderator suggests the following proposal for this issue:

**Proposal 1-2: RAN3 investigate the following procedures when consider group signaling for all connected UEs of mobile IAB-node: handover preparation, path switch, and context release.**

###  Context sharing between two logical DUs .

[[R3-224378](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117-e%5CDocs%5CR3-224378.zip) Nok] mentioned that the co-located source DU and target DU can share the UE context/configuration considering they are co-located, and this can reduce signaling.

[R3-224827 SS] also propose: In order to decrease signaling overhead caused by UE context migration, some low layer configurations can be shared between two logical DUs which are in the same entity.

We can see the common part for the two papers is that some configuration/UE context can be shared between two logical DUs inside a same mobile IAB-node, and this is beneficial for signaling reduction. And the moderator try to give the following proposal:

**Proposal 2: In case of full migration, RAN3 discuss the optimization for signaling reduction that allow some configuration/UE context be shared between two logical DUs in the mobile IAB-node**

Companies are invited to provide feedback on the following question:

**Q2: Do you agree Proposal 2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Reasons/Comments** |
| LG Uplus | Neutral | Not so critical to us |
| **Ericsson** | **Not sure** | Shouldn’t the donor CUs always be involved in the coordination? |
| Huawei | Agree | If some context/configuration can be shared between the two logical DUs, it will be beneficial for less signalling overhead and service interruption reduction. |
| Qualcomm | Yes | RAN3 may consider optimizations along these lines. The proposal is sufficiently high level. Discussion on this topic should certainly be allowed. |
| Lenovo | Yes | Because the air interface between UEs and mobile IAB-node doesn’t change during the full migration, the lower layer configuration can be shared between two logical IAB-DUs. |
| Nokia | Yes | Agree with QC |
| **Fujitsu** | **Yes** | We believe the configuration/context for the same UE can be shared between tow logical DUs which are co-located in the same IAB-node. It’s a feasible way to save the signalling cost of F1AP messages during full migration to set up the context for the UEs which are going to be handed over from the cell in the source logical DU to the cell in the target logical DU. |
| **Xiaomi** | **Yes** | We understand the common part of the UEs is they are served by the same physical IAB-node, based on this, we can further discuss which kind of information can be saved in group UE handover preparation phase.  |
| ZTE | Yes | We also think this is not critical. But we are open to this at this early stage.  |
| **KT** | Neutral | No strong opinion on this issue |
| **Samsung** | **Yes** | Agree with QC. |
| Deutsche Telekom | Yes | We see it as preferable to exchange such information between the logical DUs as from UE perspective the access link doesn’t change from radio propagation perspective.  |
| AT&T | Yes | We are open to this consideration |
| MITRE | Yes |  |
| Verizon | Yes |  |

**Summary：**

15 companies replied.

12 out of the 15 agree the proposal 2, 2 companies have no strong opinion, and 1 company is not sure about the proposal. It seems that the beneficial is acknowledged by clearly majority companies. So, the moderator will suggest the following proposal:

**Proposal 2: For full migration, RAN3 discuss the optimization that allow some configuration/UE context be shared between two logical DUs in the mobile IAB-node.**

###  Skip RACH for served UEs

[R3-224430 Len] indicates that the timing advance for the served UEs of the mobile IAB-node can be shared between the two logical DUs which are co-located at the same mobile IAB-node, so the served UEs of the mobile IAB-node can perform HO without RACH, during full migration. [R3-224356 HW] just gives similar proposal. The HO without RACH can reduce signaling and avoid RACH collision among UEs connected to the mobile IAB-node. The moderator would like to propose the following:

**Proposal 3:** **The served UE of mobile IAB-node may perform handover without RACH during inter-donor full migration together with the mobile IAB-node. More details about how to skip RACH for these UEs should involve RAN2.**

 Companies are invited to provide feedback on the following question:

**Q3: Do you agree Proposal 3?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Reasons/Comments** |
| LG Uplus | Neutral | Not so critical to us |
| **Ericsson** | **This is entirely a RAN2 issue** |  |
| Huawei | Agree | The UE HO skip RACH should be discussed in RAN2.  |
| Qualcomm | Disagree | We are not principally opposed but this topic is in RAN2 scope.In this context, RAN3 should agree that UE needs to perform security change during full migration. This needs to be taken into account by RAN2 when discussing the RACH-less HO issue. We therefore propose:**Proposal 3:** **The served UEs of the mobile IAB-node to perform security change as part of the HO between logical DUs.** |
| Lenovo | Yes | Served UEs can perform HO with RACH as baseline, and HO without RACH can be studied as an enhancement. |
| Nokia | No | This should be discussed in RAN2. |
| **Fujitsu** | Neutral | Ok to consider the RACH-less handover for the UEs connected to mobile IAB-node. But that should be discussed after the baseline procedure is determined and based on the discussion of Rel-18 mobility enhancement in RAN2. Thus, it should be deprioritized. |
| **Xiaomi** | **Agree but should be discussed in RAN2** | we think RACH-less is applicable for the group handover of the UEs served by a same IAB-node, as the TA is not changed and known by the IAB-node and UE, UE can easily achieve UL synchronization without RACH procedure, and also can avoid RACH conflict, but this should be discussed in RAN2, if anything needed in RAN3, we can wait for RAN2’s LS or progress |
| ZTE | Disagree | Suggest to discuss this in RAN2 first. |
| **KT** | Not Sure | This should be consulted in RAN2 |
| **Samsung** | **See comment** | This should be discussed in RAN2. |
| Deutsche Telekom | Agree, but | We acknowledge the benefits of this proposal, but this topic is under RAN2’s responsibility. No need to discuss it here in RAN3. |
| AT&T | Support | But this should be led by RAN2 |
| MITRE | See comment | Agree with Qualcomm’s wording |
| Verizon | See Comment | Agree with QC that security change should be considered during UE group HO. |

**Summary：**

15 companies replied.

Almost all companies agree that the RACH-skip issue of UEs should be discussed by RAN2, so no proposal will be given for this issue.

###  pre-storing the F1 and BAP configurations at the mobile IAB-node

[R3-224497 E///] pointed out that in some typical scenarios that the mIAB-nodes mounted onboard public transport vehicles, such as city buses and trains, the routes of public transport vehicles are usually predetermined and known in advance. For such scenario, the paper propose to consider the pre-storing the F1 and BAP configurations at the mIAB-node before the mIAB-node reaches connects to the area where these settings are to be applied. These configurations can be activated once the mIAB-MT connects to the corresponding cell.

The moderator try to give the following proposal based on the paper:

**Proposal 4: RAN3 investigate whether to allow pre-storing the F1 and BAP configurations at the mobile IAB-node.**

Companies are invited to provide feedback on the following question:

**Q3: Do you agree Proposal 4?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Reasons/Comments** |
| LG Uplus | Agree | As the first step, public transport usage scenario is preferred and route information seems useful for mobility parameter optimization. |
| **Ericsson** | **Agree** | Although we only discussed the scenario with known trajectory in the paper, in fact, **the pre-storing is needed even in random trajectory scenarios**, where multiple candidate configurations can be stored, and the one to be activated depends on where the mIAB moves. |
| Huawei | Agree but with some comments | 1) It is more applicable to the scenario that the trajectory is predetermined for the mobile IAB-node. 2) BAP configuration should be RAN2 scope. 3) Which configurations are suitable to be pre-stored? This needs further discussion. |
| Qualcomm | Agree | This is a good idea and needs further discussion. RAN3 should take the lead on this discussion, and if anything can be identified related to BAP, they should liaise RAN2. Agree with Huawei’s point 3): Identify which configurations are suitable to be pre-stored. |
| Lenovo | Agree, but | Pre-storing F1 and BAP configuration is beneficial especially for the scenario with known trajectory. This can be discussed after design for full migration procedure. In case of the second logical DU setups F1 with target CU in advance, the mobile IAB-node can also obtain the F1 and BAP configuration before MT migration. |
| Nokia | Agree with comments | Agree with HW. It is better to first discuss what the “configuration” is. |
| **Fujitsu** | Agree, but | Generally ok toconsider the pre-configuration of F1AP and BAP configuration for transport migration to the mobile IAB-node. But that should be an enhancement to be discussed after the baseline procedure is determined. |
| **Xiaomi** | Agree with comments | We think it’s good to have pre-storing configuration, but the proposal only mentioned pre-storing configuration in mobile IAB, we’re wondering whether it is possible that IAB-donor can also have some pre-storing configurations for the unexpected mobile IAB-node’s access.  |
| ZTE | Agree | We are open to discuss this. |
| **KT**  | Agree | Pre-storing F1 and BAP configuration at the mobile-IAB node will help to reach the coverage enhancement initially planned by operators |
| **Samsung** | Agree | In fact, it looks more like that whether to allow pre-preparation for upcoming full migration. |
| Deutsche Telekom | Agree with comments | We share Huawei’s view.For dedicated tracks in public transport, the configuration storage might be useful, but are there other scenarios that benefit from that?  |
| AT&T | Agree | We are open to this consideration |
| MITRE | Agree |  |
| Verizon | Agree |  |

**Summary：**

15 companies replied.

Almost all companies agree the intention of this proposal, and some companies has comments on the applied scenario and the detailed configuration. To address the comments from companies, the proposal 4 is modified as follows:

**Proposal 3: For the scenario that the trajectory is predetermined for the mobile IAB-node, RAN3 investigate which configurations related to the F1 and BAP configurations are suitable to be pre-stored at the mobile IAB-node, and discuss whether to allow such pre-storing.**

## Mobile IAB indication

[R3-224430 Len] has the two following proposals on introducing mobile attribute in air interface, and Xn interface:

* *Mobile IAB-node informs IAB-donor-CU with its mobile attribute during integration or after integration.*
* *Mobile attribute of mobile IAB-node needs to be exchanged between source IAB-donor and target IAB-donor via XnAP during inter-donor migration procedure.*
* *Mobile IAB-node broadcasts its mobile attribute to UEs, e.g., via SIB1.*

Besides, this paper also proposes RAN3/2 to discuss whether to differentiate onboard UEs and surrounding UEs for mobile IAB-node.

[R3-224505] proposes that to allow for mobile-IAB-specific optimizations, the IAB-DU to indicate if a cell aims to cover onboard users. This is similar to the [4430 Len]’s third proposal as pasted above.

Based on the moderator’s view, we may need to clarify the motivation before determine to introduce the mobile attribute informed from mobile IAB-node to the IAB-donor-CU, and in Xn interface during inter-donor migration. Moreover, the broadcast of mobile attributes to UEs aims at optimization for the on-board UEs, but it is RAN2 territory. In RAN3, we can first clarify that whether and how to differentiate the on-board UEs and surrounding UEs, if this is not possible, the broadcast of mobile attribute in the air interface seems not necessary.

Companies are invited to provide feedback on the following questions.

**Q5-1: Do you think the mobile IAB-node indication need to be send from the mobile IAB node to the IAB-donor CU during the integration or after integration?**

**Q5-2: Do you think the mobile IAB-node indication need to be exchanged between source IAB-donor and target IAB-donor via XnAP during inter-donor migration procedure.**

**Q5-3: Do you think the network and/or the UE itself needs to know whether the UE is an on-board UE or a surrounding UE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Reasons/Comments** |
| LG Uplus | Q5-1) Yes | Mobile IAB should be distinguished from Fixed IAB since lots of mobility features are different. Seems essential. |
| Q5-2) Yes | Similar reasoning as the response of Q5-1) |
| Q5-3) Yes (only for network) | It could be useful for preventing cell reselection of normal cell (which means non-mobile-IAB cell) by on-board UE. However, we prefer transparent solution to UE since we consider legacy UE service (legacy UE means Rel-15/16/17 UE) |
| **Ericsson** | **Q5-1) Yes, during the integration****Q5-2) Yes****Q5-3) No** | **Q5-3)** The motivation for the proposal is to prevent surrounding UEs to migrate together with the mIAB. This is an enhancement targeting surrounding UEs, which has be precluded in the WID. |
| Huawei | Q5-1) not sureQ5-2) not sureQ5-3) No | For Q5-1 and Q5-2, More clarification about the motivation for introducing the mobile IAB-node indication to the IAB-donor during the integration procedure, and the Xn handover preparation procedure are expected. Proponents please explain why the current IAB-node indication in message 5 and the Xn HO REQUEST message is not enough.For Q5-3: Agree with Ericsson. |
| Qualcomm | Q5-1) YesQ5-2) YesQ5-3) Yes (only for network and only if info is available) | Motivation for 5-1 and 5-2: The CU needs to have this information so that it won’t use the mobile IAB-node as a parent node during IAB-node migration. It may also use it for smart UE HO decisions.5-3: If the mobile IAB-node has information related to onboard coverage, e.g., cell X targets onboard UEs while cell Y doesn’t, it should disclose this information with the CU. This allows the CU to make smarter HO decisions.  |
| Lenovo | Q5-1: YesQ5-2: YesQ5-3: Yes | For 5-1 and 5-2, mobile IAB-node can support full migration while fixed IAB-node doesn’t support full migration, it’s necessary for the serving donor and target to be aware of the mobile attribute. And we also agree with QC’s motivation.For 5-3: Agree with LGU and QC. In addition, it’s not an optimal choice for the surrounding UEs to migrate together with the mobile IAB-node. It’s necessary to differentiate onboard UE and surrounding UE at least for the network. |
| Nokia | Q5-1) not sureQ5-2) not sureQ5-3) yes with comments | Q5-1: if it is via RRC, it should be discussed in RAN2.Q5-2: If it is a mobile IAB authorized indication, then it should be transferred to target. Otherwise, why is it needed?Q5-3: this is beneficial, but should this be discussed in other WGs? For example, it may be in RAN2 (UE send an indication to CU?), or SA2 (CN/application server for train/ticket know when a UE board/leave the train, then send it to CU?) |
| **Fujistu** | Q5-1: not sureQ5-2: not sureQ5-3: Yes (only for network) | **Q5-1:** Agree with the moderator that the motivation of the mobile IAB indication sent to the donor-CU should be clarified. For example, if we want to restrict the handover of UE to a mobile IAB-node, we should make it clear whether it’s needed to prevent the UE to be handed over to a mobile IAB-node in any state, e.g., in stationary state. And we may need to discuss whether the mobile IAB-node should deliver capability information, e.g. full migration capability or group signalling, instead of a mobile IAB indication.**Q5-2:** Same to Q5-1, the necessity of the mobile IAB indication delivered between two IAB-donor-CUs should be clarified.**Q5-3:** It may be necessary for network to know whether the UE is on board or not. For example, the network can determine to initiate the group handover for the on-board UEs or the network can prevent the unnecessary handover between the cell of mobile IAB-node and the neighbour cell for the on-board UEs as well as the surrounding UEs. For idle/inactive UEs, enhancement on cell (re)selection can be studied when the UEs are camping on the cell of mobile IAB-node, which should be deprioritized in Rel-18. Otherwise, the UEs don’t need to determine whether they are on board or not. |
| **Xiaomi** | Q5-1: not sureQ5-2: not sureQ5-3: not sure | Q5-1 and Q5-2, we think IAB-donor should be aware of whether it’s a mobile IAB-node or not, but it is also possible this information is from CN, after the registration of the mobile IAB-node, the CN may know whether it’s a mobile IAB or not according to its subscription info, we may need to check with SA2.Q5-3, we agree it would be beneficial for the network knowing the on-board UE or surrounding UE, but we’re not sure how to realize it, do we need an on-boarding procedure? or should this be SA2’s scope?  |
| ZTE | Q5-1: see commentsQ5-2: No sureQ5-3: No | For Q5-1, we think it is more appropriate to discuss this in RAN2. For example, the mobile IAB-MT send the mobile IAB-node indication to donor CU via RRC signalling during RRC setup. For Q5-2, agree with Nokia that the mobile IAB authorized IE may be enough to be delivered between source and target donor if it is supported. For Q5-3, agree with Ericsson that the WID has stated that “No optimizations for the targeting of surrounding UEs.”. |
| **KT** | Q5-1) YesQ5-2) YesQ5-3) Yes | Intention is to introduce **mobility** in IAB node. This should be distinguished from the beginning |
| **Samsung** | Q5-1: YesQ5-2: YesQ5-3: see comments | Q5-1 and Q5-2: Agree with Qualcomm.Q5-3: We have the same question with Xiaomi, which is that how to realize that the UE is an on-board UE or a surrounding UE. This may be discussed in RAN2. |
| Deutsche Telekom | Q5-1: yesQ5-2: yesQ5-3: yes (for network) | For Q5-1 and Q5-2 we see benefits for the donor-CU to be informed of the mobile IAB type. If it is just a simple indication or if more capabilities may be transferred, can be up to further discussion.We acknowledge that “No optimizations for the targeting of surrounding UEs.” is stated in the WID, but we see the issue in Q5-3 related to optimization for the onboard network inclusive of UEs, not for the surrounding UEs.  |
| AT&T | Q5-1) YesQ5-2) YesQ5-3) Yes | It is essential for network operation to be aware of the mobility of the IAB node. We are supportive of optimizations for Rel-18 UEs to properly associate (or not) to a specific mIAB node. |
| MITRE | Q5-1) YesQ5-2) YesQ5-3) Yes |  |
| Verizon | Q5-1) YesQ5-2) YesQ5-3) Yes | For 3), it will be beneficial to give on-board users the option to attach to an M-IAB node. |

**Summary：**

15 companies replied.

For Q5-1), 10 companies support that IAB-node send the mobile IAB-node indication to the IAB-donor during the integration or after the integration procedure, while other 5 companies have concern on the motivation and/or the responsible WG for this issue. The situation is same for Q5-2).

About the motivation, QC clarified that the motivation for the donor CU to know the mobile IAB-node is different from a fixed IAB-node is to prevent the mobile IAB-node to be a parent node during IAB-node migration. But RAN2 discussed the similar issue and had the following agreement.

* The method of not broadcasting “iab-Support” indication, is sufficient to prevent other IAB-node from accessing mobile IAB (without further spec impact).

We know that the SIB 1 of an IAB-DU is generated by itself rather than the donor CU, so, “to prevent descendant nodes connect the mobile IAB-node” seems not a valid motivation anymore. This is similar for the issue in Q5-2).

Besides, some companies think the mobile indication during the integration is send via RRC message, and one company indicated that the donor can also know the mobile IAB-node different from a fixed IAB node from the capability information, no matter which way is taken, these are in RAN2 scope. One company think this can be known by the IAB-donor from the core network, just after the registration of the mobile IAB-node.

About how to enable the target IAB-donor to know the mobile IAB-node is not a fixed IAB-node, some companies propose another solution, i.e. via the transferred mobile IAB authorized indication. This may need further confirm from SA2 about whether to introduce the “mobile IAB authorized” for mobile IAB-node.

For Q5-3), 10 companies support the distinguishing for on-board UEs and surrounding UEs at least for the network side. While the remaining 5 has concerns on the feasibility or the motivation since this seems aims at optimization for the surrounding UEs. Some companies also pointed out this should be discussed by other WGs, e.g. RAN2 and SA2.

Based on the above, the moderator proposes the following:

**Proposal 4-1: RAN3 inform RAN2 to discuss whether introducing mobile IAB-node indication in RRC message towards the IAB-donor-CU.**

**Proposal 4-2: RAN3 to discuss whether the target IAB-donor should know the migrating IAB-node is “mobile IAB-node” from the source IAB-donor. If needed, the following potential solutions can be considered: introducing explicit indication via Xn, or using the transferred mobile IAB-authorized indication if confirmed by SA2.**

**Proposal 4-3: RAN3 to check with SA2 whether to introduce the “mobile IAB authorized” from CN to IAB-donor, for the mobile IAB-node.**

**Proposal 4-4: RAN3 inform RAN2 and SA2 to discuss whether to distinguish the on-board UEs and surrounding UEs.**

## UE location related issue

### TAC/NCGI/RANAC

[R3-224505 QC], [R3-224706 Fujitsu], [R3-224713 ZTE] and [R3-224357 HW] discuss the location information for mobile IAB cells.

[R3-224706 Fujitsu] proposes that the TAC/NCGI broadcasted in the system information of the mobile IAB cell should be changed based on the location of the mobile IAB-MT.

[R3-224505 QC] proposes 3 options for the UE location reported to the AMF. [R3-224713 ZTE] also provides several solutions for the TAC and RANAC configured for the mobile IAB cell. Generally, the solutions can be categorized into two sets:

Set 1: Dynamic TAC/RANAC/NCGI for the mobile IAB cell to indicate physical location when it moves.

Set 2: Dedicated TAC/RANAC/NCGI for the mobile IAB cell.

Considering that the ongoing VMR SI in SA2 also includes the TAC/NCGI issue, [R3-224357 HW] suggest the TAC issue should wait SA2 progress and discuss RAN impact if necessary.

Companies are invited to provide feedback on the following question about the location information.

**Q6: Which option do you prefer for the issue of location information of the mobile IAB?**

* **Option 1: Dynamic TAC/RANAC/NCGI for the mobile IAB cell to indicate physical location** **when it moves.**
* **Option 2: Dedicated TAC/RANAC/NCGI for the mobile IAB cell, not change when it moves.**
* **Option 3: RAN wait for SA2 progress**

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| --- | --- | --- |
| **Company** | **Answer** | **Reasons/Comments** |
| LG Uplus | Option 3 | We slightly prefer option 1 in order to diminish complexity. However, SA2’s checking is required. |
| **Ericsson** | **Option 3** |  |
| Huawei | Option 3 | Generally, we think the location information should link to the physical location. but suggest to wait for SA2’s output since this has big impact on CN. |
| **Qualcomm** | All options | Option 1 should be supported as the baseline. SA2 currently discusses Option 2 and will bring it to RAN, which ends up being Option 3.In any case, RAN3 needs to address this issue even if SA2 did not bring it to RAN3’s attention. For these reasons, RAN3 should start the discussion to make best use of the TUs available. |
| Lenovo | Option 3 |  |
| **Nokia** | **Option 3** |  |
| **Fujistu** | **Option 1 is baseline** | Changing the Cell ID/TAC broadcasted by cell of mobile IAB-DU based on the location of the mobile IAB-node should be supported.There are problems in Option 2 that dedicated location information is broadcasted by the cell on mobile IAB-DU: * For the new UEs connected to the mobile IAB-node, when the UEs approach to the mobile IAB-node, they have to update the registered location. Another issue is that the UEs may not be able to be handed over or camp on the serving cell of IAB-node for it is forbidden in the area which is indicated by system information of the mobile IAB-node.
* For UEs which are already connected before movement of the IAB-node, if the IAB-node moves to an area which is within the forbidden area list of the UEs, the UEs will still connect or camp on the cell of IAB-node, which is not desired.

Although the VMR SI is ongoing in SA2, whether the broadcasted location information is changed or not during the IAB-node mobility depends on RAN rather than SA2. |
| **Xiaomi** | **Opiton3** |  |
| ZTE | All options for TAC, Option 1&2 for RNAC/NCGI | For the TAC, SA2 has some ongoing discussion and we may wait for their progress. However, for the RNAC issue, SA2 does not touch this and it is unlikely that SA2 will discuss this since this is pure RAN issue. So it is suggested to discuss the RNAC/NCGI issue first in RAN3. |
| **KT** | Option 3 | This should be aligned with SA2’s VMR SI |
| **Samsung**  | **Option 3** |  |
| Deutsche Telekom | Option 3 | We should consider SA2’s conclusions on that topic, but we are not against to discuss already pros and cons of the 2 mentioned sets from RAN perspective.  |
| AT&T | Option 3 |  |
| MITRE | Option 3 |  |
| Verizon | Option 3 | **Would prefer some sort of semi-dynamic solution…** |

**Summary：**

15 companies replied.

12 out of the 15 prefer option 3. 1 company prefer to use option 1 as baseline, 2 companies prefer all options for TAC. 1 company prefer option 1&2 for RANAC/NCGI, and think the RANA/NCGI is pure RAN issue and should be discussed by RAN3. The moderator wants to point out that the principle for TAC and RANAC should be similar, and SA2 also discuss the NCGI issue in their SI, so there is no harm to wait for SA2 progress. Therefore, the moderator suggests the following:

**Proposal 5: RAN3 wait for SA2 progress on the UE location issue.**

## WID modification for support UAM use cases with mobile IAB

[R3-224233 KT, LG U+ etc.] proposes to revise Mobile-IAB WID to support UAV features for UAM services, considering some legacy UEs may connect to the mobile IAB-node deployed in the UAV, the following two bullets are proposed to be added in the objective of the mobile-IAB WID:

*• The MT of IAB-node equipped with UAV features [RAN2]*

*• As for UAM use case, define procedures for the DU of IAB-node to provide flying state information of a UE riding the aerial vehicle. [RAN3]*

Companies are invited to provide your view on the above modification to WID

**Q7: Do you agree to add the following two bullets in the objective of the mobile IAB WID to support UAV** **features for UAM services?**

*• The MT of IAB-node equipped with UAV features [RAN2]*

*• As for UAM use case, define procedures for the DU of IAB-node to provide flying state information of a UE riding the aerial vehicle. [RAN3]*

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Reasons/Comments** |
| LG Uplus | Yes | In Korea, UAM service is launched in the 2nd half of 24, which is aligned with Rel-18 commercialization timeline. As mentioned in our contribution, mobile IAB is essential to support Rel-15/16/17 UEs riding in aerial vehicle.For this, we expect that the work load is very light but should be in scope. |
| **Ericsson** | **Should this be handled at RAN Plenary level?** |  |
| Huawei | See comment | We understand the motivation, but the change of WID thing should be discussed in RAN plenary.  |
| Qualcomm | See comment | This needs to be discussed in RAN Plenary. Proponents should submit contributions on this topic to TSG RAN#97. It would be helpful if these contributions would also discuss the implications, i.e., which additional functionality would have to be supported by mIAB. The better the understanding on the scope of this functionality the more likely it will be adopted. |
| Lenovo |  | It can be discussed in RAN plenary firstly. |
| Nokia |  | Agree with the motivation, but modifying WID should be discussed in RAN plenary. |
| Fujitsu | Support | We observe UAM services on mobile IAB is a valuable use case and we think the workload may not be high at least for RAN3.For other WGs may also be involved, proponents can propose the change of mIAB WID at RAN#97 and provide more details on additional functions which need to be introduced due to this new use case. |
| **Xiaomi** |  | This should be discussed in RAN plenary |
| ZTE | See comment | It is suggested to discuss this in RAN plenary first. |
| **KT** | **Yes** | As mentioned above by LG U+, Korea’s MLIT(Ministry of Land, Infrastructure and Transportation) has aggressive schedule for commercial UAM and Korean Operators would like to have legacy 5G UE’s (Rel-15/16/17) on board to have better support of 5G NR through mobile-IAB. We would like mobile-IAB to add supporting two reporting events H1 (flying) and H2 (on the ground), which I believe should not effect the work load already set.Regarding Plenary Discussion: In deed, we have submitted some contributions in RAN#96 on this issue. Unfortunately, no addition of scope was treated for RAN2/3/4 WI/SI in the last plenary. We would like to consult RAN3 first on this issue and submit Revised WID in RAN#97 if addition of this feature can be acceptable in RAN3.  |
| **Samsung** |  | Agree with Huawei. |
| Deutsche Telekom | See comment | Needs discussion in RAN Plenary to change the WID. |
| AT&T | Yes | We support this use case and believe the WID should be updated at the next RAN plenary meeting. |
| MITRE | Neutral |  |
| Verizon | Neutral |  |

**Summary：**

15 companies replied. 4 companies support the use case, almost all companies think the change of WID should be discussed in RAN Plenary. So, no need proposal for this issue here.