**3GPP TSG WG 3 Meeting #123 *R3-24xxxx***

**Athens, Greece, February 26 – March 1, 2024**

**Agenda item:** 13.1

**Source:** Qualcomm Incorporated

**Title:** Summary mobile IAB offline discussion

**Document for:** Discussion

# 1 Introduction

This document includes the mobile IAB offline discussion.

# 2 Proposals

**The following is proposed:**

**…**

# 3 Discussion

## 3.1 High level issues and stage 2

### Issue 0: Allocation of CBs

**Proposal 0:**  Allocate one CB discussion for each of 38.401, 38. 420, 38.413, 38.423, 38.473, 38.455 (to be led by former BL CR Rapporteur) to discuss all aspects of contributions including discussion of online session.

[Huawei]: For AI 9.1.9.2, Can we try to agree some simple pure ASN.1 CRs directly rather than merge them?

### Issue 1: In 38.413, add mIAB authorization status to DL NAS Transport

* R3-240289 - ZTE, Lenovo, Samsung, CATT, Nokia, Nokia Shanghai Bell, Fujitsu

This was already agreed in last meeting but not captured in chair notes.

**Proposal 1: Agree revision of R3-240289 with updated revision number and CN ticked on cover page.**

### Issue 2: CU can request from mIAB-DU to change cell barring via gNB-CU Configuration Update Request (equivalent to Rel-16 IAB)

* R3-240205 - Lenovo
* R3-240288 - ZTE

For Rel-16/17 IAB, the CU can request from the parent node to change the “IAB supported” indicator in SIB1 via gNB-CU Configuration Update Request. For IAB, the CU can dynamically reconfigure the IAB topology, and it may want to limit the hop count by deactivating the “IAB supported” indicator on some but not all parent nodes. OAM, which usually configures this parameter, does not know about the IAB topology.

For Rel-18 mIAB, the mIAB-node may connect to an Rel-16/17 IAB-topology. In analogy to Rel-16/17 IAB, the CU may want to limit the hop count to individual parent nodes.

There was some controversy if this enhancement is needed.

**Proposal 2: Agree that CU can request from mIAB-DU to change cell barring via gNB-CU Configuration Update Request (equivalent to Rel-16 IAB).**

### Issue 3: Passing mIAB authorization status indication via TMModification request without prior TMManagememt exchange

* R3-240073 - Qualcomm: Add to 38.401, that F1-terminating CU should always initiate the TMManagement procedure at least once after F1 setup. Need to add: “or when the RRC-terminating CU has changed”.
* R3-240177 - CATT: Add to 38.401, that the RRC-terminating CU only uses the TMModification Request in case it has received a TMManagement Request before, otherwise it should use the TMManagement Response. Not clear why this is any better.
* R3-240486 - Huawei: Add to 38.401 mobile IAB-node integration, that the TMM procedure SHOULD be initiated for context related to F1-C/non-F1 traffic. Similar as QC.

The offline discussion identified the following issue:

* When an mIAB-node is initially authorized, the MT’s CU establishes BH and the DU’s CU establishes F1. Without UE traffic, there may not send a TMManagement Request. When the mIAB-node is then deauthorized, the MT’s CU cannot send forward the authorization status to the DU’s CU in the TMModification Request since it does not have the XnAP UE ID allocated by the DU’s CU.

The offline discussion identified the following options:

**Option 1:** The MT’s CU does remove BH without sending the authorization status to the DU’s CU. This would not follow present procedure. This would lead to F1 hanging without TNL connectivity.

**Option 2:** The MT’s CU does not send the authorization status to the DU’s CU until the DU’s CU has traffic, initiates the TMManagement procedures, upon which the MT’s CU can send the authorization status = “not authorized” in return. This follows present procedure, but it keeps an unauthorized mIAB-DU available on the air for UE access.

**Option 3:** The DU’s CU always sends the TMManagement procedure after F1 Setup (i.e., during integration and DU migration) or after MT migration. This allows the MT’s CU to always forward the authorization status to the DU’s CU.

During the discussion, there was the feeling that Option 3 would be a “reasonable” implementation. However, there was controversy whether Option 3 should be captured in chair notes as agreement or as common understanding.

**Proposal 3: Discuss whether the following statement should be captured in chair notes as *agreement* or as *common understanding*: After F1 Setup and MT migration, the DU’s CU should always initiate the TM Management procedure toward the MT’s CU.**

[Huawei]: Agree option 3, should be captured as agreement and be reflected in the procedure design in stage 2 specification.

[Lenovo]: Prefer Option 3, and agree to capture the stage 2 statement as an agreement.

[Fujitsu]: Agree Option 3, and it should be captured in stage 2 specification.

### Issue 4: Triggering DU migration by OAM vs. by CU

* R3-240179 – CATT: Add to 38.401 (and equivalently to 38.423) “*In case the OAM provides the information of mobile IAB-DU migration, the mobile IAB-node always ignores the trigger from the source F1-terminating IAB-donor-CU for mobile IAB-DU migration*.”
* R3-240204 - Lenovo: Explicit signaling in F1 Setup response: “*If the F1 SETUP RESPONSE message contains the F1 DU Migration Triggering Info IE, the gNB-DU shall, if supported, take into account for mobile IAB-DU migration triggering*”.

During the discussion, the was the feeling that in a properly configured network, such a conflict should not arise.

**No Proposal.**

### Issue 5: In 38.401, Correct Figure 8.23.2-1: Procedure for NG-based migration of mobile IAB-MT. The old figure includes “8.YY.1”

* R3-240177 - CATT
* R3-240272 - Samsung

Based on discussion, this should be done by spec rapporteur.

**Proposal 5: Include in chair notes that reference to section “8.YY.1” in Figure 8.23.2-1 of 38.401 needs to be fixed (to be done by spec rapporteur).**

### Issue 6: In 38.401, update description of RLF recovery procedure

* R3-240177 - CATT
* R3-240487 - Huawei

Present description on RLF Recovery procedure in TS 38.401for mIAB is lacking detail. It does not handle the scenario where the MT’s initial CU and recovery CU are different from the DU’s CU. The above contributions can be used as baseline for a revision.

**Proposal 6: In 38.401, revise mIAB RLF recovery procedure to include the scenario where the F1-terminating donor is different from the RRC-terminating donors. Use R3-240177 and R3-240487 as the baseline.**

### Issue 7: Clarification on “non-F1-terminating IAB-donor” for mobile IAB

* R3-240074 - Qualcomm: Clarify in 38.423 for procedure description for TMM, that for mIAB, the non-F1-terminating IAB-donor refers to the RRC-terminating IAB-donor in.
* R3-240075/R3-240076 - Fujitsu: Include in 38.401, update definition of non-F1-terminating IAB-donor: “*Non-F1-terminating IAB-donor of boundary IAB-node: Refers to the IAB-donor that has an RRC connection with the boundary node or a mobile IAB-node but does not terminate F1 with this boundary node or the mobile IAB-node*”. They are proposing the same for 38.423 (R3-240076). May lead to confusion since for mIAB node may have two F1-terminating IAB-donors, where one is equal to the RRC-terminating IAB-donor but the other one is not.
* R3-240442 - ZTE: Add in 38.423 for every occurrence of non-F1-terminating IAB-donor an “or RRC-terminating IAB-donor in case of mIAB. Quite a lot of revision.
* R3-240203 - Lenovo: Add in 38.423 TMM procedures: “*the procedure is also applied to the mobile IAB-node, where the non-F1-terminating IAB-donor is referred to as the RRC-terminating IAB-donor of the mobile IAB-node*.”

**Problem 1: the** mIAB-node can have two F1-terminating donors, where one F1-terminating donor is the same as the non-F1-terminating donor. The differentiation “F1-terminating donor” vs. “non-F1-terminating donor” used in Rel-16/17 TMM procedures therefore is not appropriate.

[Fujitsu]: Do not agree that one F1-terminating donor is the same as the non-F1-terminating donor. An F1-terminating donor cannot be a non-F1-terminating donor by definition: *Non-F1-terminating IAB-donor of boundary IAB-node: Refers to the IAB-donor that has an RRC connection with the boundary node but does not terminate F1 with this boundary node*. An F1-terminating donor can be an RRC-terminating donor. An RRC-terminating donor can be an F1-terminating donor or a non-F1-terminating donor. The TMM procedures will only be used when the RRC-terminating donor is a non-F1-terminating donor. The use of non-F1-terminating donor (and also RRC-terminating donor) is actually correct if we extend the definition of non-F1-terminating donor to be applicable to a mobile IAB node.

**Problem 2:** Reference to “boundary node” used for Rel-17 IAB in this context does not apply to mobile IAB.

Based on offline discussion, some clarification needs to be added related to TMM and IAB Resource Coordination procedures in 38.423 that for mIAB, the non-F1-terminating donor of the boundary node refers to the RRC-terminating donor. The attempt should be made to minimize the number of changes. The above contributions can be used as baseline.

**Proposal 7: Add clarification to 38.423 that for mobile IAB, the “non-F1-terminating IAB-donor” in the TMM procedures and IAB Resource Coordination procedures refers to the “RRC-terminating IAB-donor”. Clarify that the term “boundary node” used in the context of these procedures does not apply for mobile IAB. Attempt to minimize the number of changes. Use R3-240074, R3-240075, R3-240076, R3-240442, R3-240203 as baseline.**

[Fujitsu]: Agree that clarification to 38.423 is needed. Not sure about the second sentence. All TMM procedures/messages will be reused by mobile IAB nodes. If anything, the term “boundary node” used in the context of these procedures should apply for for mobile IAB.

### Issue 8: NCGI to be Updated List IE should be in F1 Setup Request rather than gNB-DU Configuration Update Request

* R3-240273 **-** Samsung
* R3-240288 - ZTE
* R3-240473 - Xiaomi
* R3-240632 - Ericsson

Already captured in rapporteur’s CR.

**No proposal**

### Issue 9: Add to 38.401, section 8.9.14 on mIAB authorization, a paragraph on the behavior of CU(s) when authorization status is received during Xn and NG HO.

* R3-240286 - ZTE

While R3-240286 proposes to add a lengthy description, several companies felt that a minor change to section 8.9.14 may be sufficient to clarify the behavior when the mIAB authorization status = “non-authorized” is passed during MT HO. Further, this may be added to the MT migration section rather than the mIAB-authoriation section.

The equivalent topic for RLF Recovery is discussed under Issue 14 and merged into proposal 9.

**Proposal 9: 38.401 to capture the behavior of the MT’s target IAB-donor when the mIAB authorization status = “non-authorized” is received during MT migration and RLF recovery.**

[Huawei] For Issue 14, the change for TS 38.423 is needed, but not mentioned in P9 here. So, we suggest Proposal 9b as below:

Proposal 9b: 38.423 to capture the behavior of the MT’s new IAB-donor for the mIAB authorization status IE during RLF recovery.

[Lenovo]: Agree with P9b.

[CATT]: The behavior of target IAB-donor does not need to be captured in stage-2 spec. The behavior only needs to be captured in 423 without referring to 401, since it is clear and definite, that is different with the NG-RAN handling for the authorization status received from CN which would lead to different solutions for different cases. So, we agree with HW’s P9b with revision.

### Issue 10: Add to 38.401 a new section on PCI collision avoidance for mIAB.

* R3-240286 – ZTE

In offline discussion, ZTE emphasized that PCI partitioning should be captured on stage 2 as a method to avoid PCI collisions for mobile IAB based on RAN3 agreement. Other companies felt that PCI partitioning is already supported by implementation and new specification is needed.

**No Proposal.**

### Issue 11: In 38.413, add that the inclusion of mIAB authorization status in path switch request ack is mandatory

* R3-240429 – Nokia: *If the UE is an mobile IAB-MT and the mIAB authorization status has changed, the AMF shall, if supported, include the IAB Authorized IE in the PATH SWITCH REQUEST ACKNOWLEDGE message.”*

The main issue here is to indicate in the spec the nation that the AMF SHALL send the mIAB authorization status to the RAN whenever it has changed. R3-240429 raises the concern that this might not be clear from 38.413 where this update is considered OPTIONAL in the Path Switch Request ACK. During offline discussion, several companies felt that the AMF’s behavior was already adequately captured on stage 2.

**No Proposal.**

### Issue12: Clarification that in presence of two logical DUs, DL traffic can be differentiated based on upper layers

* R3-240075/R30240076 - Fujitsu: Add to DU migration: “*NOTE: For the downstream data handling arriving at the mobile IAB-node, the upper layers (e.g., IP layer) can differentiate the data to different logical DUs based on upper-layer header information*.”

**Proposal 12: Clarify on stage 2 that in presence of two logical DUs, DL traffic can be routed to the appropriate destination based on TNL information.**

### Issue 13: In 38.413, add “No PDU Session Indication IE” in Handover Required by AMF

* R3-240486 – Huawei: Include IE and corresponding description in procedural text.
* R3-240287 - ZTE: Add explicit text: “*If the UE is an mobile IAB-MT which does not have any PDU sessions, the AMF shall ignore the PDU Session Resource Admitted List IE, and behave as specified in TS 23.502 [10].”*

Offline discussion was not certain on details, e.g., whether the AMF would or would not know which PDU session was (de)activated, or whether the RAN was directly informed about activated PDU sessions by the SMF. The offline discussion converged to wait for ongoing work in SA2 to conclude.

**Proposal 13: Regarding PDU session indication in NG Handover Required and/or NG Handover Request ACK messages in 38.413, wait for ongoing discussion in SA2 to concluded.**

[Huawei] Fine to wait for SA2 for the NG Handover Required, but not for the NG Handover Request Ack. Because R3 already agreed that the AMF to include the no PDU session indicator in the NG Handover Request message, so it is natural for the AMF to ignore the PDU session Resource Admitted List IE in the Handover Request Ack message if the indication is included in the request message.

### Issue 14: In 38.423, add to Retrieve UE Context Retrieval message behavior in case mIAB-MT is not authorized

* R3-240488 – Huawei: *“…consider that the UE is a mobile IAB-node. If the Mobile IAB Authorization Status IE is set to "not authorized" for a mobile IAB-MT, the new NG-RAN node shall, if supported, refrain from establishing backhaul resources for this mobile IAB-node”.*
* R3-240178/R30240176 - CATT: In 38.423, add explicit description to Xn Context Retrieval Response (and TMManagementResponse) for RRC-terminating CU’s behavior when receiving the “non-authorized” indicator.

This issue has been merged in with proposal 9.

**No separate proposal**

### Issue 15: Merged with Issue 14.

### Issue 16: In 38.420, add to exchange information on mIAB authorization status to 5.2.10.2 IAB Transport Migration function and 6.2.10 IAB procedures.

* R3-240629 – Ericsson

Offline discussion was controversial whether every little bit of information would have to be included in the IA

**Proposal 16: Capture in 38.420 that TMM procedures convey IAB and mIAB authorization status, e.g., “… change information, e.g., mIAB authorization information”.**

### Issue 17: RRC-terminating CU to refuse IAB TMM request for offload if mIAB-MT is not authorized

* R3-240178/R30240176 - CATT: Add in 38.423, that RRC-terminating CU to reject IAB TMM request for offload if mIAB-MT is not authorized.
* R3-240427/28 - Nokia: Add in 38.423 to reject procedure new cause values for “no BH resource” and “non authorized”

The following scenarios are considered:

1. The mIAB authorization status changes at MT handover (e.g., due to the MT’s new location) to “not authorized”. After the HO, the DU’s CU initiates the TMManagement procedure with an traffic offload request. Presently, the MT’s CU would not be able to reject this offload request since there is no appropriate cause value. Therefore, the MT’s CU would have to accept the offload request and send the TMModification Request afterwards with the new authorization status. To avoid this extra step, it is proposed to add a “mIAB-node not authorized” cause value to the traffic offload rejection.
2. In case the DU’s CU request traffic offload and there are no radio resources, the MT’s CU should be able to reject the traffic offload with a cause value.

The following points were discussed:

* For (2), whether we can use an existing cause value (“no radio resources available”), which is not BH related.
* Whether there is potential impact on Rel-16/17 IAB.
* Whether there is potential impact on F1AP.

This would require more discussion.

**Proposal 17: Discuss new cause values to be used in TMManagement Reject for “no radio resources available for BH” and “mIAB-node not authorized”. Check potential impact on Rel-16/17 IAB. Check potential impact on F1AP.**

[Huawei]: It is unclear to me why we need check the previous release in Rel-18 Agenda Item? What is the impact to F1AP on the TMM reject? Would like to suggest the following change

**Proposal 17: Discuss new cause values to be used in TMManagement Reject for “no radio resources available for BH” and “mIAB-node not authorized”.**

[CATT]: If we consider cause values, it does not make sense to only introduce values for such two cases.

On the other hand, if the mIAB-node is not authorized, after the MT’s CU reject the offload request, it can send the TMModification Request with “not authorized” information to the DU’s CU immediately, then the DU’s CU will know that the rejection received before is due to mIAB-node not being authorized. Alternatively, the TMM Reject message can carry the authorized status.

We need to capture that MT’s CU may reject IAB TMM request for offload when mIAB-MT is not authorized. Or, we introduce authorization status IE in the TMM Reject message.

**P17: Capture in spec that RRC-terminating CU may reject IAB TMM request for offload if mIAB-MT is not authorized, or introduce authorization status IE in the TMM Reject message.**

### Issue 18 – not discussed during offline: In 38.401, clarify under IAB and mIAB integration procedures, that the (m)IAB-indication in Msg5 also indicates “operation as (m)IAB-node”

* R3-240177 - CATT

38300 already includes: “A RAN node operating as a mobile IAB-node shall not concurrently operate as an IAB-node. During network integration, the RAN node shall indicate whether it intends to *operate* as a mobile IAB-node or as an IAB-node via an indicator in the *RRCSetupComplete* message.”

**No proposal.**

### Issue 19 – not discussed during offline: In 38.401, add to migration of mobile IAB-MT via Xn the NOTE that Xn-based signaling is up to implementation in absence of Xn interface between MT’s CU and DU’s CU.

* R3-240177 – CATT

38.401 already contains multiple NOTEs for mIAB that operation in absence of Xn is up to implementation. This tdoc aims to add such a NOTE also to Xn-based MT migration with respect to Xn between DU’s CU and MT’s CU.

**Potential proposal 19:** **In 38.401, add to migration of mobile IAB-MT via Xn the NOTE that Xn-based signaling is up to implementation in absence of Xn interface between MT’s CU and DU’s CU.**

[CATT]: We have the similar NOTE in DU migration and MT migration via NG HO, whereas, the note for MT migration via Xn HO is missing.

### Issue 20 – not discussed during offline: In 38.401, add in multiple occasions that signaling between F1- and RRC-terminating IAB-donors only applies if these donors are not the same.

* R3-240177 - CATT.

The rapporteur believes that this is not needed since obvious.

**No proposal.**

[CATT]: We believe this should be made clear because different cases are involved in each relative procedure.

### Issue 21 – not discussed during offline: In 38.423, differentiate in gNB-DU Configuration Update whether only BAP address is provided or both, BAP address and gNB ID.*.*

* R3-240179 - CATT

The rapporteur believes that this IE is only used when both BAP address and gNB ID are updated.

**No proposal.**

[CATT]: There is case where only BAP address is needed, i.e., the target MT’s CU is the same as DU’s CU and in that case TMM procedure is not necessary. However, 473 captures that:

“If the *RRC Terminating IAB-Donor Related Info* IE is included in the GNB-DU CONFIGURATION UPDATE message, the gNB-CU shall, if supported,…, and it shall **use this BAP address and gNB ID for the subsequent IAB Transport Migration Management procedure** towards the RRC-terminating IAB-donor of the mobile IAB-node,…”

### Issue 22 – not discussed during offline: In 38.473, clarify for gNB-DU Config Update that for mIAB-nodes, the gNB-DU applies mIAB-DU and the gNB-CU to donor-CU

* R3-240412 – Xiaomi: Add “*NOTE: This procedure is applicable for mobile IAB-nodes, where the term "gNB-DU" applies to a mobile IAB-DU, and the term "gNB-CU" applies to a F1-terminating IAB-donor-CU.”*

The rapporteur believes that this clarification was not added for Rel-16/17 IAB-DU. It would therefore be inconsistent to introduce it only for mIAB.

**No proposal.**