3GPP TSG-RAN WG3 #116-e R3-223706

Online, 9th – 19th May 2022

Agenda Item: 9.1.2.1

Source: Lenovo (moderator)

Title: Summary of IAB corrections on TS 38.401

Document for: Approval

# Introduction

This paper provides the summary for following offline discussion: And in this paper, only some essential issues which may need to be discussed are listed, and the remaining stage-2 wording and editorial corrections are summarized in another parallel draft TP, and the output of the draft TP will be merged into the final single CR.

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| **CB: # IAB\_02\_CR38.401**  **- Agree on needed corrections**  **- Converge on Single CR**  (Lenovo - moderator)  Summary of offline disc [R3-223706](file:///C:\temporary\RAN3\RAN3%20May%2022\CB%20sessions\IAB_02_38401\Inbox\R3-223706.zip) |

Phase I：Please give your feedback before Wednesday, 11th May 2022, 23:59 UTC. This allows us to give some inputs for Thursday’s online session (12th May 2022).

Phase II：TBD.

# For the Chairman’s Notes

# Discussion – 1st Round

## Issues for IAB Inter-CU Topology Redundancy

In the last RAN3 meeting, following agreements were achieved for IAB Inter-CU Topology Redundancy procedure of the boundary node.

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| **2a: The baseline procedure for inter-donor redundancy of the boundary node includes at least the following steps:**  **1). DC setup (IP address request or configuration need not be included)**  **2). XnAP Transport Migration Management Request: Includes QoS info per traffic without IP address.**  **3). RRC Reconfiguration by CU2: Includes configuration of additional IP addresses.**  **4). XnAP Transport Migration Management Response: Includes L2 info per traffic.**  **5). F1AP IAB UP CONFIGURATION UPDATE REQUEST: Includes new UL mappings for each migrated traffic**  **6). F1AP IAB UP CONFIGURATION UPDATE RESPONSE: Includes IP address selected for each migrated traffic**  **7). XnAP Transport Migration Management Request: Includes modification of each traffic with new IP address.**  **8). XnAP Transport Migration Management Response: Acknowledgement of modification.**  **IP addresses are requested to CU2. Options for the request are either Step 1 or Step 2 above or via RRC. Details on how the are requested are FFS.** |

In contribution [2], IP addresses for the boundary node based on either Step1 or Step 2 are both discussed. And Step 1 is preferred in contribution [2] where RRC container with the boundary node’s IP address information is included in XnAP messages for dual connectivity setup or modification. And the corresponding CR is provided in contribution [3].

While in the current TS 38.401, IP address request for the boundary node is included in the IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message in Step 2, and the non-F1-terminating IAB-donor-CU sends the RRC configuration which include the new TNL address(es) anchored at the second-path IAB-donor-DU to the boundary node.

***Q1-1: Please share your views on the corrections for IP address request for boundary node in IAB Inter-CU Topology Redundancy in contribution [3]. And please provide the corresponding text proposal based on the [3] or based on the latest TS 38.401, if needed.***

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| Company | Yes/No | Comment |
| Qualcomm |  | The proposals by [2] are incorrect.  CU1 requests IP addresses from CU2 only for descendant nodes. For the boundary node in topology 2, the IP addresses are allocated by CU2 via RRC as captured in 38.401 section 8.17.2.1 IAB Inter-CU topological redundancy procedure in steps 3 and 4.  This is based on agreement:  For IP address addition, non-F1-terminating CU to configure IP addresses on the boundary node via Rel-16 RRC signalling, and boundary node reports the F1-U IP addresses it wants to use via Rel-16 F1AP signalling to the F1-terminating CU. |
| **Ericsson** |  | Same view as QC. |
| Huawei |  | We think [2] and [3] raised a valid issue.  Currently, the step 2 in 8.17.2.1 stated that the IP address request may be included in the IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message, and the non-F1 terminating CU (CU2) will send DL RRC message includes the new TNL address(es) to the boundary node in step 3.  For descendant nodes, CU1 includes the IP address request in the IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message, and CU2 will respond the IP address in the XnAP message send to CU1, and then CU1 configure the new IP address to descendant nodes via RRCReconfiguraiton.  However, if the IP address request is included in the IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message, **CU2 is not able to know whether the IP address request in the XnAP message is for the boundary node or descendant nodes**, then how can it know whether to include the new TNL address(es) in a RRCReconfiguraiton message and send to the boundary node directly, or include the TNL address in the XnAP respond message to CU1?  Based on the above understanding, the intention of the change proposed by [3] make sense to us, while some details improvement are still expected.  Suggest the following proposal:  **Proposal: The new TNL address request and allocation for the boundary IAB-node in the inter-donor redundancy scenario are performed during the DC setup procedure.** |
| ZTE |  | We prefer to request for IP address for the boundary node via step 1, i.e. via RRC container in NR-DC establishment procedure.  As analyzed in [2], if the IP address for boundary node is requested via step 2, non-F1-terminating donor would send the allocated IP addresses via the response message to the F1-terminating donor since it cannot differentiate whether the IP address request is for boundary node or for descendant node. And the non-F1-terminating donor doesn’t know how many IP addresses the boundary requires. And then F1-terminating donor can send the IP addresses to the boundary node via RRC, which is not aligned with the agreements.  Regarding QC’s comment, we don’t think CU1 requests IP addresses from CU2 **only** for descendant nodes. We think CU1 needs to request IP addresses from CU2 for the boundary node as well. Otherwise, CU2 doesn’t know exactly how many IP addresses the boundary node requires. |
| Fujitsu |  | We think the corrections in [3] is necessary.  The present spec text for IP addresses request of the boundary node is based on Step 2. If the IP addresses for boundary node are requested in step 2, i.e., using XnAP transport migration management procedure, non-F1-terminating CU will not know the IP addresses request is for boundary node or descendant nodes. Non-F1-terminating CU should always provide the allocated IP addresses in the response message upon receiving IP address request in the transport migration request message.  For scenario that SN is F1-terminating donor, if the allocated IP addresses are provided to F1-terminating donor (SN) from non-F1-terminating CU (MN), the F1-terminating CU (SN) cannot configure the allocated IP address via RRC if SRB3 is not set up.  To answer QC:  It is true we have such an agreement.  If the IP address request is from the boundary node, it’s not clear how the boundary node knows the number of IP addresses needed for the migrated traffic, because it should be the F1-terminating CU rather the boundary node to decide the traffic to be migrated.  We think the most reasonable solution is step 1. |
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In contribution [3], it’s proposed to add the following texts for non-F1-terminating CU initiated traffic release procedure for inter-CU topology redundancy.

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| The traffic offload for descendant nodes follows the same procedure as defined for the partial migration in clause 8.17.3.2.  The F1-terminating IAB-donor-CU may request full or partial release of the offloaded traffic from the non-F1-terminating IAB-donor-CU by initiating the IAB Transport Migration Management procedure towards the non-F1-terminating IAB-donor-CU (e.g., for the purpose of revoking or in case UE bearers are released). The non-F1-terminating IAB-donor-CU may request full or partial release of the offloaded traffic by initiating the IAB Transport Migration Modification procedure towards the F1-terminating IAB-donor-CU (e.g., for the purpose of revoking).  The traffic offloaded through the inter-CU topological redundancy procedure described in steps 1 to 12 (including the offload of traffic pertaining to the dual-connecting boundary IAB-node and its descendant IAB-nodes and their served UEs) can be partially or fully revoked, resulting in the return of the offloaded traffic back to the F1-terminating IAB-donor-CU’s topology. Full or partial traffic revoking can be initiated by the F1-terminating IAB-donor-CU by initiating the IAB Transport Migration Management procedure towards the non-F1-terminating IAB-donor-CU. The non-F1-terminating IAB-donor-CU can request partial or full traffic revoking from the F1-terminating IAB-donor-CU by initiating the IAB Transport Migration Modification procedure towards the F1-terminating IAB-donor-CU. |

However, in contribution [9], they think that the description of the second paragraph has been covered in the third paragraph and the whole second paragraph looks redundant.

***Q1-2: Do you agree to add the texts for non-F1-terminating CU initiated traffic release procedure for inter-CU topology redundancy? Or to delete the second paragraph?***

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| Company | Yes/No | Comment |
| QCOM | No | This is already captured in the third paragraph |
| **Ericsson** | **No** | The 3rd paragraph above captures it already. |
| Huawei | No | Agree with QC and Ericsson that the content has already been captured. |
| ZTE | No | Same view as above. |
| Fujitsu |  | OK, we can compromise. The 3rd paragraph also captures the F1-terminating CU initiated traffic revocation, we understand the second paragraph should be deleted. |
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In contributions [4], [5] and [11], it’s proposed to remove the following NOTE in the IAB Inter-CU topological redundancy procedure and IAB inter-CU topology adaptation procedure since there is no BAP header re-writing for the boundary IAB’s F1-C/U.

NOTE: The non-F1-terminating IAB-donor-CU should select the same IAB-donor-DU in its topology for all to-be-offloaded traffic, whose UL BH mappings received from the F1-terminating IAB-donor-CU in step 2 share the same BAP address.

While in contributions [8] and [9], they think the intention of the above NOTE is for the source IP address selection for the descendant nodes of the boundary node and the content is not appropriate for the boundary node. And they propose another NOTE as follow.

NOTE: The boundary node selects the TNL address for UP/non-UP traffic to be forwarded towards the (Non)-F1-terminating topology corresponds to an anchored donor DU’s BAP address, among the TNL address(es) configured by donor (MN/SN) of the egress topology.

***Q1-3: Do you agree to remove the first NOTE above*** ***in the IAB Inter-CU topology redundancy procedure and IAB inter-CU topology adaptation procedure? And do you agree to add the second NOTE?***

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| Company | Yes/No | Comment |
| QCOM |  | On the removal of the original NOTE: Indeed, this NOTE should be removed in this sections on boundary nodes, but it should be included in section 8.17.3.2, Migration of the DESCENDENT node.  On the new NOTE: It makes sense to include such a Note but it is needs to be made more comprehensible. We propose:  **NOTE: The IP address selected by the boundary node for a traffic type needs to be anchored at the BAP address contained in the BAP routing ID of the UL mapping for this traffic type.** |
| **Ericsson** | **Yes and yes** | Same view as QC, with the following modification of the QC version of the new NOTE:  NOTE: The IP address selected by the boundary node for a traffic type needs to be anchored at the IAB-donor-DU whose BAP address is contained in the BAP routing ID of the UL mapping for this traffic type. |
| Huawei | Yes for both | Suggest some rewording on the new NOTE based on the Ericsson and QC’s version, in case the two donor DU in two topology has same BAP address:  NOTE: The IP address selected by the boundary node for a traffic type needs to be anchored at the IAB-donor-DU whose BAP address is contained in the BAP routing ID of the UL mapping for this traffic type, and configured by donor (MN/SN) of the egress topology. |
| ZTE | Yes | 1. We agree to remove the first NOTE above. 2. We are ok to add another NOTE with some rewording:   NOTE: The IP address selected by the boundary node for a traffic type needs to be associated with the donor DU BAP address which is contained in the BAP routing ID of the UL mapping for this traffic type, and configured by donor (MN/SN) of the egress topology. |
| Fujitsu | See comment | 1. Agree to remove the first NOTE. 2. Understand and agree to the intention that the boundary node should select the TNL address for the traffic according to the relative topology. In fact, the boundary node should firstly differentiate the topology of TNL address configuration based on which CU configures the TNL address and then select the correct TNL address. Since the performance is complicated, the text from HW is too vague to instruct the performance. The text from QC is not complete.   We suggest revising the second NOTE as following:  NOTE: **The TNL address selected by the boundary node for a traffic type needs to be anchored at the BAP address belonging to the topology contained in the BAP routing ID of the UL mapping for this traffic type.**  The boundary node can derive which topology the TNL address of the BAP address belongs to basing on which donor-CU (F1-terminating CU/non-F1-terminating CU) provides the TNL address configuration. |
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In contribution [6], F1AP gNB-DU CONFIG UPDATE and SCTP association establishment are proposed to be added in Step 9 of IAB inter-CU topology redundancy with following correction.

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| 9. The F1-terminating IAB-donor-CU updates the boundary node with the UL BH information received form the non-F1-terminating IAB-donor-CU in Step 8. This step may also update UL FTEID and DL FTEID associated with individual GTP-tunnel(s). The affected GTP tunnel(s) will be switched to use the dual-connecting IAB-node’s new TNL address(es). This step may use non-UE associated signaling in E1 and/or F1 interface to provide updated UP configuration for F1-U tunnels of multiple connected UEs or child IAB-MTs. Implementation must ensure the avoidance of potential race conditions, i.e., no conflicting configurations are concurrently performed using UE-associated and non-UE-associated procedures.  The F1-terminating IAB-donor-CU may also provide UL BH information associated with non-UP traffic. New TNL addresses for F1-C traffic configured in step 3, if any, can be added to the dual-connecting IAB-DU’s F1-C association(s) with the F1-terminating IAB-donor-CU.  The dual-connecting IAB-node sends F1AP gNB-DU CONFIG UPDATE to the F1-terminating IAB-donor-CU, which may include new (outer) IP addresses and corresponding new (inner) IP address for offloaded F1-U traffic. If new TNL addresses for F1-C traffic are configured, new SCTP association(s) between the dual-connecting IAB-node and the F1-terminating IAB-donor-CU may be established using the new TNL address information of the dual-connecting IAB-node. |

In contribution [11], it’s also proposed to clarify that the boundary node updates the IAB-donor-CU with DL IP addresses it decided to use for the offloaded traffic.

***Q1-4: Please share your view to add the F1AP gNB-DU CONFIG UPDATE and SCTP association establishment in Step 9?***

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| Company | Yes/No | Comment |
| QCOM | Yes | This step is essential. The boundary DC IAB-node needs to tell CU1 which IP address is uses for each offloaded traffic. The inner IP address for offloaded F1-U does not need to change. |
| **Ericsson** | **Yes** |  |
| Huawei | Yes |  |
| ZTE | Yes |  |
| Fujitsu | See comments | Agree to add the F1AP gNB-DU CONFIG UPDATE in step 9, but SCTP association establishment is not necessary. |
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In contribution [6], it’s proposed that the non-F1-terminating donor cannot obtain boundary node’s new IP address for each GTP-U tunnel until step 10. So the DL mapping configured by non-F1-terminating IAB-donor in step 7 is only for CP traffic while the DL mapping configured in step 10 is for UP and non-UP traffic, which is similar as in inter-donor migration procedure.

***Q1-5: Do you agree that DL mapping configured by non-F1-terminating IAB-donor in step 7 is only for CP traffic and the DL mapping configured in step 10 is for UP and non-UP traffic?***

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| Company | Yes/No | Comment |
| QCOM | No | This DL mapping in step 7 is necessary for F1-C but it can also be used for F1-U. There is no reason to restrict it to F1-C only. |
| **Ericsson** | **No** | Same view as QC |
| Huawei | No | We think the DL mapping configuration in step 7 is not possible for either CP or UP traffic. Due to that the CU2 is lack of the new TNL address information.  Although CU2 provides the new TNL address for the boundary node at earlier step, e.g., via RRCReconfiguraion in step 3, but the new TNL address allocation only indicates the boundary node which IP address(es) is(are) used for F1-C/F1-U/non-F1 traffic, CU2 has no idea about which new IP address will be selected by the boundary node for each traffic. For example, if CU2 allocates two new IP address (IP1, and IP2) for CP traffic of boundary IAB-node, and the boundary node will use the IP1 for UE associated F1AP, and use IP2 for the Non-UE associated F1AP, then how can the CU2 perform DL mapping for boundary node’s CP traffic to the IAB-donor-DU before it knows which IP address is selected for UA/NUA F1AP message? Similar issue also applies to the UP traffic. That’s why we observe that the DL mapping configuration in the step 7 is not correct and should be removed. |
| ZTE | Yes | In step 7, the non-F1-terminating node is not able to configure DL mapping for UP traffic since it can’t obtain boundary node’s new IP address for each GTP-U tunnel. So the DL mapping configured by non-F1-terminating IAB-donor in step 7 is only for non-UP traffic. |
| Fujitsu | Yes |  |
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In contribution [9], it’s proposed that the non-F1 terminating donor is not aware of the DL TNL address for a given offloaded F1-U/C traffic before Step 7, thus the DL mapping configuration cannot be performed in this step.

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| 7. The non-F1-terminating IAB-donor-CU may configure or modify BH RLC channels and BAP-sublayer routing entries on the second path between the dual-connecting IAB-node and the second-path IAB-donor-DU as well as DL mappings on the second-path IAB-donor-DU for the dual-connecting IAB-node’s second path. These configurations may support the transport of UP and non-UP traffic on the second path. |

Similar problems observed in step 14 in Section 8.17.3.1, and step 2 in 8.17.3.2.

***Q1-6: Do you agree that the non-F1 terminating donor is not aware of the DL TNL address for a given offloaded F1-U/C traffic before Step 7? If yes, do you agree to delete the corresponding sentence in Step 7 of Section 8.17.2.1, Step 14 of Section 8.17.3.1, and Step 2 of Section 8.17.3.2?***

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| Company | Yes/No | Comment |
| QCOM | No | CU2 configures the new TNL addresses used in topology 2 via RRC directly on the boundary node in step 3. It can use the knowledge of these addresses to configure the DL mapping in Step 7. |
| **Ericsson** | **No** | Same view as QC |
| Huawei | Yes for both | We think the DL mapping configuration in step 7 is not possible for either CP or UP traffic. Due to that the CU2 is lack of the new TNL address information.  Although CU2 provides the new TNL address for the boundary node at earlier step, e.g., via RRCReconfiguraion in step 3, but the new TNL address allocation only indicates the boundary node which IP address(es) is(are) used for F1-C/F1-U/non-F1 traffic, CU2 has no idea about which new IP address will be selected by the boundary node for each traffic. For example, if CU2 allocates two new IP address (IP1, and IP2) for CP traffic of boundary IAB-node, and the boundary node will use the IP1 for UE associated F1AP, and use IP2 for the Non-UE associated F1AP, then how can the CU2 perform DL mapping for boundary node’s CP traffic to the IAB-donor-DU before it knows which IP address is selected for UA/NUA F1AP message? Similar issue also applies to the UP traffic. That’s why we observe that the DL mapping configuration in the step 7 is not correct and should be removed. |
| ZTE | Yes, and No | We agree that the non-F1 terminating donor is not aware of the DL TNL address for a given offloaded F1-U/C traffic before Step 7. But we think the above sentence should not be removed since the non-F1 terminating donor could DL mapping for non-UP traffic for the boundary node based on the allocated TNL address(es). |
| Fujitsu | No | Step 7 is for non-UP traffic configuration, suggest revising step 7 as following:  7. The non-F1-terminating IAB-donor-CU may configure or modify BH RLC channels and BAP-sublayer routing entries on the second path between the dual-connecting IAB-node and the second-path IAB-donor-DU as well as DL mappings on the second-path IAB-donor-DU for the dual-connecting IAB-node’s second path. The DL mappings may be based on the TNL address(es) allocated to the dual-connecting IAB-node for non-UP traffic in step 3. These configurations may support the transport of non-UP traffic on the second path.  Similar change is needed for Step 14 of Section 8.17.3.1, and Step 2 of Section 8.17.3.2 |
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In contribution [10], they want to clarify the header rewriting, routing update, and BAP mapping configuration update for inter-donor topology redundancy as below.

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| 9. The F1-terminating IAB-donor-CU updates the boundary node with the UL BH information received form the non-F1-terminating IAB-donor-CU in Step 8. This step may also update UL FTEID and DL FTEID associated with individual GTP-tunnel(s). The affected GTP tunnel(s) will be switched to use the dual-connecting IAB-node’s new TNL address(es). This step may use non-UE associated signaling in E1 and/or F1 interface to provide updated UP configuration for F1-U tunnels of multiple connected UEs or child IAB-MTs. Implementation must ensure the avoidance of potential race conditions, i.e., no conflicting configurations are concurrently performed using UE-associated and non-UE-associated procedures.  The F1-terminating IAB-donor-CU may also provide UL BH information associated with non-UP traffic. New TNL addresses for F1-C traffic configured in step 3, if any, can be added to the dual-connecting IAB-DU’s F1-C association(s) with the F1-terminating IAB-donor-CU.  The F1-terminating IAB-donor-CU also configures the dual-connecting IAB-node with the BAP-sublayer routing, header-rewriting and BH RLC CH mapping entries. |

In addition, same clarification is added for inter-donor topology adaptation procedure.

***Q1-7: Do you agree to clarify the header rewriting, routing update, and BAP mapping configuration update for inter-donor topology redundancy and inter-donor topology adaptation procedure?***

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| Company | Yes/No | Comment |
| QCOM | No | This section is on the boundary node. Header rewriting and BH RLC CH mapping only applies to descendent-node traffic. It is properly captured in 8.17.3.2. |
| **Ericsson** | **No** | Wrong section |
| Huawei | Yes | Agree with QC that this should be captured in 8.17.3.2 |
| ZTE | No | Agree with QC. |
| Fujitsu | No | No need to add the description, since the BAP-sublayer routing, header-rewriting and BH RLC mapping are configured for the traffic of descendant nodes. For the traffic of the boundary node, the UL BH information is used. |
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## Issues for IAB Inter-CU Topology Adaptation

In both contributions [5] and [6], same text of MOBIKE is proposed to be added in the inter-CU topology adaptation procedure.

***Q2-1: Please share your views on adding the texts for MOBIKE in the*** ***inter-CU topology adaptation procedure? And if you agree with it, please share your preference on Opt.1 (after Step 15[5]) or Opt.2 (after Step 19[6])?***

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| Company | Yes/No | Comment |
| QCOM | Yes | Option 1 is correct. MOBIKE can already be applied to the migration of F1-C, which is migrated in Step 15. Option 2 introduces this too late, i.e., it appears as if it only applied to F1-U. |
| **Ericsson** | **Option 1** |  |
| Huawei | Option 1 |  |
| ZTE | Yes | Ok to add the text for MOBIKE after step 15, i.e. option 1. |
| Fujitsu | **Option 1** |  |
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In contribution [6], it’s proposed that the source IAB-donor-CU couldn’t derive the new IP addresses for each F1-U tunnel until F1-U redirection (i.e. step 19). So, the migrating IAB-node cannot report IP address for each F1-U tunnel and non-UP traffic type via the gNB-DU configuration update message in Step 15, and two the IAB Transport Migration Management procedure needs to be performed twice. For the first one, it doesn’t include the new DL TNL address information necessary for the target IAB-donor-CU to configure or modify DL mappings on the target IAB-donor-DU and it can be performed earlier, e.g. after receiving HO request ACK in step 4. And the second one is introduced after Step 19 which include the new DL TNL address information necessary for the target IAB-donor-CU to configure or modify DL mappings on the target IAB-donor-DU.

***Q2-2: Please share your views on the changes above for IAB inter-CU topology adaptation?***

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| Company | Yes/No | Comment |
| QCOM |  | For F1-U, everything is fine.  CU1 sends the original IP addresses used by the IAB-node for F1-U in the RRC container to CU2, and CU2 simply replaces them. The gNB-DU then reports the F1-U IP addresses it uses via the gNB-DU Config Update. Therefore, CU1 knows the new IP addresses used by the IAB\_node for F1-U. All of this works fine.  The IP addresses for non-F1 are not reported by the IAB-node in the gNB-DU Config Update, and CU1 therefore doesn’t know them. However, it is sufficient that CU2 knows these IP addresses so that it can configure the DL mapping.  In summary: the change above is not correct. |
| **Ericsson** | **Disagree** | CU1 need not know the IP addresses for non-F1 traffic, since this traffic does not pass through CU1. For F1-U, there is no problem. |
| Huawei |  | Even for F1-U traffic, there may still have some problem.  CU2 can know which new IP is used to replace which old IP address in advance, but CU2 cannot know which new IP address will be used for which traffic (or for which F1-U tunnel), because CU2 has no idea about which F1-U tunnel use which old IP address. Then the DL mapping configuration for the IAB-donor-DU in CU2’s topology will not be performed correctly, before the CU2 get the new IP address information via the IAB Transport migration management procedure.  The gNB-DU Config Update only provides CU1 the information of inner IP address(es) and the new outer IP address(es) for F1-U traffic, if the inner IP address is same as before (e.g. using MOBIKE), then CU1 can derive the new outer IP address to be used for each F1-U tunnel implicitly. However, if the inner IP address also changes, CU1 will not know the new outer IP address for each F1-U tunnel. In such sense, the issue raised by [6] seems valid. |
| ZTE | Yes | For F1-U traffic, there is a problem **when MOBIKE is not applied**:  The F1AP gNB-DU CONFIG UPDATE message sent to the source CU in step 15 includes only new (outer) IP addresses and corresponding new (inner) IP address for F1-U traffic. If MOBIKE is used, source CU would know that the same inner IP address is used after migration upon receiving F1AP gNB-DU CONFIG UPDATE message. However, source CU can’t obtain the new inner IP address until F1-U redirection in step 17 if MOBIKE is not applied.  So it’s incorrect to say that “The migrating IAB-node may report the new TNL address information it wants to use **for each F1-U tunnel and non-UP traffic type** to the source IAB-donor-CU via the gNB-DU CONFIGURATION UPDATE message.” in step 15. |
| Fujitsu | Not strong view |  |
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In contribution [6], it’s proposed that the Step 1 for descendant IAB-node can be performed in parallel with the Step 0 after the source IAB-donor-CU receives HANDOVER REQUEST ACKNOWLEDGE message. For example, the context of the traffic to be offloaded for the migrating/descendant nodes and IP address request information could be contained in the same IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message.

***Q2-3: Do you agree that Step 1 for descendant IAB-node can be performed in parallel with the Step 0?***

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| Company | Yes/No | Comment |
| QCOM | Yes |  |
| **Ericsson** | **OK** |  |
| Huawei | Fine |  |
| ZTE | Yes |  |
| Fujitsu | No | Before step 19 of inter-CU topology adaption for the boundary node, the routing configuration for non-F1-terminating topology is not ready in the boundary node. According to 38.340, when a BAP Data PDU that contains a BAP address which is not included in the configured BH Routing Configuration the BAP entity shall discard the BAP PDU. If the procedure for descendant IAB-node is performed in parallel with that of boundary node, the UL data from descendant node may be discared by the boundary node. |
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In contribution [9], the second paragraph of traffic revocation seems not necessary in Section 8.17.3.1, since the previous paragraph has stated that the IAB-MT is handed over in reverse direction.

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| The traffic offloaded through the inter-CU topology adaptation described in steps 1 to 20 (including the offloaded traffic pertaining to the migrating IAB-node and its descendant IAB-nodes and their served UEs) can be fully revoked. In this case, the migrating IAB-MT is handed over in reverse direction, i.e., from the non-F1-terminating IAB-donor-CU to the F1-terminating IAB-donor-CU, and the traffic of the migrating IAB-DU and the descendant IAB-DUs is routed again along the former source path. |

***Q2-4: Do you agree to delete the second paragraph above for traffic revoke?***

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| --- | --- | --- |
| Company | Yes/No | Comment |
| QCOM | Yes |  |
| **Ericsson** | **Yes, but** | The deleted part is a part of the next paragraph, not the entire nextparagraph!  We would then prefer to reword the paragraph above to the following:  The traffic offloaded through the inter-CU topology adaptation described in steps 1 to 20 (including the offloaded traffic pertaining to the migrating IAB-node and its descendant IAB-nodes and their served UEs) can be fully revoked. If the full revoking is initiated by the non-F1-terminating IAB-donor-CU, the migrating IAB-MT is handed over in reverse direction, i.e., from the non-F1-terminating IAB-donor-CU to the F1-terminating IAB-donor-CU, and the traffic of the migrating IAB-DU and the descendant IAB-DUs is routed again along the former source path. |
| Huawei | Yes |  |
| ZTE | Yes | The revision suggested by Ericsson above is not necessary since the migrating IAB-MT is handed over in reverse direction when the full revoking is initiated by the F1-terminating IAB-donor-CU as well. |
| Fujistu | No | The second paragraph for traffic revoking should not be deleted. The first paragraph clarifies the scenario of full revocation, i.e, the migrating IAB-MT is handed over back to F1-terminating CU when all traffic is revoked, while the second paragraph is saying the non-F1-terminating CU **can** trigger the full revocation via XnAP Handover Preparation procedure. |
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## Issues for IAB Intra-CU Topology Adaptation

To enable the parallel TNL migration of the descendant nodes, it’s proposed to clarify the routing entry in the migrating IAB and descendant IAB should be configured before the migration [4]. Otherwise, the migrating IAB cannot forward the further *RRCReconfigurationComplete* message received from child IAB node, and the parallel TNL migration cannot be performed. In addition, the corresponding stage-2 update in [5] is pasted below.

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| Based on implementation, these steps can be performed after or in parallel with the handover of the migrating IAB-node. To enable performing these steps in parallel, the IAB-donor-CU sends the RRCReconfiguration message with the new TNL address(es) and the new default UL mapping to the descendent node while the migrating IAB-MT is still connected with source parent node, for example, before Step 5. In this case, the UE CONTEXT MODIFICATION REQUEST message carrying this RRCReconfiguration message includes a conditional delivery indication for the descendent node’s parent IAB-DU to withhold the delivery of the RRCReconfiguration message, as specified in TS 38.473 [4]. The IAB-donor-CU also configure the migrating IAB-node and descendant IAB node(s) with routing entry, at least the routing entry for the default UL BAP Routing ID, while the migrating IAB-MT is still connected with source parent node. |

Same issue is discussed in contribution [7], and 2 alternatives are given as follows to solve it,

* Alt #1: The trigger condition for the descendent IAB node to transfer the buffered RRC message to its child IAB node is that the descendent IAB-node has one or more routing entries for the target path.
* Alt #2: In case no routing entry exists for the received packets, use the default configuration of the descendant nodes to forward the TNL migration related UL packets received from the child node.

***Q3: Please share your view on the trigger condition of descendant node? And do you agree to the stage-2 update in [5]?***

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| --- | --- | --- |
| Company | Yes/No | Comment |
| QCOM |  | We do not need to add new trigger conditions. We should solely add on St2 that the descendent nodes need to be configured with routing entries, and that this should be done before the migration. No need to confine this to the default mapping only:  The IAB-donor-CU also configure**s** the migrating IAB-node and descendant IAB node(s) with routing entry**ies**~~, at least the routing entry for the default UL BAP Routing ID,~~ while the migrating IAB-MT is still connected with source parent node. |
| **Ericsson** | **See comment** | **We should not add any triggering conditions to stage2** – putting the agreed conditions in stage3 was the outcome of RAN3 discussion. If we are going to add any text, **we prefer to refer to the default UL BRID only -** we do not recall any agreement saying that multiple entries can be configured while the node is still connected to the source parent. |
| Huawei | See comment | As stated in our paper [8], the current trigger condition for descendant node will cause some problem. So we need to discuss how to solve it. About the two alternatives, we are open for both, but slightly prefer Alt 2, considering that alt 1 will result in more latency and diminish the benefit for the concurrent TNL migration.  We disagree with the stage-2 update in [5], there is no such agreement to require the CU pre-configure some routing entries to the descendant IAB-nodes before the migrating IAB node’s migrating. And how to perform such pre-configuration is unclear, e.g., it may require some prediction of IAB-node’s migration but how to perform such prediction is not clear. |
| ZTE | See comment | We prefer Alt #2 as proposed in [7].  We think configuration of routing entry before the migration of the migrating MT would lead to additional service interruption during the migration procedure.  And in some scenarios, the donor CU cannot be able to configure the migrating IAB-node and descendant IAB node(s) with routing entry before the migration of the migrating MT, e.g. when the radio condition deteriorates rapidly. |
| Fujitsu | See comment | Regarding to the issue that there is no routing entry available during the parallel migration, we prefer Alt.2, i.e., using the default configuration to forward the UL packets.  According to present 38.340, the default configuration can be used to deliver the BAP data from upper layer when the routing configuration is not reconfigured. It’s not necessary to preclude using the default configuration to deliver the data received from child nodes.  Based on Alt.2, we don’t have to restrict the IAB-donor-CU to configure the migrating node and descendant nodes with multiple routing entries before the parallel migration.  The description added according to [5] is not needed if Alt.2 is applied, because the RRCReconfiguration message for descendant node includes the default UL mapping. |
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## Issues for IAB Inter-CU Backhaul RLF recovery

In contributions [6] and [11], the following texts are added in the Step 14.

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| 14. The new IAB-donor-CU sends a DL RRC MESSAGE TRANSFERmessage to the new parent IAB-DU, which includes an *RRCReconfiguration* message for the IAB-MT undergoing recovery. The RRC configuration may include new TNL addresses anchored at the new IAB-donor-DU. The RRC configuration includes a BAP address for the recovery IAB-node in the new IAB-donor-CU’s IAB topology, default BH RLC channel and a default BAP routing ID configuration for UL F1-C/non-F1 traffic mapping on the recovery path. |

***Q4-1: Do you agree to clarify that the RRC configuration further includes the BAP address and the default configuration?***

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| QCOM | Yes |  |
| **Ericsson** | **OK** |  |
| Huawei | Ok |  |
| ZTE | Yes |  |
| Fujitsu | Yes |  |
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For the definition of the IAB-node which performs BH RLF recovery to another parent node underneath a different IAB-donor-CU. Following 3 options are suggested in different contributions.

* Option 1: Boundary IAB-node [5]
* Option 2: Recovery IAB-node [6]
* Option 3: Recovering IAB-node [1] [11]

***Q4-2: Please share your preference for the definition of the IAB-node which perform inter-CU BH RLF recovery?***

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| --- | --- | --- |
| Company | Option 1/2/3 | Comment |
| QCOM | Opt 3, potentially Opt 1 | Option 2 is not good. There is not a “recovery node”, e.g. , as there is a “boundary node”. |
| **Ericsson** | **Opt3** | Alternatively, “the IAB-node undergoing RLF recovery” (or “attempting”). |
| Huawei | Option 1 or 3 |  |
| ZTE | Option 2 | The term “recovery IAB-node” is used in the Figure 8.17.4-1. And this term is also used in intra-donor RLF recovery procedure in section 8.2.5. If the term “recovery IAB-node” should not be used, do we need to correct it in R16? |
| Fujitsu | Option 3 |  |
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## Issues for IP address allocation for IAB-nodes

In contribution [7], it’s proposed to add the stage-2 description of IP address allocation for IAB inter-CU topology management in clause 8.9.13 as follow.

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| In case of IAB-donor-based IP address allocation, the IP address(es) is(are) allocated by the IAB-donor-CU or IAB-donor-DU. In both cases, the IAB-node requests the IP address(es) via RRC from the IAB-donor-CU. It includes a separate IP address request for each usage, where the usages defined are all traffic, F1-U, F1-C and non-F1. The IAB-donor-CU may initiate the IAB TNL Address Allocation procedure to obtain IP addresses from the IAB-donor-DU. The IAB-donor-CU sends the IP addresses allocated for each usage to the IAB-node via RRC. In case of IAB inter-CU topology management, the F1-terminating IAB-donor-CU may obtain the IP addresses for each usage from the non-F1-terminating IAB-donor-CU for the boundary IAB-node and descendant IAB-nodes of the boundary IAB-node. |

***Q5: Do you agree to clarify IP address allocation for inter-CU cases in clause 8.9.13?***

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| --- | --- | --- |
| Company | Yes/No | Comment |
| QCOM | Yes |  |
| **Ericsson** | **OK** |  |
| Huawei | YES |  |
| ZTE | OK |  |
| Fujitsu | Yes | Suggest a little change:  In case of IAB inter-CU topology management, the F1-terminating IAB-donor-CU may obtain the IP addresses for each usage in non-F1-terminating IAB-donor-CU’s topology from the non-F1-terminating IAB-donor-CU for the boundary IAB-node and descendant IAB-nodes of the boundary IAB-node. |
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## Issues for IAB node Integration

In contribution [9], it’s proposed to add a NOTE to capture the following agreement for the OAM based F1-terminating donor selection in Section 8.12.1.

*For OAM-based donor selection, the IAB-node indicates the F1-terminating donor node by signaling its IP address(es) to this donor node using the Rel-16 RRC-based signaling mechanism*.

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| NOTE: If the IAB-node establishes NR-DC before the establishment of F1-C connection, and the IAB-donor is selected by OAM, the MN or SN of the IAB-node will perform as the F1-terminating donor if receiving IP address(es) of the IAB node through RRC signaling. |

***Q6-1: Do you agree to add the NOTE above for IAB node Integration?***

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| --- | --- | --- |
| Company | Yes/No | Comment |
| QCOM | Yes |  |
| **Ericsson** | **OK, but...** | We prefer a note that resembles more the agreement:  NOTE: For OAM-based donor selection, if the IAB-node establishes NR-DC before the establishment of F1-C connection, the IAB-node indicates the F1-terminating donor node by signaling its IP address(es) to this donor node by using the Rel-16 RRC signaling. |
| Huawei | Yes | Also ok with Ericsson’s version of the wording. |
| ZTE | Ok |  |
| Fujitsu | Yes |  |
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In contribution [11], it’s proposed to capture the following RAN3 agreement for IAB-donor determination.

*For donor-based IP-address allocation, the MN determines the F1-terminating node.*

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| NOTE: If the IAB-node establishes NR-DC before the establishment of F1-C connection, the MN decides which of MN or SN becomes the F1-terminating IAB-donor. In case it decides that the SN become the F1-terminating IAB-donor, it signals via Xn to the SN to establish the backhaul connectivity (phases 2.1 and 2.2). The IAB-node can implicitly derive whether the MN or the SN is the F1-terminating donor, e.g., based on the entity which provides the default BAP configuration. |

***Q6-2: Do you agree to modify the NOTE above to capture the agreement for IAB node Integration?***

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| --- | --- | --- |
| Company | Yes/No | Comment |
| QCOM | Yes | Also needs to be added to 38.423 |
| **Ericsson** | **OK, but with modifications** | NOTE: If the IAB-node establishes NR-DC before the establishment of F1-C connection, the MN decides whether the MN or the SN becomes the F1-terminating IAB-donor. In case it decides that the SN becomes the F1-terminating IAB-donor, it notifies the SN via Xn (Phases 2.1 and 2.2). The IAB-node can implicitly derive whether the MN or the SN is the F1-terminating donor, e.g., based on the entity which provides the default BAP configuration. |
| Huawei | ok | Prefer Ericsson’s version. |
| ZTE | No | We don't think an explicit indicator is needed to be sent to indicate SN to be the F1-terminating donor. If MN decides that SN become the F1-terminating donor, after receiving IP address request from IAB node via RRC, MN would send IAB transport migration management request message to SN, which includes IP address request info but doesn't include traffic to be offloaded information. After receiving this IAB transport migration management request message without traffic to be offloaded information, SN could derive implicitly that it should take the role of F1-terminating donor and provide default BAP configuration and allocated IP addresses to the IAB node. |
| Fujitsu | Yes |  |
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## Issues for IAB protocol stack

***Q7: Do you agree to add the protocol stacks for CP-UP separation scenarios 1 and 2 [11]?***

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| Company | Yes/No | Comment |
| QCOM | Yes | We have the stacks for F1-C routing via MeNB for ENDC. It would look a little awkward if we didn’t include those for CP-UP separation. |
| **Ericsson** | **OK, but…** | The first added figure is wrong, since it says ‘SgNB’ in the figure – it should say ‘MgNB’. |
| Huawei | ok | Agree with Ericsson, the typo of the first added figure should be corrected. |
| ZTE | Yes | Agree with Ericsson. |
| Fujitsu | Yes |  |
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## Others

***Q8: Please provide view if any issue is missing in above discussion (except for the rewording and editorial correction in another draft CR).***

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| Company | Comment |
| Fujitsu | The IP address configuration is a little different to descendant node compared to the boundary node. The IP address configured for descendant nodes is anchored to IAB-donor-DUs in non-F1-terminating topology but it is configured by the BAP address of a IAB-donor-DU belonging to F1-terminating topology.  Propose adding following text in step 6 of section 8.17.3.2:  The RRCReconfiguration may include the new TNL address(es) anchored at the target IAB-donor-DU which are configured using a BAP address of source IAB-donor-CU topology. |
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# Discussion – 2nd Round

[TBD]

# References

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | [R3-223116](file:///D:\会议硬盘\TSGR3_116-e\Docs\R3-223116.zip) | (CR TS 38.401): IAB Rel-17 Corrections (Ericsson) | CR0203r, TS 38.401 v17.0.0, Rel-17, Cat. F |
| 2 | [R3-223219](D:\\会议硬盘\\TSGR3_116-e\\Docs\\R3-223219.zip) | Discussion on IP address request for boundary node in inter-donor redundancy (Fujitsu) | discussion |
| 3 | [R3-223220](file:///D:\会议硬盘\TSGR3_116-e\Docs\R3-223220.zip) | CR for 38.401 on inter-donor redundancy (Fujitsu) | CR0208r, TS 38.401 v17.0.0, Rel-17, Cat. F |
| 4 | [R3-223250](file:///D:\会议硬盘\TSGR3_116-e\Docs\R3-223250.zip) | Corrections for IAB (Nokia, Nokia Shanghai Bell) | discussion |
| 5 | [R3-223251](file:///D:\会议硬盘\TSGR3_116-e\Docs\R3-223251.zip) | Corrections for IAB (Stage-2) (Nokia, Nokia Shanghai Bell) | CR0212r, TS 38.401 v17.0.0, Rel-17, Cat. F |
| 6 | [R3-223294](file:///D:\\会议硬盘\\TSGR3_116-e\\Docs\\R3-223294.zip) | Corrections on procedures for inter-donor topology adaptation, redundancy, and BH RLF recovery in TS 38.401 (ZTE) | CR0215r, TS 38.401 v17.0.0, Rel-17, Cat. F |
| 7 | [R3-223308](file:///D:\会议硬盘\TSGR3_116-e\Docs\R3-223308.zip) | Correction on IP address allocation (Lenovo) | CR0216r, TS 38.401 v17.0.0, Rel-17, Cat. F |
| 8 | [R3-223384](file:///D:\会议硬盘\TSGR3_116-e\Docs\R3-223384.zip) | Remaining issue for source IP selection and concurrent TNL migration (Huawei) | discussion |
| 9 | [R3-223385](file:///D:\会议硬盘\TSGR3_116-e\Docs\R3-223385.zip) | Miscellaneous correction for IAB enhancement (Huawei) | CR0218r, TS 38.401 v17.0.0, Rel-17, Cat. F |
| 10 | [R3-223541](file:///D:\会议硬盘\TSGR3_116-e\Docs\R3-223541.zip) | Correction on Rel-17 eIAB(Stage-2) (Samsung, Huawei) | CR0221r, TS 38.401 v17.0.0, Rel-17, Cat. F |
| 11 | [R3-223673](file:///C:\temporary\RAN3\RAN3%20May%2022\CB%20sessions\IAB_02_38401\Inbox\R3-223673.zip) | CR to 38.401 for Rel-17 IAB (Qualcomm Incorporated) | CR0231r, TS 38.401 v17.0.0, Rel-17, Cat. F  Late contribution |