3GPP TSG-RAN WG3 #115-e R3-222717

Online, 21st Feb-3rd Mar, 2022

Agenda Item: 13.2.3

Source: Huawei (moderator)

Title: Summary of Offline Discussion on IAB Topology redundancy

Document for: Approval

# Introduction

This paper is for the following offline discussion:

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| **CB: # 1304\_IAB\_Top\_Red**  **-Discuss details of the new Xn procedure (IAB Transport Migration Management), e.g. is it UE associated or non UE associated?**  **- Which node initiates it and for what purpose**  **- Boundary IAB-MT’s ID: storage and usage**  **- One procedure or two instances (CU-1 initiated, CU-2 initiated)**  **- Should CU1 use the new Xn procedure to request CU2 for full release of traffic offloading?**  **- Should CU2 use the new procedure to initiate modification, full/partial release, revoking of traffic offloading?**  **- Details on information exchanged between the F1-terminating donor and non-F1-terminating donor**  **- What information to be exchanged over Xn for F1 transport migration?**  **- Any further usage of the HO procedures and DC establishment procedures, e.g. to request IP address information?**  (HW - moderator)  Summary of offline disc [R3-222463](file:///D:\RAN3\RAN3-115\Inbox\R3-222463.zip) |

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

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| [R3-221683](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-221683.zip) | (TP for IAB BL CR for TS 38.423) IAB Inter-Donor Topology Redundancy (Ericsson) | Other  Rev in [R3-222500](file:///D:\RAN3\RAN3-115\Inbox\R3-222500.zip) |
| [R3-221691](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-221691.zip) | Discussion on Inter-topology transport (ZTE) | other |
| [R3-221842](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-221842.zip) | IAB Inter-Donor Procedures St3 (Qualcomm Incorporated) | discussion |
| [R3-221980](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-221980.zip) | Remaining issues for IAB inter-donor topology adaptation (Lenovo, Motorola Mobility) | discussion |
| [R3-222128](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-222128.zip) | (TP for BL CR for TS 38.423) Further discussion on inter-CU topology redundancy (Huawei) | other |
| [R3-222131](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-222131.zip) | (TP for BL CR for TS 38.473) F1AP enhancement to enable inter-topology (re)routing (Huawei) | other |
| [R3-222143](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-222143.zip) | (TP for TS38.423 BL CR) discussion on Inter-Donor IAB Topology Redundancy (Nokia, Nokia Shanghai Bell) | other |
| [R3-222313](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-222313.zip) | (TP to BL CR of TS38.423) Discussion on XnAP stage-3 issues for Rel-17 eIAB (Samsung) | other |
| [R3-222314](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-222314.zip) | (TP to BL CR of TS38.473) Discussion on F1AP stage-3 issues for Rel-17 eIAB (Samsung) | other |
| [R3-222126](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-222126.zip) | (TP for BL CR for TS 38.423) Further discussion on Inter-Donor IAB Node Migration (Huawei) | Other  Move to 13.2.3 |
| [R3-222142](file:///D:\会议硬盘\TSGR3_115-e\Docs\R3-222142.zip) | (TP for TS38.423 BL CR) discussion on Inter-Donor IAB Node Migration (Nokia, Nokia Shanghai Bell) | Other  Move to 13.2.3 |

The phase I discussion will focus on some critical open issues for the XnAP and F1AP signaling design for the IAB transport migration and BAP configuration. Some FFS part which is not so critical can be handled in phase II.

**Phase I**：Please give your feedback before Thursday, 24th February, 2022, 23:59 UTC. This allows us to give some input for Monday’s online session (28 February, 2022).

**Phase II**：Remaining issues in phase I and Converge on stage-3 TPs based on Phase I agreements. The deadline for Phase 2 is officially the same as for all email discussions, i.e., Tuesday, 1st March, 2022, 13:00 UTC.

# For the Chairman’s Notes

**[to be updated]**

# Discussion- Phase II after Monday’s online session

The following assumption has been agreed during Monday’s online session, so we need to continue discuss the solutions for the source IP address selection for the IAB-node.

**R17 supports multiple donor-DUs in topology 2 being used for transport migration**

**Details on the solutions are to be continued. If no agreements at this meeting, we may leave further agreements stemming from the assumption above to company contributions**

**Q1: Which solution should be used for source IP address selection at the descendant IAB-nodes?**

**Solution 1 (QC):**

* CU2→CU1: IP address/prefix allocated to the descendant IAB node + the anchored donor DU’s BAP address;
* CU1→descendant IAB node: pseudo BAP address in topology 1 + allocated IP address/prefix, where the pseudo BAP address in topology 1 is 1:1 mapped to the donor DU’s BAP address in topology 2.

**Solution 2 (ZTE):** F1-terminating donor can determine the used UL/DL IP addresses for boundary node and descendant node, and send the configuration to them.

**Solution 3 (Fujitsu):**

* CU1→CU2:pseudo BAP address in topology 1 which is 1:1 mapped to the donor-DU in topology 2, such info is carried in RRC container for the IP address request in IAB TRANSPORT MIGRATION MANAGEMENT REQUEST
* CU2→CU1: RRC container includes IP address/prefix allocated to the descendant IAB node + pseudo BAP address in topology 1 which is 1:1 mapped to the anchored donor-DU in topology 2
* CU1→descendant IAB node: Pseudo BAP address in topology 1 + allocated IP address/prefix.

**Solution 4 (Samsung):**

* CU2→CU1: IP address/prefix allocated to the descendant IAB node + the anchored donor DU’s BAP address;
* CU1→descendant IAB node: IP address/prefix allocated to the descendant IAB node + the anchored donor DU’s BAP address in topology 2 + topology 2 indication.
* CU1→descendant IAB node: UL mapping configuration for each UP/non-UP traffic + the anchored donor DU’s BAP address in topology 2 + topology 2 indication

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| **Company** | **Answer and comments if any** |
| Huawei | Each solution has pros and cons. At this stage, **we prefer solution which has least specification impact**.  Among them, we slightly prefer solution 1, since the Solution 1 has no impact on the descendant nodes, and only requires CU1 to ensure 1:1 mapping between the pseudo BAP address in top 1 and the donor-DU’s BAP address in top2, but this should be up to CU1’s implementation. While solution 2 and solution 4 will introduce more standardize impact, and are not support for rel-16 IAB-nodes, which may be the descendant nodes.  Our question for solution 3 is why the IP address configuration for the descendant nodes is carried via RRC container in the Xn interface, in our view, the RRC message to the descendant nodes are generated at the CU1 rather than CU2. |
| **Ericsson** | This is beyond the basic scenario and should not be discussed in this release. |
| ZTE | We prefer solution 2. But we can accept solution 1. |
| Fujitsu | Option 3 is based on the assumption that pseudo donor-DU address can be generated before the IP address request from CU1 to CU2.  We agree with HW’s comment that it’s CU1’s decision for mapping between the pseudo donor-DU address in top 1 and donor-DU’s BAP address in top 2. Because there may be some other cases that CU1 does not need to generate the pseudo donor-DU address, e.g., all the traffic anchored to a top 1 donor-DU is migrated to top 2.  Considering whether to generate the pseudo donor-DU address in top 1 is determined after CU1 receiving the IP address allocation from CU2, we can compromise to Option 1.  Based on option 1, IP allocation in RRC container is not necessary any more. |
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**Q2: According to the Monday’s online session, we have the following agreements and FFS:**

**Add a notification in IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE to indicate that the resources corresponding to the listed traffic are released. It is FFS how such notification can be encoded.**

**To address the FFS part, two ways are proposed:**

**Option 1: Add an optional Traffic Released List IE in IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE.**

**Option 2: Just response with the boundary node’s UE XnAP ID.**

**Which option is preferred?**

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| **Company** | **Answer and comments if any** |
| Huawei | Either way is fine, we prefer option 2 for simple.  The proponents for option 1 clarified that this IE is introduced in case that only traffic to be released list are included in the request message, and the receiver of such request message should send response message with some content to the transmitter due to that the procedure is a class 1 procedure. We understand the intention, but since all traffic requested to be released will be released by CU2, option 2 can achieve same results, and make the response message simpler. |
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**Q3: Whether to include the Control Plane traffic type IE which indicates the priority of BH RLC CH for non-UP traffic type in the IAB TRANSPORT MIGRATION MANAGEMENT REQUEST message?**

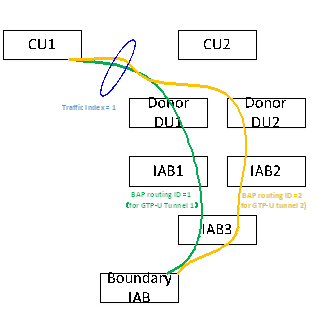
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| **Company** | **Answer and comments if any** |
| Huawei | Not necessary.  We think the non-UP traffic type {UA F1AP, NUA F1AP, non-F1} is enough for the CU2 to decides the priority for a BH RLC CH in its own topology. For example, the NUA F1AP messages should be handled with higher priority than the UA F1AP messages, because these NUA messages (e.g. interface management related messages) are usually more important, and such principle should be aligned for different CUs. It is not reasonable that one donor treat NUA F1AP with higher priority than UA F1AP while another adjacent donor treat the NUA F1AP with lower priority than UA F1AP. |
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One more open issue is mentioned by Samsung and Qualcomm just before the Monday’s online session: **To support the release of traffic, whether the Traffic To Be Released List can include a list of BH info Index to achieve the partial release of the traffic**

To explain this issue more clearly, the discussion contents from the email sent by Samsung and QC are copied here for your convenience:

*[Samsung]: In current Stage-3 signaling, under each traffic index, CU1 provides a list of BH info index which is used to index a set of BH configuration in Topo1 belonging to one traffic. For example, if a traffic contains two GTP-U tunnels, CU1 may provide two sets of BH info in Topo1, which are indexed by two BH Info Index. The reason to have such information is that CU1 aggregates two tunnels with different BAP routing paths in Topo1 into one offloaded traffic since they have similar QoS requirement. In this sense, the CU2 may configure different BAP paths in Topo2 by providing the separate BAP paths in Topo2, as shown in the following figures.*

*Please note that this signaling design is aligned with our agreement that 1:N mapping is not supported since the included BH information in Topo 1 for each BH Info Index can help the CU2 ensure this.*

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*In case of CU1-initiated traffic release, one possible case is that CU1 may request the release of traffic over GTP-U tunnel 1 (e.g., because the UE served by GTP-U tunnel 1 goes into RRC\_IDLE state). If we follow the current signaling design, i.e., by indicating the traffic index only for release, the CU1 has to request the release of both GTP-U tunnel 1 and GTP-U tunnel 2. Apparently, this is not a good way since the GTP-U tunnel 2 can be still kept.*

*In case of CU2-initiated traffic release, one possible case is that CU2 may request the release of traffic over GTP-U tunnel 2 (e.g., because the congestion at the IAB2). If we follow the release request at traffic index granularity, both GTP-U tunnel 1 and 2 should be requested to be released, which is not a good way since GTP-U tunnel 1 can be kept in Topo2.*

*In summary, the current Traffic to Be Release List IE cannot realize the cause the some of GTP-U tunnels belonging to the one traffic is requested to be released.*

*To resolve this issue, we propose to add BH Info Index under Traffic to Be Release List IE, i.e., (Please note that for modification case, the current signaling support to modify BH information referring to some BH Info Index)*

*[Qcom]:*

*The present structure is:*

*List of Traffics*

* *Traffic type*
* *QoS*
* *List of BH infos*

*-- BH RLC CH*

*-- BAP routing ID*

*Let’s say there are two F1-U tunnels. There are two options on how CU1 could request the traffic offload:*

***Option 1:*** *CU1 requests F1-U 1 and F1-U 2 as same traffic with different BH info. In this case, CU2 cannot request release of only one of the F1-Us.*

***Option 2:*** *CU1 requests F1-U 1 and F1-U 2 as separate traffics. In this case, CU2 can request release of only one of them.*

*So everything is possible. It is up to CU1 to determine the granularity of traffics in top2. If CU1 wants to allow CU2 to release with finer granularity, it can package the F1-Us to traffics accordingly.*

**Q4: To support the release of traffic, whether the Traffic To Be Released List can include a list of BH info Index to achieve the partial release of the traffic?**

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| **Company** | **Answer and comments if any** |
| Huawei | Not necessary.  The Traffic indicated by the Traffic index can only include one F1-U tunnel (up to CU implementation), so the release operation with finest granularity (e.g. per F1-U) has already been supported. |
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# Discussion-Phase I

## General issues of the new Xn procedure

### Boundary node ID & UA or NUA of the Procedure & Terminology

RAN3#114-e agreed that the new Xn procedure should include an identifier for the boundary node, the ID can be the UE XnAP ID of the boundary IAB-MT or the BAP address of the boundary IAB-node.

Based on the contributions [ZTE-1691] [QC-1842][Len-1980][ Nok-2143] [E///-2500] [HW-2126] [SS-2313], it seems that all companies submit papers to this agenda item can accept using the boundary node’s UE XnAP ID. So the moderator propose the following:

**Proposal 1: Using the UE XnAP ID as the boundary node ID in the IAB transport migration management procedure.**

Another issue for the new Xn procedure is whether uses UE-associated or Non-UE associated signalling, [E///-2500] suggest to use NUA signaling, while other companies [ZTE-1691] [QC-1842][Len-1980][Nok-2143] [HW-2126] [SS-2313] prefer to use UE-associated signaling. If the UE XnAP ID is adopted as the boundary node ID, using UA signaling is straightforward. Based on the majority view, the moderator suggests the following proposal:

**Proposal 2: The IAB transport migration management procedure uses UE-associated signaling.**

[ZTE-1691] suggests to use “F1-terminating donor” & “non-F1-terminating donor” instead of “NG-RAN Node 1” & “NG-RAN Node 2” in the new Xn procedure, while [SS-2313] proposes that the describing text uses NG-RAN Node 1 and NG-RAN Node 2.

Companies are encouraged to provide input for the following question:

**Q1-1: Do you agree the above proposal 1 and Proposal 2?**

**Q1-2: Which terminology is used for the IAB transport migration management procedure?**

* **Option 1: “F1-terminating donor” & “non-F1-terminating donor”.**
* **Option 2: “NG-RAN Node 1” & “NG-RAN Node 2”, and using one sentence to indicate the relationship between NG-RAN Node1&2 and F1/non-F1 terminating donor.**

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| **Company** | **Answer and comments if any** |
| Huawei | For Q1-1: Agree both proposals  For Q1-2: No strong opinion, either option is fine. Using “F1-terminating donor” & “non-F1-terminating donor” may be more straightforward. |
| **Ericsson** | **Q1-1:**   * **P1: agree** * **P2: we can live with** the UA option, as long as the procedure can be triggered from both CUs   **Q1-2:** We notice that usually (found only one exception in TS 38.423), the terms NG-RAN Node 1” and “NG-RAN Node 2” are used for NUA procedures. **We prefer Opt1.** |
| Qualcomm | For Q1-1: Agree both proposals  For Q1-2: Agree option 1: Use “F1-terminating donor” & “non-F1-Terminating donor”.  Option 2 doesn’t make sense. Why introduce the terms “NG-RAN Node 1/2” if they need to be mapped to the “(non)-F1-terminating donor”, which essentially is option 1. |
| Lenovo | Q1-1: agree P1 and P2  Q1-2: no strong view, we can follow the majority’s preference. |
| ZTE | For Q1-1: Agree both proposals  For Q1-2: Agree option 1 |
| Nokia | Q1-1: agree both proposals  Q1-2: Option 1 |
| Fujitsu | Q1-1: agree P1 and P2  Q1-2: prefer option 1. |
| Samsung | Q1-1: agree P1 and P2  Q1-2: “NG-RAN Node 1” & “NG-RAN Node 2” would be more aligned with the current XnAP spec. style, i.e., only mention the NG-RAN node in the procedure text (one exception is “E-UTRA – NR Cell Resource Coordination” procedure). We face the similar case in Rel-16 when developing F1AP, and we finally choose to use gNB-CU and gNB-DU, and add a note. |
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Summary:

8 companies provide feedback.

All companies agrees P1, 7 companies agree P2 and 1 can live with the option provided by P2

About the terminology, 5 companies prefer option 1, and 2 companies can accept any option, 1 companies prefer option 2.

Then the moderator will propose to capture the following proposals in the chairman notes:

**Proposal 1-1: Using the UE XnAP ID as the boundary node ID in the IAB transport migration management procedure.**

**Proposal 1-2: The IAB transport migration management procedure uses UE-associated signaling.**

**Proposal 1-3: Use “F1-terminating donor” & “non-F1-terminating donor” to indicate CU1 and CU2 respectively, in the IAB transport migration management procedure.**

### Whether the boundary node’s UE XnAP ID be retained or not?

About whether the boundary node’s UE XnAP ID should be retained, [E///-2500] proposes that the boundary node’s UE XnAP ID is retained by the F1-terminating CU after the non-F1-terminating CU has sent the UE Context Release message to the F1-terminating CU, while [SS-2313] suggests that the XnAP UE ID of boundary node during partial migration/RLF recovery procedure needn’t to be retained. Besides, [QC-1842] proposes that the boundary node-ID may be released after transmission of the UE Context Release message and release of all the transport paths in the non-F1-terminating CU’s topology used for communication with the F1-terminating CU.

[Nok-2143] mentioned a case that the new Xn procedure is performed before Xn HO procedure, and for such case, the XnAP HANDOVER REQUST message need to be updated to add the Target NG-RAN node UE XnAP ID IE, in addition, the XnAP IAB TRANSPORT MIGRATION MANAGEMENT REQUEST and RESPONSE message need to include both XnAP IDs allocated by the transmitter and the receiver.

Companies are invited to provide feedback for the following question.

**Q1-3: Whether the boundary node’s UE XnAP ID should be retained, if the IAB transport migration management procedure is performed after the F1-terminating CU receiving UE Context Release message for the boundary IAB node?**

**Q1-4: If the answer to Q1-3 is YES, when should the retained boundary node’s UE XnAP ID be released by the F1-terminating CU?**

**Q1-5: Whether to support the case that the IAB transport migration management procedure is performed before Xn HO procedure?**

**Q1-6: If your answer to Q1-5 is YES, please share your view on the proposal: In case using XnAP ID for the boundary IAB, the XnAP HANDOVER REQUST message need to be updated to add the Target NG-RAN node UE XnAP ID IE. The XnAP IAB TRANSPORT MIGRATION MANAGEMENT REQUEST and RESPONSE message need to include both XnAP IDs allocated by the transmitter and the receiver.**

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| **Company** | **Answer & Comments if any** |
| Huawei | YES to Q1-3, with the retained UE XnAP ID, it is easy for the non-F1 terminating CU to find the anchored IAB-donor-DU of the boundary IAB-node, after receiving the request message during the IAB transport migration management procedure.  For Q1-4: The retained boundary node’s UE XnAP ID can be released by the F1-terminating CU, after all the offloaded traffic which across the boundary IAB-node being released by the non-F1 terminating donor.  For Q1-5: We are not sure such case is reasonable. In our view, the IAB transport migration will occur only after the IAB-MT HO procedure (for partial migration case). |
| **Ericsson** | **Q1-3: Yes.** Also**,** since, according to TS 38.401, as long as the logical association for the BN between CU1 and CU2 exists, both sides should retain both IDs. This means that, in the request/response of the new procedure, both versions of the ID (CU1 and CU2 side) should always be indicated.  **Q1-4:** In Rel-18, when boundary and MT and DU can both migrate to another donor?  **Q1-5:** We think that the new procedure should be initiated after the HO.  **Q1-6:** As explained in Q1-3, both IDs need to be indicated in request/response of the new procedure, regardless of whether the new procedure can be executed before the HO. |
| Qualcomm | Q1-3: Yes. This was already agreed.  Q1-4: Agree with HW, it should not be released until all traffic migration has been revoked, i.e., released by non-F1-terminating donor, since CU2 may want to use the Xn procedure to request change of L2 configuration in top-2 or to request release of offloaded traffic.  Q1-5: It should not be done before the Xn HO. If it was done before, CU2 would not be able to determine a donor-DU and configure anything since it does not know the boundary node. It would be possible to include the NCGI of the target parent but this becomes equivalent to an Xn HO Request. |
| Lenovo | Q1-3: Yes, this has been agreed in last meeting.  Q1-4: It can be only released after full revocation from CU2 to CU1 or after full migration of boundary IAB-node.  Q1-5: This issue has been discussed in last meeting, and we only support the new XnAP procedure after the Xn HO. |
| ZTE | For Q1-3: Yes, non-F1-terminating CU includes an indication in the UE Context Release message to indicate F1-terminating CU to retain boundary node’s UE XnAP ID.  For Q1-4: F1-terminating CU retains boundary node’s UE XnAP ID by implementation.  For Q1-5: We slightly prefer the new procedure is initiated after Xn HO procedure. If non-F1-terminating donor refuses the HO REQUEST, the IAB transport migration management procedure performed beforehand does not make sense. |
| Nokia | Q1-3: yes  Q1-4: this may be up to the implementation, e.g. when no UE traffic using CU2’s topology.  Q1-5: Yes for following reasons:   * AI “13.2.2. Reduction of Service Interruption” has agreed the RRCReconfiguration for descendant IAB is delivered via source path. If the migration procedure is only performed after the Xn HO, how CU1 can deliver the RRCReconfiguration for descendant via source path? * If the traffic migration cannot be supported, there is No need for Xn HO.   So it should be up to the CU1’s implementation to decide whether first perform HO then check migration, or first check migration then perform HO.  Q1-6: Yes. the XnAP HANDOVER REQUST message need to be updated to add the Target NG-RAN node UE XnAP ID IE. The XnAP IAB TRANSPORT MIGRATION MANAGEMENT REQUEST and RESPONSE message need to include both XnAP IDs allocated by the transmitter and the receiver. |
| Fujitsu | Q1-3: Yes, this has been agreed.  Q1-4: It can be only released after full revocation.  Q1-5: Yes. There are two reasons:  First, since the new IP addresses request/response is performed in HO procedure, if the new Xn procedure is performed after HO, QoS info will be transferred after IP addresses request that CU2 cannot choose the target donor-DUs based on traffic QoS.  Second, for descendant nodes, if the new Xn procedure is performed after HO, there may be UL data loss of descendant traffic, since the Header Rewriting info has not been configured to boundary node when HO completes, the UL traffic from descendant nodes will be discarded by boundary node. That’s the reason to perform the new Xn procedure before HO.  To let CU2 knows the potential parent node the new Xn procedure can include NCGI of target parent node. Xn HO procedure can only help to carry RRC container, it cannot take the role of the new Xn procedure.  Q1-6: No strong view. |
| Samsung | Q1-3: Yes  Q1-4: it can be released when all traffic is revoked.  Q1-5: after HO |
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**Summary:**

8 companies provide comments.

All companies answered YES to Q 1-3. Thus, it make sense that the XnAP IAB TRANSPORT MIGRATION MANAGEMENT REQUEST and RESPONSE message need to include both XnAP IDs allocated by the transmitter and the receiver.

For Q1-4, 6 out of 8 companies think that the retained UE XnAP ID of boundary node should not be released until all migrated traffic across the non-F1 terminating topology being revoked, 2 companies think the release of retained boundary node’s UE XnAP ID should be up to implementation, and 1 company think the release of retained UE XnAP ID will performed when boundary and MT and DU can both migrate to another donor (maybe in R18). Since RAN3 has agreed that the DU migration is not supported in Rel-17. It is reasonable to only consider the traffic revocation case.

For Q1-5, 2 out of 8 companies answered YES to support the new procedure is performed before Xn HO procedure, while other companies prefer that the new procedure is initiated after Xn HO procedure. So, there is no consensus to support the new Xn procedure be performed before the Xn HO procedure.

Accordingly, the moderator suggests the following to achieve some progress:

**Proposal 1-4: The boundary node’s UE XnAP ID, to be used in the IAB transport migration management procedure, should be retained by both the F1-terminating donor and the non-F1 terminating donor, after the F1-terminating CU receiving UE Context Release message for the boundary IAB node.**

**Proposal 1-5: The XnAP IAB TRANSPORT MIGRATION MANAGEMENT REQUEST/RESPONSE message should include both boundary node’s UE XnAP IDs allocated by the transmitter and the receiver.**

**Proposal 1-6: The retained boundary node’s UE XnAP ID can be released after all the offloaded traffic which across the boundary IAB-node being released by the non-F1 terminating donor. But the release is up to implementation.**

## Information to be carried in the new Xn procedure

### QoS info of non-UP traffic

As shown in the following table, the traffic non-UP traffic Type in current XnAP BL CR (R3-221551) is FFS, [ZTE-1691] [QC-1842] [HW-2128]and [SS-2313] propose that the QoS information of non-UP traffic sent from F1-terminating donor to non-F1-terminating donor is the non-UP traffic type {UE-associated F1AP message, non-UE-associated F1AP message and non-F1 traffic}, which is same as Rel-16.

9.2.2.x1 Traffic Profile

This IE is used to indication the Traffic QoS parameters for F1-U traffic or non-UP traffic type.

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| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| CHOICE *Traffic type* | M |  |  |  |
| *>UP Traffic* |  |  |  |  |
| >>QoS Parameters | M |  | 9.2.3.5 |  |
| >*Non-UP Traffic* |  |  |  |  |
| >>Non-UP Traffic Type | M |  | FFS |  |

Thus, the moderator propose the following:

**Proposal 3: The QoS information of non-UP traffic sent from F1-terminating donor to non-F1-terminating donor is the non-UP traffic type: {UE-associated F1AP message, non-UE-associated F1AP message, non-F1 traffic}**

[QC-1842] also suggest to optionally include the Control Plane Traffic Type = Integer (1,…,3) for the QoS information of non-UP traffic. The TP in [E///-2500] also include this IE to indicate the DL non-UP traffic type.

Companies are invited to provide input for such information in the following question.

**Q2-1: Do you agree the above proposal 3?**

**Q2-2: Does the Control Plane Traffic Type = Integer (1,…,3) should be included as the QoS info for non-UP traffic type in the IAB transport migration management procedure?**

|  |  |
| --- | --- |
| **Company** | **Answer & Comments if any** |
| Huawei | ForQ2-1: Agree.  For Q2-2: Not necessary. the ***Control Plane Traffic Type* IE** defined in Rel-16 is to indicate the priority of BH RLC CH which is used for transmitting the non-UP traffic type. The non-F1 terminating donor CU can determine the priority of BH RLC CH for offloaded non-UP traffic in its own topology according to the indicated traffic type. |
| **Ericsson** | **Q2-1: Yes, but only for UL traffic.** In Rel-16 the *Non-UP Traffic Type* is used for **UL traffic** mapping at access node, **not for DL + UL**. For DL non-UP traffic, we have agreed the *Control Plane Traffic Type*, to indicate the relative priorities between different types of DL non-UP traffic. So, we P3 is not following Rel-16.  We would like to ask: does it make sense that CU2 obeys the CU1 recommendation wrt relative priorities of UP traffic types (QoS retained under CU2) and act on its own for non-UP traffic types?  **Q2-2: Yes, for DL non-UP traffic.** For UL non-UP traffic, we have *Non-UP Traffic Type*. |
| Qualcomm | Q2-1: Agree  Q2-2: Should be included.  On Huawei’s comment: CU1 should provide CU2 with all QoS/priority information. CU2 is free to follow this guidance or to take its own decisions. |
| Lenovo | Q2-1: agree with P3  Q2-2: No need for the Control Plane Traffic Type. The Control Plane Traffic Type is locally determined by the CU1 and CU2 may have a different determination for each type associated with the non-UP traffic. In addition, non-UP traffic type is enough for CU2 to be aware of the QoS of non-UP traffic. |
| ZTE | Q2-1: Agree  Q2-2: In our view, F1-terminating donor should not indicate the Control Plane Traffic Type as QoS information of non-UP traffic to non-F1-terminating donor. Because priorities setting principle depends on donor-CU, and it varies among different donor-CUs. F1-terminating donor should send the non-UP traffic type to non-F1-terminating donor. Then non-F1-terminating donor can know the non-UP traffic type to be migrated and determine priority for the non-UP traffic, thereby configuring routing and bearer mapping correspondingly. |
| Nokia | Q2-1: agree  Q2-2: not necessary. Control Plane Traffic Type is used during a BH setup/modification procedure, and it is associated with the BH RLC CH. CU1 only need to indicate the non-UP traffic type, then CU2 determine the Control Plane Traffic Type when setup/modify BH RLC CH for the offloaded non-UP traffic. |
| Fujitsu | Q2-1: Agree.  Q2-2: No strong view. |
| Samsung | Q2-1: agree with P3  Q2-2: no need for control plane traffic type. The offloaded non-UP traffic type only contains **{UE-associated F1AP message, non-UE-associated F1AP message, non-F1 traffic}**. We either use the specific non-UP traffic type (i.e., UE F1AP, non-UE F1AP, non-F1) or use a priority indication for non-UP traffic (e.g., 1, 2, 3, …). There is no need to include both of them. In this sense, we prefer to indicate the specific type. |
|  |  |
|  |  |

**Summary:**

8 companies provide comments. 7 companies agree the proposal 3, one company think the proposal 3 is applicable for UL traffic.

About the Control Plane Traffic Type = Integer (1,…,3), 2 companies think this should be included as the QoS info, and one of them propose this IE to be used for DL traffic. 5 companies think the IE is not needed, only the non-UP traffic type IE is enough. Obviously, there is no consensus on introducing such IE. Thus, the moderator suggest the following:

**Proposal 2-1: The QoS information of non-UP traffic sent from F1-terminating donor to non-F1-terminating donor is the non-UP traffic type: {UE-associated F1AP message, non-UE-associated F1AP message, non-F1 traffic}**

### Content of the F1-terminating Topology BH Information IE

In the current XnAP BL CR [R3-221551], we still have the following FFS for the F1-terminating Topology BH Information IE “ *Editor’s Note: FFS on whether and how to include above BAP routing ID/BH RLC CH ID. FFS on whether and how to differentiate DL, UL and both directions.*”

For the first FFS, some papers discussed the detailed design of the content, which are briefly listed as follows:

[ZTE-1691]: F1-terminating donor sends non-F1-terminating donor:

* For DL traffic, *next-hop BAP address* and *egress BH RLC channel*
* For UL traffic, *prior-hop BAP address* and *ingress BH RLC channel*
* The *routing ID allocated by F1-terminating donor* for DL descendant node traffic

[QC 1842]: the F1-terminating Topology BH Information IE includes:

* *(indices of) ingress BAP routing IDs* and *(indices of) BH RLC CH IDs* for UL or bidirectional descendant traffic
* *(indices of) egress BAP routing IDs* and *(indices of) BH RLC CH IDs* for DL or bidirectional descendant traffic

**[**HW-2128]: For descendant node traffic, CU1 to CU2 Xn message includes:

* egress BAP routing ID, *egress BH RLC CH* for DL;
* *ingress BAP routing ID*, *ingress BH RLC CH* for UL;
* list of TEID of F1-U tunnels for each QoS info.

[SS-2313]: CU1 to CU2: *BAP routing ID/BH RLC CH ID* as the optional IE with the QoS information.

Based on the common part of these proposals, the moderator suggests the following proposal

**Proposal 4: For descendant node’s traffic, the *F1-terminating Topology BH Information* IE includes:**

* ***(indices of)* egress BAP routing ID, and *(indices of)* *egress BH RLC CH* for DL traffic;**
* ***(indices of) ingress BAP routing ID*, and *(indices of) ingress BH RLC CH* for UL traffic;**

Besides the common part, companies are invited to provide views on the additional contents:

* A. For DL traffic, *next-hop BAP address* [ZTE-1691]
* B. For UL traffic, *prior-hop BAP address* [ZTE-1691]
* C. list of TEID of F1-U tunnels for each QoS info **[**HW-2128].

**Q2-3: Do you agree the above proposal 4?**

**Q2-4: Besides the information in Proposal 4, what additional information is need** **in the *F1-terminating Topology BH Information* IE?** **Do you think the above 3 bullets should be included in the F1-terminating Topology BH Information IE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Answer** | **Answer and Comments if any** |
| Huawei |  | **For Q2-3: Agree**  **For Q2-4: NO to A and B, Yes to C**.  C will be beneficial for the non-F1-terminating CU providing the UL BH mapping configuration for each F1-U traffic of the boundary node. So C can be carried as an optional IE |
| **Ericsson** | **Q2-3: Yes**  **Q2-4: No to all** | **Q2-4:** In our understanding, CU2 need not know about GTP-TEIDs. This is only of concern for CU1 and boundary DU. GTP-U tunnels terminate at CU1 or CU1-UP, not at CU2. |
| Qualcomm |  | **Q2-3: Agree on proposal 4.**  P4 is in line with QC, SS and HW contributions.  **A, B, C: No**  **On A, B:** We would not able to construct a scenario where not including the next/prior hop BAP addresses would create a problem.  **On C:** There is no need to include TEID information. Why would it be “helpful” to CU2? What would CU2 do with it. It doesn’t terminate any of the tunnels. |
| Lenovo |  | Q2-3: Agree with P4  For A and B, next-hop BAP address for DL and prior-hop BAP address for UL has been already included in the egress BAP routing ID for DL and the ingress BAP routing ID for UL.  For C, CU2 doesn’t need to know the TEIDs of F1-U tunnels between CU1 and IAB-nodes. |
| ZTE |  | For Q2-3: Agree  For Q2-4:  On A, B: Including next-hop BAP address/prior-hop BAP address is beneficial as boundary node may have more than one child nodes. But, we are ok if it is not included.  On C: We cannot see the benefit of including TEID information. Non-F1-terminating donor configures routing and BH RLC channels according to QoS info. It does not need to care about which F1-U tunnel the QoS info refers to. |
| Nokia |  | Q2-3: Agree  Q2-4: No for A, B and C. TEID is not visible to CU2. |
| Fujitsu |  | Q2-3: Agree.  Q2-4: No to all. The ingress/egress routing ID and BH RLC CH ID are enough to provide the mapping information. |
| Samsung |  | Q2-3: Yes  Q2-4: none of them |
|  |  |  |
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**Summary:**

8 companies provide comments.

All companies agree proposal 4.

While the additional information: A, B, and C, each only has 1 proponent respectively. So we do not have agreements on these additional information.

Thus, the moderator suggests to capture the following:

**Proposal 2-2: For descendant node’s traffic, the *F1-terminating Topology BH Information* IE includes:**

* ***(indices of)* egress BAP routing ID, and *(indices of)* *egress BH RLC CH* for DL traffic;**
* ***(indices of) ingress BAP routing ID*, and *(indices of) ingress BH RLC CH* for UL traffic;**

For the second FFS, i.e. *FFS on whether and how to differentiate DL, UL and both directions*. Many contributions [Lenovo-1980] [QC-1842] [HW-2128] [Samsung-2313] addressed this FFS. All the 4 papers indicate that the traffic direction is necessary in the F1-terminating Topology BH Information IE,

So, the moderator suggests the following:

**Proposal 5: The F1-terminating Topology BH Information IE carries information to indicate the traffic direction.**

And there are two ways for “how to differentiate DL, UL and both directions”:

**Option 1**: Using Choice structure among {DL, UL, both} for each BH Information Response item

**Option 2**: For each BH Information Response item, the *DL BH info* and the *UL BH info* IE are included as optional IEs [HW-2128].

For option 2:

If only *DL BH info* exists, the traffic direction is DL only;

else if only *UL BH info* exists, the traffic direction is UL only;

else if both *DL BH info* and *UL BH info* exists, the traffic is bi-directional;

else if none of the two IEs exists, the traffic is originated/terminated at the boundary node.

Companies are invited to provide views on the Proposal 5 and the above two options.

**Q2-5: Do you agree the above proposal 5?**

**Q2-6: Which option do you prefer if your answer to Q2-5 is yes?**

|  |  |  |
| --- | --- | --- |
| **Company** |  | **Answer and comments if any** |
| Huawei |  | For Q2-5: Agree  For Q2-6: Option 2**.**  This option 2 structure will simplify the IE design, and can indicate traffic of the boundary node also. |
| **Ericsson** |  | **Q2-5: OK**  **Q2-6: Slight preference towards Opt2**, but it seems easiest to stick with the current design? |
| Qualcomm |  | Q2-5: Agree  Q2-6: We prefer option 2 since the UL and DL info needs to be included anyway. |
| Lenovo |  | Q2-5: Agree with P5  Q2-6: prefer option 2. |
| ZTE |  | Q2-5: Agree  Q2-6: Option 2 is slightly better. It simplifies the IE design. |
| Nokia |  | Q2-5: Agree  Q2-6: Option 2. |
| Fujitsu |  | Q2-5: Agree.  Q2-6: No strong view, but option 1 is more aligned with the design in Non-F1-terminating Topology BH Information in the current BL CR. |
| Samsung |  | Q2-5: Agree  Q2-6: prefer to option 1 since if both DL and UL share the same BH RLC CH and prior-hop/next-hop BAP address, option 1 can save signalling bits. However, option 2 is also acceptable to us. |
|  |  |  |
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**Summary:**

8 companies provide comments.

All companies agree proposal 5. One company pointed out that the traffic direction should be included in both directions, i.e. the BH Information Request item and the BH Information Response item

For Q2-6，6 companies prefer option 2，1 company prefer option 1 but can accept option 2.

So, the moderator will propose to capture the following:

**Proposal 2-3: The F1-terminating/non-F1-terminating Topology BH Information IE include two optional IEs {DL BH info, UL BH info} for each BH Information Request/Response item to indicate the traffic direction.**

## Remaining issues for BAP configuration via F1 interfaces

### BAP routing configuration

RAN2#116-bis-e agreed the following: “**The routing configuration to include information that allows the boundary node to determine the topology each routing entry applies to. RAN3 to decide on St3-related aspects.**” Thus the routing configuration at a boundary IAB-node needs to indicate the egress topology it refers to.

Based on the contributions, there are two ways to indicate the egress topology:

**Option 1:** Explicitly carry an egress topology indicator {F1-terminating topology, non-F1-terminating topology} for each configured routing entry [ZTE-1691] [HW-2131] [SS-2314].

**Option 2:** Include an indicator into the routing configuration only if the configuration applies to the non-F1-terminating CU’s topology. [QC-1842]

Companies are invited to share views on the above two options.

**Q3-1: Which option do you prefer for indicating the egress topology when provides BAP routing configuration?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preference** | **Comments if any** |
| Huawei | Option1 |  |
| **Ericsson** | **Opt2** | Opt2 is simpler and compliant to Rel-16. |
| QCOM | Option 2 | Option 2 represents an optimization of option 1, i.e., the topology indicator can be skipped for F1-terminating topology. |
| Lenovo | Slightly prefer opt2 |  |
| ZTE | Option 1 | Actually, Opt 1 and Opt 2 are the same. The topology identity IE can be set as Optional. If the routing entry applies to F1-terminating topology, the topology identity could be not included. If the routing entry applies to non-F1-terminating topology, the topology identity indicates “non-F1-terminating topology”. |
| Nokia | Option 2 |  |
| Fujitsu | Option 2 | Compliant to R16. |
| Samsung | Option 1 | Agree Option 2 is an optimization to Option 1.  We think Topology indication will be used in many place. If an unified codepoint can be used everywhere, we are fine with either option. This can be checked in round 2. |
|  |  |  |
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**Summary:**

8 companies provide comments.

3 companies prefer option 1, the remaining 5 companies prefer option 2. But one of option 1 proponents can also accept option 2.

Since both options works, we need to converge on such essential stage 3 related design in this meeting, the moderator will suggest we go for the majority view, i.e. option 2, and the corresponding proposal will be merged to the proposal for Q3-2.

### UL mapping configuration

RAN2#116-bis-e agreed the following: “**The UL mapping configuration to include information for the boundary node to determine the egress topology of each UL mapping entry.**”

Thus the topology indicator is also needed in the UL mapping configuration.

Based on the contributions, there are two ways to indicate the egress topology:

**Option 1:** An egress topology indicator {F1-terminating topology, non-F1-terminating topology} is explicitly included for each configured routing entry [ZTE-1691] [SS-2314].

**Option 2:** Including an indicator into the UL mapping configuration only if the configuration applies to the non-F1-terminating CU’s topology. [QC-1842]

**Q3-2: Which option do you prefer for indicating the egress topology when provides UL mapping configuration?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preference** | **Comments if any** |
| Huawei | Option1 |  |
| **Ericsson** | **Opt2** | Opt2 is simpler and compliant to Rel-16. |
| QCOM | Option 2 | Option 2 represents an optimization of option 1, i.e., the topology indicator can be skipped for F1-terminating topology. |
| Lenovo | Slightly prefer opt2 |  |
| ZTE | Option 1 |  |
| Nokia | None | This is not needed. According to BAP spec, the node performs UL mapping first and routing after it. Thus, UL mapping should use pseudo Routing ID (i.e., F1-terminating topology Routing ID) which is then header rewrited in the routing procedure. |
| Fujitsu | Option 2 | Same as Q3-1. |
| Samsung | Option 1 | Agree Option 2 is an optimization to Option 1.  We think Topology indication will be used in many place. If an unified codepoint can be used everywhere, we are fine with either option. This can be checked in round 2. |
|  |  |  |
|  |  |  |

**Summary:**

8 companies replied.

3 companies prefer option 1

4 companies prefer option 2, but one of the proponents of option 1 can also accept option 2 as an optimization solution. So the option 2 has 5 proponents.

And one company think none of them is needed. It is worth noting that this issue aims at capture stage 3 design for RAN2 agreements, which is clearly stated that such indicator is needed for UL mapping config at the boundary node, so we should just choose one stage 3 design, instead of have more discussion on whether to revert RAN2 conclusion.

Similar to the summary at Q3-1, according to majority view, option 2 is suggested to be adopted in stage 3 design. The moderator suggests to capture the following proposal which address Q3-1 and Q3-2 jointly, since how to indicate the topology is common for the two issues:

**Proposal 3-1: To enable the boundary node determine the topology each routing entry/UL mapping config applies to, a non-F1-terminating topology indicator is included only if the configuration applies to the non-F1-terminating CU’s topology, the absent of this indicator indicates the configuration applies to the F1-terminating CU’s topology.**

[SS-2314] raised another issue: In order to help the correct DL IP address selection, the F1-terminating donor CU may indicate anchored topology, or the BAP address of anchored donor DU under CU2 and the corresponding topology of DL traffic when configuring the UL mapping in case of inter-donor topology redundancy.

First, the moderator is not sure about the difference between the “anchored topology” ang the “corresponding topology of DL traffic”, So Samsung is encouraged to provide some clarification on the proposal.

From the TP part included in the [SS-2314], the following Donor DU Information IE is added when providing the UL mapping configuration to the IAB-node via F1AP messages.

9.3.1.y Donor DU Information

This IE indicates the information of the anchored donor DU of DL traffic to help IAB-DU determine the IP address.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** |
| Topology Indication | M |  | 9.3.1.x |  |
| Donor DU BAP address | O |  | 9.3.1.111 | This IE indicates the BAP address of the IAB-donor-DU via which the DL traffic is transmitted. The presence of this IE indicates that the BAP address in the *BAP routing ID* IE of the *BH Information* IE is not used to indicate the IAB-donor-DU via which the DL traffic is transmitted. |

**Q3-3: Do you think the above donor DU information is needed in the UL mapping configuration to help the IAB-DU determine the DL IP address?**

|  |  |
| --- | --- |
| **Company** | **Answer & Comments if any** |
| Huawei | We agree that the DL IP address selection is an issue to be discussed, but the topology indication in the table is unclear, which need some clarification from Samsung. |
| **Ericsson** | Not sure why donor-DU BAP address needs to be indicated. Is it not sufficient for the IAB-DU to know that the entry refers to, e.g., CU2 topology? Or is the assumption that the IAB node is configured with several pools of new IP addresses, pertaining to different donor-DUs under CU2? |
| QCOM | We agree that there is an issue that needs to be addressed. However, it applies to UL, not to DL.  Explanation:  CU2 may spread the offloaded traffic over two donor-DUs in top-2, e.g., donor-DU2-a and donor-DU2-b. This implies that the boundary or descendent node may be configured with IP addresses from both donor-DU2s. The boundary or descendent nodes should select the source IP address on a packet in compliance with the BAP routing ID of the UL mapping, which may go to either donor-DU2-a or donor-DU2-b.  In Rel-16, the same issue arose, and we solved it by including the donor-DU’s BAP address with the IP address configuration on the IAB node.  In Rel-17, for the boundary node, the same rules apply since the boundary node’s IP addresses in top 2 are configured by CU2 via RRC.  In Rel-17, for the descendent node, the BAP address of the donor-DU should also be included with the IP address configuration contained in the new Xn procedure (i.e., IAB TNL Address Response IE in IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE). This BAP address, however, belongs to top-2 and is meaningless for UL mappings configured on descendent nodes in top-1. CU1 must therefore translate the top-2 BAP address in this IP configuration to a “pseudo-BAP address” used in top-1 for BAP routing IDs in UL mappings toward donor-DU2s. This needs to be captured in St2.  Here is an example:   * CU2 provides to CU1:   + IPprefix P1-a +BAPaddress A2-a for donor DU2-a.   + IPprefix P1-b +BAPaddress A2-b for donor DU2-b * CU2 provides to CU1 for an offloaded traffic of desc node:   + Traffic a: UL BAProutingID = R2-a = (A2-a, Pid)   + Traffic b: UL BAProutingID = R2-b = (A2-b, Pid) * CU1 determines for the offloaded traffic of the desc node:   + Traffic a: UL BAProutingID = R1-a = (A1-a, Pid)   + Traffic b: UL BAProutingID = R1-b = (A1-b, Pid)   Where A1-a and A1-b are the top-1 pseudo BAP addresses for A2-a and A2-b.   * CU1 configures header rewritings (R1-a, R2-a) and (R1-b, R2-b) on the boundary node. * CU1 configures IP addresses (P1-a, A1-a) and (P1-b, A1-b) on the descendent node. * CU1 configures UL mappings for traffic a and b containing R1-a and R1-b respectively.   We propose:  **Proposal X: The IAB TNL Address Response IE in IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE to include for each IAB TNL Address the corresponding BAP address of the donor-DU where this IAB TNL Address is anchored.**  **Proposal X+1: When CU1 passes the IP address configurations it received from CU2 to the descendent node and exchanges the donor-DU’s BAP address contained in each IP address configuration, it should apply a 1:1 mapping, i.e., each donor-DU BAP address received from CU2 should be mapped to a separate BAP address in top1.** |
| Lenovo | Agree with QC that the donor-DU’s BAP address is beneficial for IP address determination of the descendant nodes in case of the offloading spread more than one target-donor-DUs.  With the assumption of only offloading to one target-donor-DU, there has no such problem. If we want to support offloading to more than one target-donor-DUs, donor-DU’s BAP address needs to be indicated in the IP address allocation procedure. |
| ZTE | Topology identity is needed, while the donor-DU BAP address may be needed if CU2 spreads the offloaded traffic over two donor-DUs in top-2.  Actually, this is about IP address selection. In our view, F1-terminating donor can determine the used UL/DL IP addresses for boundary node and descendant node, and send the configuration to them. Otherwise, boundary node/descendant node has to report the selected IP address to F1-terminating donor, which leads to much overhead and delays the DL transmission in the non-F1-terminating topology.  Anyway, the IP address selection should be addressed in CB 1302. |
| Nokia | Agree with QC |
| Fujitsu | Understand the problem QC raised.  But we think it’s more reasonable that the BAP address present in the IAB TNL Address Response is the top 1 pseudo BAP address for the target donor-DUs (i.e., A1-a and A1-b). Because CU2 can generate the RRC container used for configuring IP addresses to descendant nodes directly.  If the BAP address indicated by CU2 is top 2 donor-DU’s address (A2-a and A2-b), CU1 needs to change the top2 donor-DU’s BAP address into the top1 pseudo BAP address and then configure the IP address (paired with this pseudo BAP address) of the descendant node. This does not follow the legacy method about RRC reconfiguration. Further, the IP address configuration from CU2 is agreed to be contained in RRC container that is not likely be modified by CU1.  We propose:  **Proposal X: the *iab-donor-DU-BAP-Address* included in the RRC container for the IP address request in IAB TRANSPORT MIGRATION MANAGEMENT REQUEST is the top 1 pseudo BAP address for the top 2 donor-DU.**  **Proposal X+1: The IAB TNL Address Response IE in IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE to include for each IAB TNL Address the corresponding top 1 pseudo BAP address of the donor-DU while this IAB TNL Address is anchored at the target donor-DU.**  **Proposal X+2: CU1 passes the IP address configurations to the descendent node in the RRC container generated by CU2.** |
| Samsung | Clarification to our contribution: the “anchored topology” and the “corresponding topology of DL traffic” are the same, which indicates the topology where the DL traffic is anchored.  **We agree to include the above donor DU information (topology indication, and anchor donor DU’s BAP address) in the UL mapping configuration to help the IAB-DU determine the DL IP address**.  **We agree Proposal X from QC.**  For Propose X+1 from QC, we are not sure if it is a good method.  QC’s proposal requires the donor DU address remapping at the CU1, and the CU1 configured anchored donor DU BAP address together IP address is a pseudo BAP address. As shown in QC’s example,   * CU2 provides to CU1 for an offloaded traffic of desc node:   + Traffic a: UL BAProutingID = R2-a = (A2-a, Pid)   + Traffic b: UL BAProutingID = R2-b = (A2-b, Pid) * CU1 determines for the offloaded traffic of the desc node:   + Traffic a: UL BAProutingID = R1-a = (A1-a, Pid)   + Traffic b: UL BAProutingID = R1-b = (A1-b, Pid)   Where A1-a and A1-b are the top-1 pseudo BAP addresses for A2-a and A2-b.  After using pseudo BAP address of CU2’s donor DU in top1, the BAP routing ID for all offloaded UL traffic at the descendant node should be changed to the ones containing it. Meanwhile, to adapt the BAP routing ID change, the routing configuration in F1-terminating topology (between boundary node and descendant node) should be reconfigured by using new BAP routing IDs containing the pseudo BAP address. In other words, QC’s method needs another step, i.e.,   * CU1 configures routing for traffic a and b containing R1-a and R1-b, respectively at the parent nodes of descendant node.   However, if CU1 “**include the above donor DU information (topology indication, and anchor donor DU’s BAP address) in the UL mapping configuration**”, some benefits to QC’s method is:   * No need for pseudo BAP address at CU1 side * No need routing reconfiguration in other parent nodes of descendant node.   In addition, such method can be also applied for boundary node.  In summary, our proposals are:  **Proposal X: The IAB TNL Address Response IE in IAB TRANSPORT MIGRATION MANAGEMENT RESPONSE to include for each IAB TNL Address the corresponding BAP address of the donor-DU where this IAB TNL Address is anchored.**  **Proposal Y: when configuring UL mapping to the offloaded traffic, the CU1 can configure the indication of anchored topology and the BAP address of anchored donor DU in the anchored topology.** |
|  |  |

**Summary：**

8 companies replied.

First, as clarified by QC, the issue for this question is how to enable the descendant IAB-node select a proper source IP address (anchored at the donor DU in CU2’s topology) for UL transmission. Lenovo pointed out that such issue only occurs when more than one donor-DU in topology 2 will be used for transport migration. So first we need to converge on **whether to support multiple donor-DUs in topology 2 being used for transport migration**. If we will support such scenario in R17, then we can discuss the detailed solutions provided by companies.

The solutions provided by companies are diversified. To the moderator’s understanding, at least the following solutions are provided:

**Solution 1 (QC):**

* CU2→CU1: IP address/prefix allocated to the descendant IAB node + the anchored donor DU’s BAP address;
* CU1→descendant IAB node: pseudo BAP address in topology 1 + allocated IP address/prefix, where the pseudo BAP address in topology 1 is 1:1 mapped to the donor DU’s BAP address in topology 2.

**Solution 2 (ZTE):** F1-terminating donor can determine the used UL/DL IP addresses for boundary node and descendant node, and send the configuration to them.

**Solution 3 (Fujitsu):**

* CU1→CU2:pseudo BAP address in topology 1 which is 1:1 mapped to the donor-DU in topology 2, such info is carried in RRC container for the IP address request in IAB TRANSPORT MIGRATION MANAGEMENT REQUEST
* CU2→CU1: RRC container includes IP address/prefix allocated to the descendant IAB node + pseudo BAP address in topology 1 which is 1:1 mapped to the anchored donor-DU in topology 2
* CU1→descendant IAB node: Pseudo BAP address in topology 1 + allocated IP address/prefix.

**Solution 4 (Samsung):**

* CU2→CU1: IP address/prefix allocated to the descendant IAB node + the anchored donor DU’s BAP address;
* CU1→descendant IAB node: IP address/prefix allocated to the descendant IAB node + the anchored donor DU’s BAP address in topology 2 + topology 2 indication.
* CU1→descendant IAB node: UL mapping configuration for each UP/non-UP traffic + the anchored donor DU’s BAP address in topology 2 + topology 2 indication

Apparently, no easy agreements can be directly summarized here. The moderator will suggest we continue the discussion on the assumption (R17 supports **multiple donor-DUs in topology 2 being used for transport migration**) and the solutions in phase II and online session.

### Header Rewriting Configuration

RAN2#115-e agreed the following: “**Will have rewriting mapping configuration(s) Old routing ID to New routing ID that limits the possible rewriting (for all cases of re-writing), details FFS.**” And RAN2#116-bis-e agreed the following: “**For inter-topology routing, the header rewriting configuration to include information that allows the boundary node to determine either the egress topology, or the ingress topology, or the traffic direction of a header-rewriting entry (selection of one of these expected). RAN3 to handle the St3-related aspects.**”

Based on the agreements, [ZTE-1691] [HW-2131]and [SS-2314] provide TPs to carry BAP header re-writing configuration in the BAP MAPPING CONFIGURATION message. So, the moderator proposes the following

**Proposal 6: Using BAP MAPPING CONFIGURATION message to carry the BAP header re-writing configuration.**

About the rewriting type indicator, [QC-1842] suggests to carry egress topology indicator and (only be carried if belongs to the non-F1-terminating CU’s topology), [HW-2131] prefer to use traffic direction (i.e., CU1 to CU2, CU2 to CU1, or re-routing), and [SS-2314] proposes to use the ingress topology indication. Apparently, which option will be selected is RAN2 scope, the moderator will suggest to wait for RAN2 progress.

**Q3-4: Do you agree the above proposal 6?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments if any** |
| Huawei | Agree |  |
| **Ericsson** | **Yes** |  |
| QCOM | Agree | RAN2 as agreed that RAN3 should handle this:  For inter-topology routing, the header rewriting configuration to include information that allows the boundary node to determine either the egress topology, or the ingress topology, or the traffic direction of a header-rewriting entry (selection of one of these expected). RAN3 to handle the St3-related aspects.  We have added this at the end of the discussion (Others). |
| Lenovo | Agree |  |
| ZTE | Agree |  |
| Nokia | Agree |  |
| Fujitsu | Agree |  |
| Samsung | Agree |  |
|  |  |  |

Summary:

8 companies replied, all agree proposal 6. So, the moderator will suggest to capture the following

**Proposal 3-2: Using BAP MAPPING CONFIGURATION message to carry the BAP header re-writing configuration.**

### BH RLC CH Mapping Configuration

RAN2#116-bis-e agreed the following: “**The BH RLC CH mapping configuration of the boundary node includes information for the boundary node to differentiate mappings based on ingress topology and egress topology.**” Therefore, the BH RLC CH mapping entry should differentiate the topology of the prior-hop node and the topology of the next-hop node.

Based on the agreements, [ZTE-1691] [HW-2131]and [SS-2314] provide TPs to explicitly carry the explicit ingress topology indication and the egress topology indication in the *BAP layer BH RLC channel mapping Information List* IE. The moderator suggests the following:

**Proposal 7: Using *BAP layer BH RLC channel mapping Information List* IE to carry the topology indicator for ingress topology and egress topology.**

**Q3-5: Do you agree the above proposal 7?**

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| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments if any** |
| Huawei | Agree |  |
| **Ericsson** | **Modification needed** | It is enough to indicate whether ingress or egress topology is CU2 topology. This is simpler and compliant to Rel-16. |
| QCOM | Agree | Only “non-F1-terminating topology” indicator should be included. “F1-terminating topology” is default. |
| Lenovo | Agree |  |
| ZTE | Agree |  |
| Nokia | Agree | Agree with QC. |
| Fujitsu | Agree |  |
| Samsung | Agree |  |
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**Summary:**

8 companies provide feedback. All agree proposal 7.

Three companies (E/// , Qcom and Nokia) suggest to use the way which only explicitly indicates the non-F1-terminating topology for ingress and egress topology, while the default case without the explicitly indication indicates the F1-terminating topology. The moderator thinks it make sense to use a unified way to indicate the topology, according to summary for Q3-1 and Q3-2.

The P7 and the proposal for next Q3-6 will be merged.

[QC-1842] proposes “The BH RLC CH mapping configuration to indicate if the ingress topology (of the prior-hop node) and/or the egress topology (of the next-hop node) is the non-F1-terminating CU’s topology.”

Similarly, we still have two options for the topology indicator for the BH RLC CH mapping configuration at the boundary node:

**Option 1:** Explicit ingress/egress topology indicator, e.g. {F1-terminating topology, non-F1-terminating topology} [ZTE-1691] [HW-2131] [SS-2314].

**Option 2:** Include a topology indicator only if the ingress/egress topology is the non-F1-terminating CU’s topology. [QC-1842]

**Q3-6: Which option do you prefer for indicating the egress topology when provides BH RLC CH mapping configuration?**

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| --- | --- | --- |
| **Company** | **Preference** | **Comments if any** |
| Huawei | Option1 |  |
| **Ericsson** | **Opt2** | Opt2 is simpler and compliant to Rel-16. |
| QCOM | Opt2 | Same as Ericsson |
| Lenovo | Slightly prefer opt2 |  |
| ZTE | Option 1 |  |
| Nokia | Opt 2 |  |
| Fujitsu |  | No strong view |
| Samsung | Opt1 | Agree Option 2 is an optimization to Option 1.  We think Topology indication will be used in many place. If an unified codepoint can be used everywhere, we are fine with either option. This can be checked in round 2. |
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**Summary:**

8 companies provide comments.

3 companies prefer option 1

4 companies prefer option 2, but one of the proponents of option 1 can also accept option 2 as an optimization solution. So the option 2 has 5 proponents.

The situation is similar to other issues related to how to indicate the topology, so the moderator suggests to use a unified way, i.e. option 2: only include explicit indicator for the non-F1-terminating topology.

The following will be suggested to be captured:

**Proposal 3-3: A non-F1 terminating topology indicator is introduced in *BAP layer BH RLC channel mapping Information List* IE for the boundary node’s BH RLC CH mapping configuration, to indicate if the ingress topology (of the prior-hop node) and/or the egress topology (of the next-hop node) is the non-F1-terminating CU’s topology.**

## Revocation and modification of transport migration

### Revocation of transport migration

Some papers [Len-1980] [HW-2128&2126] [SS-2313] [E///-2500] discussed the remaining issues about the revocation of the transport migration for the partial migration/RLF recovery and the redundancy case. But the moderator noticed that some issues has been covered by the CB#1302, e.g. whether to support CU1 initiation full or partial release for revocation of partial migration and RLF recovery case, the way of CU2 initiated revocation for redundancy case, etc. The same discussion will not be repeated in this CB. Thus, in this CB, only the signaling related issues not covered by CB #1302 will be involved.

For the inter-donor redundancy case, the [Lenovo-1980][HW-2128]and [E///-2500] suggest that CU2 initiating the revoking using the new XnAP procedure (IAB Transport Migration Management procedure) to CU1, and the revoking traffic will be carried as the traffic to be released in the request message. [SS-2313] suggests to introduce a new class-2 revocation procedure for the CU2 triggered partial revocation.

Companies are invited to provide the view on the following question:

**Q4-1: Which way is preferred to support the CU2 initiated revoking for the inter-donor topology redundancy:**

**Option 1: CU2 initiating IAB Transport migration management procedure, including the list traffic to be released.**

**Option 2: CU2 initiating new class-2 procedure, which can indicate a request to revoke all traffic, or to indicate the serving status information of CU2.**

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| --- | --- | --- |
| **Company** | **Preference** | **Comments if any** |
| Huawei | Option1 | Using the IAB transport management procedure is enough, no need to introduce another one. |
| **Ericsson** | **Option 1** | The new class-1 procedure that we already defined can cover all cases of interest. |
| QCOM | Option 1 | CU2 must be able to use the IAB Transport Migration Request if it wants to change L2 parameters of offloaded traffic.  This implies that CU2 can initiate this procedure.  Therefore, it is just simpler to reuse this same approach if CU2 wants to request traffic release. We may debate if CU1 can reject this request. |
| Lenovo | Opt1 |  |
| ZTE | Option 1 | IAB transport management procedure is enough. Option 2 is kind of optimization. |
| Nokia | Option 1 |  |
| Fujitsu | Option 2, but | It is better to use a new procedure for CU2 initiated revocation. We prefer to use class-1 procedure, to let CU1 be able to reject the request. |
| Samsung | Option 2 or Option 2 under Q4-2 | Why CU2-initiated procedure needs a feedback from CU1? What kind of information is needed for feedback. In our understanding, after receiving the CU2’s revoke request, CU1 can trigger the IAB Transport Migration Management procedure.  However, if companies feel a class-1 prodedure is needed, we are not in favour of Option 1. The reason is given Q4-2. |
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Summary:

8 companies reply.

6 prefer option 1

1 prefer option 2.

1 prefer a new class 1 procedure.

Apparently, majority think the IAB Transport migration management procedure is enough for CU2 initiated traffic revoking, it is not necessary to introduce a new procedure at the last meeting. The moderator suggests to capture the following:

**Proposal 4-1: For traffic revoking, CU2 can initiating IAB Transport migration management procedure, including the list of traffic to be released.**

### CU2 initiated Modification of transport migration

Last RAN3-114bis meeting agrees that “**CU2 can initiate the new procedure to request modification of traffic migration (modification of L2 info only)**”, [SS-2313] prefers to use another procedure, e.g., IAB Transport Migration Management Required/Confirm message, since CU2-initiated procedure is only for L2 information modification. While the TP in [E///-2500] still use the IAB Transport management request/response message to achieve the same purpose, by minor revision, e.g. add non-F1 terminating topology BH Information in the request message, if the procedure is initiated by CU2.

Companies are invited to provide the view on the following question:

**Q4-2: Which way is preferred for the CU2 initiated traffic modification (L2 info only):**

**Option 1: CU2 initiating IAB Transport migration management procedure, including the non-F1 terminating topology BH Information in the request message.**

**Option 2: Introducing** **another procedure, e.g., IAB Transport Migration Management Required/Confirm message for the non-F1 terminating donor initiated modification.**

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| --- | --- | --- |
| **Company** | **Preference** | **Comments if any** |
| Huawei | Slightly prefer Option1 | Option 1 requires less spec impact, since the IAB transport migration procedure will be reused. |
| **Ericsson** | **Option 1** | If we go for Option 2, it should also include a revoking IE. |
| QCOM | Option 1 | Less impact. Simpler. |
| Lenovo | Opt1 |  |
| ZTE | Ok for both |  |
| Nokia | Option 1 |  |
| Fujitsu | Option 2 | It is better to use a new procedure for CU2 initiated modification. The IE design will be clearer than putting both CU1 and CU2 initiated modification in the same procedure. |
| Samsung | Option 2 | **A clean design is always our intention**, and this is always used as an argument when doing stage-3 signaling design. We agree Option 1 can work in Rel-17. However, we have concern on whether Option 1 is a clean design, and whether Option 1 is a good design for future with the following considerations:   * Normally, two procedures are defined for two unequal position entities in XnAP/F1AP/E1AP so that each entity can use the corresponding procedure to initiate their request, even there are some overlapping information   F1-term. donor and non-F1-term. donor are similar, i.e., they are in unequal position in the procedures, which is similar to MN and SN, gNB-CU and gNB-DU, gNB-CU-CP and gNB-CU-UP.  The contained information highly depends on the initiating node. Obviously, it should be two different procedures  If same procedure is considered as simple and less impact, why does RAN3 not to choose this design before?   * Use the same procedure to represent both F1-termi. Donor and non-F1-termi. Donor initiated procedures, the signalling design complexity increase, for example, * We have to indicate which IE should be present w.r.t. the initiating node. I guess, in Rel-18, new IEs will be added and the semantic description will be continuously added. * The message structure becomes much complex since the IE presence needs taking the initiating node into account * Such design is not future-proof   In Rel-18, we will highly possible to enhance this procedure for mobility. We are not sure if Option 1 can simplify our Rel-18 signaling. However, Option 2 is a safe way since several practices has been used in other messages.   * Option 1 is not good design for engineering to develop codes for this procedure |
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Summary:

8 company reply.

5 prefer option 1, 2 prefer option 2, and 1 company is ok for both.

The proponents of option 2 also admits that the option 1 works for option 1. And the intention for option 2 is to develop a cleaner design. Considering the time limit for R17 IAB WI, and the majority view. The moderator suggests to capture the following:

**Proposal 4-2: For traffic modification, CU2 initiating IAB Transport migration management procedure, including the non-F1 terminating topology BH Information in the request message.**

## Others

**Q5: Any other issues related to the Agenda item, but not covered by 3.1-3.3?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Issues** | **Comments if any** |
| Qualcomm | Header rewriting configuration | RAN3 to decide if the header rewriting configuration to include the:  Option 1: Ingress topology  Option 2: Egress topology  Option 3: Traffic direction  We prefer to Option 2. |
| Lenovo |  | Option 2 for header rewriting configuration. |
| ZTE |  | For the issue raised by QC, since both UL mapping configuration and routing configuration use egress topology indicator. For simplicity, the egress topology indicator is used for header rewriting as well. |
| Samsung | Configuration for BAP control PDU transmission | BAP control PDU transmission is handled by CU2, and it is not the offloaded traffic. So, CU2 should directly provide the egress BH RLC CH and next-hop BAP address to CU1 for BAP control PDU when it knows that the boundary node has the capability to support HbH flow control/RLF indication.  In other words, such information is not requested from the CU1, i.e., we don’t need add “BAP control PDU” in non-UP traffic type IE.  So, we propose to add an optional IE (e.g., BAP Control PDU CH List) in Non-F1-terminating Topology BH Information IE. |
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Summary:

QC raised an issue that RAN3 to select the header rewriting configuration from the {option 1. Ingress topology; option 2. Egress topology, option 3. Traffic direction}, 3 companies (AC, Lenovo, ZTE) provide feedback to this issue, and all the 3 companies select option 2. So the moderator suggest the following:

**Proposal 5-1: For each BAP header rewriting configuration, include an egress topology indicator to indicate the traffic direction.**

Samsung raised another issue that CU2 should directly provide the egress BH RLC CH and next-hop BAP address to CU1 for BAP control PDU when it knows that the boundary node has the capability to support HbH flow control/RLF indication. Since Samsung is the last company to provide feedback in phase I, such issue hasn't receiving any comments. Companies please provide feedback on the following proposal in phase II:

**Proposal 5-2: Add an optional IE (e.g., BAP Control PDU CH List) in Non-F1-terminating Topology BH Information IE.**