**3GPP TSG-RAN WG2 Meeting #118 Electronic R2-220xxxx**

**Online Meeting, 9th – 20th May, 2022**

Agenda Item: 6.4.4.2

Source: Huawei, HiSilicon

**Title:** Report of [AT118-e][066][eIAB] BAP

Document for: Discussion and Decision

# Introduction

This paper aims at capturing the summary of offline discussion.

* [AT118-e][066][eIAB] BAP (Huawei)

Scope: 1. Address the remaining TS issues from tdocs submitted under AI 6.4 (and below), except those issues addressed in specific discussion. Review collect comments identify agreement points, points for online CB etc. 2. Progress the CR, merge all TS impacts into a single CR.

Intended outcome: Report, CR

Deadline: 1 for CB W2 Wed, 2 CR agreement is expected in Post meeting discussion

1. R2-2205253 Miscellaneous CR for TS 38.340 Huawei, HiSilicon
2. R2-2204793 Miscellaneous IAB Corrections on BAP in 38.340 ZTE, Sanechips
3. R2-2204912 Miscellaneous corrections to TS 38.340 Fujitsu
4. R2-2204881 Local congestion-based re-routing at divergence point of DL paths Nokia, Nokia Shanghai Bell
5. R2-2204913 SCG deactivation impact on NR eIAB Fujitsu discussion
6. R2-2205254 Corrections on the handling of unknown, unforeseen, and erroneous protocol data for header rewriting case in TS 38.340 Huawei, HiSilicon
7. R2-2204899 Corrections to 38340 vivo
8. R2-2206040 Miscellaneous corrections to 38.340 for eIAB Qualcomm Incorporated

# Discussion

**2.1 Miscellaneous/Editorial**

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| **Tdoc** | **Changes** | **Rapporteur’s suggestions** |
| R2-2205253 | All changes | **To be merged to Rapp CR and further reviewed in later phase.** |
| R2-2204793 | Changes in 5.2.1.3 | **Not pursued**  [Rapp]: The general note in the beginning already clarifies the applied topology of each routing entry.  “*In the BH Routing Configuration, the entry configured with Non-F1-terminating Topology Indicator IE applies to the BAP Data PDU considered as non-F1-terminating donor topology data, and the entry not configured with Non-F1-terminating Topology Indicator IE only applies to the BAP Data PDU not considered as non-F1-terminating donor topology data.*” |
| Changes in 5.2.1.4.1, 5.2.1.4.2 | **Not pursued**  [Rapp]: The “*, belonging to topology indicated by Ingress Non-F1-terminating Topology Indicator IE in F1AP,*” in the current spec already clarifies the topology of egress link. |
| Changes in 5.2.1.4.3 | **To be merged to Rapp CR and further reviewed in later phase.** |
| R2-2204912 | All changes | **To be merged to Rapp CR and further reviewed in later phase.** |
| R2-2204881 | Proposal 1 | **To be merged to Rapp CR and further reviewed in later phase.** |
| Proposal 2/3 | **See the discussion in below 2.2** |
| R2-2204913 |  | **See the discussion in below 2.3** |
| R2-2205254 |  | **See the discussion in below 2.4** |
| R2-2204899 | Changes in 5.2.1.3 on type indicator | **See the discussion in below 2.5** |
| Changes in 5.2.1.4.1 | **Not pursued**  [Rapp]: Similar to the comment on R2-2204793. |
| Changes in 5.3.1.2 | **Not pursued**  [Rapp]: current wording “per BAP routing ID” already covers that. |
| Others | **To be merged to Rapp CR and further reviewed in later phase.**  [Rapp]: there may be some minor update. |
| R2-2206040 | Changes in 3.1 | **See the discussion in below 2.5** |
| Changes on “*consider this BAP Data PDU to be routed in the non-F1-terminating IAB-donor’s topology*” | **Not pursued**  [Rapp]: The proposed wording does not change the meaning. |
| Change on F1AP IE naming of *Non-F1-terminating IAB-donor’s Topology Indicator* | Wait for RAN3 spec update first. |
| Changes in 5.4.1 | **Not pursued**  [Rapp]: Wording optimization. The proposed wording does not change the meaning. We should focus on essential/critical changes. |
| Other details | **To be merged to Rapp CR and further reviewed in later phase.**  [Rapp]: there may be some minor update/selection. |

**Q1: Do you agree with the rapporteur’s suggestion, and provide detailed comments otherwise.** (You can skip the changes if you agree with rapporteur’s suggestion)

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| **Companies** | **Tdoc/changed section** | **Comments** |
| Fujitsu |  | Agree with rapporteur’s suggestion. |
| ZTE | Changes in 5.2.1.3 and 5.2.1.4.1, 5.2.1.4.2 | It is suggested to have separate field description of *Non-F1-terminating Topology Indicator* IE for each entry of the BH Routing Configuration, *Ingress Non-F1-terminating Topology Indicator* IE and *Egress Non-F1-terminating Topology Indicator* IE for each entry of the BH RLC Channel Mapping Configuration, *Egress Non-F1-terminating Topology Indicator* IE for each entry of the Uplink Traffic to BH RLC Channel Mapping Configuration. In addition, the routing procedure and BH RLC channel mapping procedure should include the topology check, which follows legacy conventions and is helpful for the implementation. |
| Apple | R2-2204881, Proposal 1 | Not sure this is needed or makes a difference. It may be acceptable to us. However, according to clause 5.3.1.2 and 6.3.9 the available buffer size is given “per BAP routing ID”, indicated by a BAP Control PDU for flow control feedback. |
| Apple | R2-2206040 | Except for 5.4.1, the proposed changes make the spec more readably and consistent, fine to agree most of them. |
| Ericsson | R2-2204793, Changes in 5.2.1.3, Changes in 5.2.1.4.1, 5.2.1.4.2 | No strong view, the text indicated by the rapporteur seems however enough exhaustive without further complicating the procedural text. |
| Ericsson | R2-2204881 P1 | Not sure about the intention. The NOTE is already clear that the link congestion affects a certain BAP routing based on the flow control feedback. |
| Ericsson | R2-2206040 | Not sure about the intention of this change:  - else if the BAP entity belongs to the IAB-MT and at least one egress link is available, and if *Re-routing Disable Indicator* IE is not configured by F1AP:  We prefer the original wording. |
| vivo | R2-2204793: Changes in 5.2.1.3 and 5.2.1.4.1, 5.2.1.4.2;  R2-2204899 Changes in 5.2.1.4.1. | We share the view with ZTE. Though we have the general description for *BH Routing Configuration* with respect to *Ingress/Egress Non-F1-terminating Topology Indicator IE* as pointed out by the Rapporteur, this does not mean that related description is not necessary in the procedure description. The changes can clearly improve the readability of the procedure related to *Ingress/Egress Non-F1-terminating Topology Indicator IE*. |
| LGE | R2-2204881 | For P1, considering descriptions in the flow control feedback section, the current Note may be clear enough. |

**2.2 DL re-routing in R2-2204881**

Following is proposed in R2-2204881

**Proposal 2**: An egress link may be determined as congested also locally by an IAB-DU or IAB-donor-DU.

**Proposal 3**: (To implement Proposal 2) amend the current BAP note to say “[…] if it is determined as congested based on the received flow control feedback, as defined in sub-clause 5.3.1, or locally by an IAB-DU or IAB-donor-DU.”

**Rapporteur’s view**: It seems purely IAB-node implementation that IAB node can consider the link not available/congestion in DL. Also, IAB-DU can also trigger the polling of flow control feedback, if it wants, where the received flow control feedback can also trigger the re-routing, if congested.

**Q2: Do you think the proposed change from P3 in R2-2204881 is needed?**

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| **Companies** | **Yes/No** | **Comments** |
| Fujitsu | Yes | Agree IAB node may decide a link is congested locally and re-route the traffic to another available link. It can also achieve load balance. It can decide congestion based on its own buffer without triggering a polling of a flow control feedback. |
| ZTE | Yes | We see the points of this proposal. If we allows the upstream node to perform re-routing, it is reasonable for the congested node to perform re-routing too. |
| Apple | See comment | We assume P2 is missing in the question. Local re-routing based on flow-control feedback should be for the IAB node with diverging paths, but the paper (at P2) talks about the IAB-node with converging paths. So it seems the proposal is for the upstream path, but this is not clear from P3 at all.  Might be good to start by clarifying the scenario first.  Overall, this seems to be a special case. Local rerouting looks ok according to what we already have in 38.300: "*In case the BH link resolved from the routing entry is considered unavailable for this packet, the IAB-node may perform local rerouting*”. Otherwise, we wonder if the proposal is rather a slight design change that may lead to an IAB node not considering the flow control feedback, which may not be desirable. |
| Kyocera | Yes | We agree with the rapporteur that it’s up to IAB-DU implementation, while we think it’s useful to be clarified. |
| Ericsson | Yes | We agree with the proposal. Not sure however, if the word ”locally” is technically correct. One alternative could be:  ” An egress link may be not considered to be available for a BAP routing ID, if it is determined by the IAB node to be ~~as~~ congested, for example based on the received flow control feedback, as defined in clause 5.3.1, ~~or locally by an IAB-DU or IAB-donor DU.~~” |
| vivo | Yes | Agree with the rapporteur’s view. |
| Intel | Change is not needed | Agree with rapporteur’s view that it is an implementation issue. So far, there’s no threshold for the IAB-node to decide whether a BH link is congested based on the traffic static of its own. |
| Lenovo | Yes | Agree with the Ericsson version with the following update.  ” An egress link may be not considered to be available for a BAP routing ID, if it is determined by the ~~IAB node~~ IAB-DU or IAB-donor-DU to be ~~as~~ congested, for example based on the received flow control feedback, as defined in clause 5.3.1, ~~or locally by an IAB-DU or IAB-donor DU.~~” |
| LGE | No. (change is not needed) | Agree with intel and rapporteur’s analysis. We prefer not to change this note. |

**2.3 SCG deactivation in R2-2204913**

Following is proposed in R2-2204913

Proposal 1: RAN2 to confirm that SCG deactivation is supported by IAB-MT.

Proposal 2: The egress link corresponding to IAB-MT’s SCG is not considered to be available if SCG is deactivated.

Proposal 3: When BH RLF occurs at MCG and SCG is deactivated at the IAB-MT, the IAB-DU may send a BH RLF detection indication to its child nodes.

Proposal 4: Adopt the TP for TS 38.340 in Annex.

**Rapporteur’s view**: It is good if companies can first confirm on whether SCG deactivation is supported by IAB-MT. Rapp understands that the SCG deactivation is somehow for the motivation of power saving, which is not needed for the IAB-node.

**Q3: Do you think SCG deactivation is supported by IAB-MT?**

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| **Companies** | **Yes/No** | **Comments** |
| Fujitsu | Yes | Normally, the NR DC framework (e.g., MCG/SCG-related procedures) is applicable to IAB-MT. It is reasonable and feasible that IAB-MT also supports SCG deactivation. Otherwise, we will have to state in spec that it is not applicable to IAB-MT. We don't see a strong reason that this DC/CA enhancement is excluded for IAB. |
| ZTE | See comment | It make sense that if the SCG of IAB MT could be be deactivated, the corresponding egress link should be regarded as unavailable. However, this is not R17 specific issue. R16 IAB also has this issue. |
| Apple | Yes | It seems logical an IAB-MT (and also the parent node) would consider the SCG activation state in a mature implementation, although it can be good to clarify this case in the spec. |
| Kyocera | No | We have the same understanding with the rapporteur that the SCG deactivation is intended for UEs to reduce their power consumption. So, we assume the IAB-MT’s SCG is always activated since there is no such a battery concern. |
| Ericsson | No | Agree with Rapporteur, we never discussed this feature in the context of IAB. Further, we are also not sure that this specific issue should be captured in the BAP spec (especially the note 4). |
| vivo | No | Agree with the rapporteur. It is reasonable to assume that SCG for IAB-MT is always active. |
| Intel | See comment | Theoretically, IAB-MT’s SCG could be deactivated. However, considering the co-existence between SCG deactivation and IAB has not been discussed before, we think it would be better not to support SCG deactivation in Rel-17. |
| Lenovo | No | Agree with the rapporteur that SCG deactivation is for power saving, IAB-node’s SCG can be always active to realize BH link redundancy. |
| LGE | No | The purpose of SCG deactivation is to enable reasonable UE battery consumption while having fast usage of SCG when MR-DC is configured. However, in our view, the IAB node handles backhaul traffic from many UEs and we doubt whether SCG deactivation is helpful and useful for IAB. |

As to the proposed changes, **rapporteur understanding**, even if the SCG deactivation is supported by IAB-MT:

Donor implementation should update the routing configuration together or even before deactivate SCG. If donor considers the SCG is not useful anymore, the all the routing entry via SCG should be released. So, with correct implementation, no BH link on the deactivated SCG will be used/considered by current BAP spec.

**Q4: Do you think the changes in R2-2204913 are needed?**

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| **Companies** | **Yes/No** | **Comments** |
| Fujitsu | Yes | The activation/deactivation mechanism of SCG is supported to have fast usage of SCG when MR-DC is configured. There is no need to create/release the routing entries in a fast way. With the changes in R2-2204913, the SCG deactivation and routing can work together properly. |
| ZTE | No | Agree with rapporteur’s comments. |
| Apple | Yes | See answer to Q3 |
| Kyocera | No | We share the rapporteur’s view. |
| Ericsson | No | Agree with rapporteur, the impact of the SCG deactivation does not need to be handled at BAP lavel. |
| vivo | No | See answer to Q3. |
| Intel | No |  |
| Lenovo | No | Agree with rapporteur. |
| LGE | No |  |

**2.4 Error handling in R2-2205254**

Following is proposed in R2-2205254

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| When a BAP Data PDU (after the BAP header rewriting operation in accordance with clause 5.2.1.5 or 5.2.1.3, if applied) that contains a BAP address which is not included in the configured BH Routing Configuration and is not the BAP address of this node is received; or when a BAP Control PDU that contains reserved or invalid values is received the BAP entity shall:  - discard the received BAP PDU. |

**The reason for change is copied:**

In R17, there may be some BAP data with the BAP address in header not included in the BH Routing Configuration, due to the header rewriting:

Case 1: At the boundary node, the non-F1-terminating topology data just received may contains BAP address not included in the routing configuration, but will contains the BAP address included in the routing configuration after header rewriting. So, we need to clarify that as long as the data after header rewriting contains the BAP address included in the routing configuration, it should not be discarded.

Case 2: At the IAB-node configured with inter-donor-DU re-routing, after the routing configuration is updated by F1AP after RLF recovery, there may be still some old data received from the descendant node, which contains the old BAP address not included in the new routing configuration. But, those data can be re-routed with header rewriting, which should not be discarded. So, we need to clarify that as long as the data after header rewriting contains the BAP address included in the routing configuration, it should not be discarded.

**Q5: Do you think the changes in R2-2205254 are needed?**

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| **Companies** | **Yes/No** | **Comments** |
| Fujitsu | See comment | Agree with the intention. Need to add more constraint like the following:  When a BAP Data PDU (after the BAP header rewriting operation in accordance with clause 5.2.1.5 or 5.2.1.3, if applied) that contains a BAP address which is not included in the configured BH Routing Configuration with the same topology indicator as this BAP Data PDU and is not the BAP address of this node is received; |
| ZTE | Yes, but... | We also think the topology should be considered when check the BH Routing configuration for the BAP address . |
| Apple | Maybe | Agree with the reason for change but the actual text proposed in the CR may need to be refined in a more generic manner. |
| Kyocera | Yes | We think both Cases are valid and support the solution in R2-2205254. |
| Ericsson | OK, but | The intention of the change is correct, but this is a legacy procedure that should not be affected. If we keep the proposed wording it seems that this procedure is applicable only to packets which were subject to the BAP header rewriting.  Rather than using the text in brackets, we prefer having a separate sentence just handling the case in which the IAB-MT does the BAP header rewriting. |
| vivo | See comments | The intention is correct. But the change could be refined. For each BAP header rewriting entry, the new BAP routing ID should be assumed to be a correct BAP routing ID. So the BAP address carried in a BAP PDU after BAP header rewriting should be a valid one.  However, it could happen that the BAP entity fails to rewrite the BAP header according clause 5.2.1.5 or 5.2.1.3 for a BAP PDU and its BAP address in the BAP header is invalid, the BAP PDU is determined to be invalid. This could be considered in the refinement. |
| Intel | Yes | In general, we agree that discarding BAP Data PDU should be done after BAP header rewriting operation so that the BAP routing ID or BAP header are updated with the latest routing information. Considering topology information and using separate paragraph to capture packet discarding case for BAP header rewriting case only as commented by Ericsson are ok for us. |
| Lenovo | See comments | Agree with the intension to consider the BAP header rewriting.  And we also need to consider the topology when checking the BAP address. |
| LGE | Yes | The intention is correct and header rewriting should be also considered in this section. If company has concerns on detailed wording, we can discuss it at the 2nd phase. |

**2.5 Terminology preference**

Following is proposed in R2-2204899

- an IAB Topology indicator, indicating whether the Egress Routing ID belongs to the non-F1-terminating donor topology, which is indicated by *Non-F1-terminating Topology Indicator* IE.

**Rapporteur’s view**: We use “Type indicator” to be a more general indicator for future proof. In R18 (or future release), we may also need some other indicator for the configured entry, e.g. the indicator of target logical DU of mobile IAB. Companies are welcome to comment if we need to change the current terminology.

**Q6: Do you think the change (Type indicator->Topology indicator) in R2-2204899 is needed?**

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| **Companies** | **Yes/No** | **Comments** |
| Fujitsu | Yes | This correction is reasonable.  It is expected that each parameter name being aligned with TS38.473. |
| ZTE | Yes | IAB topology is widely used in the R17 spec. It is more clear ompared with type indicator. |
| Apple | See comment | The name should make it clear this identifies the Type of IAB topology, potentially somewhat distinct from the Topology Indicator IE. How about “*IAB Topology Type*”? |
| Kyocera | Slightly No | We think either can work, which does not need the change. |
| Ericsson | No strong view |  |
| vivo | Yes |  |
| Intel | No strong view |  |
| Lenovo | Yes |  |
| LGE | No strong view |  |

Following is proposed in R2-2206040:

**BH RLC channel:** an RLC channel between two nodes, which is used to transport backhaul packets, as defined in TS 38.300 [2]**.**

**Boundary IAB-node**: as defined in TS 38.401 [6].

**Egress BH RLC channel:** a BH RLC channel on which a packet is transmitted by a node.

**Egress link**: a radio link on which a packet is transmitted by a node.

**F1-terminating IAB-donor**: as defined in TS 38.401 [2].

**IAB-donor**: as defined in TS 38.300 [2].

**IAB-donor-DU**: as defined in TS 38.401 [6].

**IAB-node**: as defined in TS 38.300 [2].

**Ingress BH RLC channel:** a BH RLC channel on which a packet is received by a node.

**Ingress link**: a radio link on which a packet is received by a node.

**Non-F1-terminating IAB-donor**: as defined in TS 38.401 [2].

**Rapporteur’s view**: It is fine to align the wording with RAN3 spec. But, those terms are frequently used in 38.340, it is preferred to also copy it in BAP spec.

**Q7: Do you agree to update the terms in sec. 3.1 as below (i.e. copy from the 38.401 spec and add reference)?**

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| **Boundary IAB-node**: an IAB-node with one RRC interface terminating at a different IAB-donor-CU than the F1 interface, as defined in TS 38.401 [6].  **F1-terminating donor**: refers to the IAB-donor that terminates F1 for the boundary IAB-node, as defined in TS 38.401 [6]  **Non-F1-terminating donor**: refers to the IAB-donor that has an RRC connection with the boundary node but does not terminate F1 with this boundary node, as defined in TS 38.401 [6] |

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| **Companies** | **Yes/No** | **Comments** |
| Fujitsu |  | Either way is fine, as long as they are aligned. |
| ZTE | See comment | We are fine to align the term with F1-terminating IAB-donor and non-F1-terminating IAB-donor as in TS38.401. However, we think the definition can be copied from 38.401 as rapporteur does. |
| Apple | Partly | We think it is enough to insert “IAB-“ immediately before “donor” and add TS 38.401 as a reference. We consider it useful to keep a crisp summary for each term. |
| Kyocera | Yes | We support the rapporteur’s suggestion, which makes 38.340 to be more readable. |
| Ericsson | Yes | Better to keep some explanation in our RAN2 specs. |
| Vivo | Yes | Good to have unified definition across different specifications. |
| Intel | Yes | Agree to copy from 38.401 which is more friendly to readers |
| Lenovo | Yes | Prefer to have the detail definition in BAP for these terms. |
| LGE | Yes | Rapporteur’s suggestion seems fine to us. |

# Conclusion and proposals

Based on the above summary, following proposals are given

# Reference

1. R2-2205253 Miscellaneous CR for TS 38.340 Huawei, HiSilicon
2. R2-2204793 Miscellaneous IAB Corrections on BAP in 38.340 ZTE, Sanechips
3. R2-2204912 Miscellaneous corrections to TS 38.340 Fujitsu
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