3GPP TSG RAN WG1 Meeting #108-e R1-22xxxxx

21st February – 3rd March 2022

Agenda Item: 8.10

Source: Moderator (Qualcomm Incorporated)

Title: Summary of [108-e-R17-eIAB-04] Email discussion on eIAB TP (R1-2202155) for 38.300

Document for: Discussion and decision

This document provides a summary of the following email discussion on text proposals for RAN1 related eIAB updates to TS 38.300 based on the input from R1-2202155:

[108-e-R17-eIAB-04] Email discussion on eIAB TP (R1-2202155) for 38.300 by February 24 – Luca (Qualcomm)

**Moderator Proposal 1:**

**Adopt the following TP for 38.300:**

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| **<**Unchanged text is omitted> 5.3.5.3 Uplink timing control The gNB determines the desired Timing Advance setting and provides that to the UE. The UE uses the provided TA to determine its uplink transmit timing relative to the UE's observed downlink receive timing.  An IAB-node may support multiple modes for uplink timing:   * The IAB-MT behaves exactly as the UE to determine its uplink transmission timing. * The IAB-MT uses the provided TA plus a provided additional offset to determine its uplink transmission timing, to facilitate parent node’s IAB-MT Rx / IAB-DU Rx multiplexing. * The IAB-MT aligns its uplink transmission timing to the IAB-DU downlink transmission timing, to facilitate IAB-MT Tx / IAB-DU Tx multiplexing.   The IAB-node uplink timing mode is indicated by the parent node via MAC-CE.  **<**Unchanged text is omitted> |

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| Company | Comments on Moderator Proposal 1 |
| ETRI | Agree in principle.  We think all IAB-node should implement the first mode, at least. To imply this aspect, the following revision on the main bullet is suggested:  An IAB-node ~~may~~ supports ~~multiple~~ one or more of the following modes for uplink timing: |
| CEWiT | Support the proposal |
| Ericsson | Support in general.  Although we can sympathize with ETRI’s comment on making Case-1 mandatory, we don’t think this is captured in ETRI’s proposed modification.  Regarding the final sentence above, it is also possible for the IAB-node to inform its parent node that Case-6 timing is required for simultaneous operation per the following agreement:  A child IAB-MT can inform a parent node via MAC-CE whether Case 6 timing is required for simultaneous operation.  This should be included, e.g., by the following addition (underlined) to the last sentence:  The IAB-node uplink timing mode is indicated by the parent node via MAC-CE, and, for IAB-MT Tx / IAB-DU Tx timing mode, may also be requested by the IAB-node. |
| ZTE, Sanechips | Support the proposal. |
| Samsung | Support the proposal. |
| Nokia | Agree with the intention of ETRI’s modified proposal; however, further clarification might be necessary to indicate that legacy TA is required for IAB-MT operation:  The gNB determines the desired Timing Advance setting and provides that to the UE/IAB-MT. The UE/IAB-MT uses the provided TA to determine its uplink transmit timing relative to the UE/IAB-MT's observed downlink receive timing.  An IAB-node may support additional modes for uplink timing:   * The IAB-MT uses the provided TA plus a provided an additional offset to determine its uplink transmission timing, to facilitate parent node’s IAB-MT Rx / IAB-DU Rx multiplexing. * The IAB-MT aligns its uplink transmission timing to the IAB-DU downlink transmission timing, to facilitate IAB-MT Tx / IAB-DU Tx multiplexing.   The IAB-node uplink timing mode is indicated by the parent node via MAC-CE. |

Based on the feedback the moderator believes the suggestion from Nokia addresses all the comments and it is therefore recommended as the updated proposal.

**Moderator Proposal 1b:**

**Adopt the following TP for 38.300:**

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| **<**Unchanged text is omitted> 5.3.5.3 Uplink timing control The gNB determines the desired Timing Advance setting and provides that to the UE/IAB-MT. The UE/IAB-MT uses the provided TA to determine its uplink transmit timing relative to the UE/IAB-MT's observed downlink receive timing.  An IAB-node may support additional modes for uplink timing:   * The IAB-MT uses the provided TA plus a provided an additional offset to determine its uplink transmission timing, to facilitate parent node’s IAB-MT Rx / IAB-DU Rx multiplexing. * The IAB-MT aligns its uplink transmission timing to the IAB-DU downlink transmission timing, to facilitate IAB-MT Tx / IAB-DU Tx multiplexing.   The IAB-node uplink timing mode is indicated by the parent node via MAC-CE.  **<**Unchanged text is omitted> |

**Moderator Proposal 2:**

**Adopt the following TP for 38.300:**

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| **<**Unchanged text is omitted> 10.9 IAB Resource Configuration In general, the IAB-DU and the IAB-MT of an IAB-node are subject to a half-duplex constraint, as correct transmission/reception by one cannot be guaranteed during transmission/reception by the other and vice versa, e.g., when collocated and operating in the same frequency. An IAB-node can report its duplexing constraints between the IAB-MT and the IAB-DU via F1AP.  The scheduler on an IAB-DU or IAB-donor-DU complies with the gNB-DU resource configuration received via F1AP, which defines the usage of scheduling resources to account for the aforementioned duplexing constraint.  The resource configuration assigns an attribute of hard, soft or unavailable to each symbol of each DU cell. Additionally, for IAB-nodes supporting FDM operation, the resource configuration may include an attribute of hard, soft or unavailable for a RB in a symbol. Transmission/reception can occur for RBs in a symbol~~s~~ configured as hard, whereas scheduling cannot occur, except for some special cases, for RBs ~~symbols~~ configured~~s~~ as unavailable. For RBs ~~symbols~~ configured as soft, scheduling can occur conditionally on an explicit indication of availability by the parent node via DCI format 2\_5, or on an implicit determination of availability by the IAB-node. The implicit determination of availability is determined by the IAB-node depending on whether or not the operation of the IAB-DU would have an impact on the collocated IAB-MT.  The resource configuration can be shared among neighbouring IAB-nodes and IAB-donors to facilitate interference management, dual connectivity, and enhanced multiplexing.  To facilitate transitioning from IAB-MT to IAB-DU operation and vice versa, guard symbols can be used to overcome potentially misaligned symbol boundaries between the IAB-MT domain and the IAB-DU domain (e.g. IAB-MT Rx boundaries are not aligned with the IAB-DU Tx boundaries). Specifically, an IAB-node can indicate to a parent node a number of desired guard symbols, while the parent node can indicate to the IAB-node the number of actually provided guard symbols for specific transitions.  An IAB-node supporting enhanced multiplexing capabilities, i.e. IAB-MT Rx / IAB-DU Rx, IAB-MT Tx / IAB-DU Tx, IAB-MT Rx / IAB-DU Tx, IAB-MT Tx / IAB-DU Rx, can provide via MAC-CE to a parent node information to facilitate scheduling for enhanced multiplexing operation by the IAB-node, specifically:   * recommended IAB-MT’s Tx/Rx beams, * desired IAB-MT Tx PSD range, * desired parent node’s IAB-DU Tx power adjustment, * required IAB-MT’s uplink transmission timing mode.   Correspondingly, the parent node can provide via MAC-CE information to the IAB-node to facilitate enhanced multiplexing at the IAB-node and/or at the parent node:   * restricted IAB-DU beams, * actual parent node’s IAB-DU Tx power adjustment, * IAB-MT’s uplink transmission timing mode.   **<**Unchanged text is omitted> |

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| Company | Comments on Moderator Proposal 2 |
| ETRI | Agree in principle.  We have two comments:   1. We think “supporting FDM operation” in the first revision should be “supporting enhanced multiplexing operation” to be aligned with the other parts. 2. It seems that the following RAN1 agreement could be captured here:  |  | | --- | | **Agreement**  Support indication of whether FDM is required or not for an enhanced multiplexing operation mode to donor-CU. |   TP for the first comment:  Additionally, for IAB-nodes supporting ~~FDM operation~~ enhanced multiplexing operation, the resource configuration may include an attribute of hard, soft or unavailable for a RB in a symbol.  [moderator] The moderator believes that the suggestion in the first comment should not be applied and the current formulation of the text is slightly more accurate since FDM operation implies an enhanced multiplexing operation (i.e. beyond TDM).  TP for the second comment:  An indication of whether FDM is required or not for an enhanced multiplexing operation mode in the IAB-node can be shared to donor-CU.  [moderator] This comment is accepted and it has been incorporated in the updated proposal with some minor editorial modifications to better align with the existing text. |
| CEWiT | We have the following comment regarding H/S/NA configuraton part:  The Rel. 16 H/S/NA and Rel. 17 frequency domain H/S/NA are given separately and only one is applied by IAB node based on active mode of operation in the symbol. For e.g., IAB node operating in TDM can transmit/receive in an RB which is configured as S. Therefore, the definition of Rel 17 H/S/NA should be written separately from the existing definition for Rel. 16 H/S/NA. Also, the text should capture the following   * An IAB node transmit/receive based on hard, soft or unavailable for a RB in a symbol when simultaneously operating in IAB-MT and IAB-DU using FDM.   [moderator] This comment, also provided by other companies, is accepted. The text for Rel-16 H/S/NA configuration has been reverted in the updated proposal. It is proposed to add an additional paragraph on Rel-17 H/S/NA configuration once the corresponding behavior is agreed under AI 8.10.1. |
| Ericsson | Agree in general.  Regarding FDM H/S/NA specification, we think this discussion should be postponed until agreed in AI 8.10.1 where such a discussion, in our opinion, is necessary.  To avoid ambiguities, we think the below sentence should be modified according to the underlined text:  Additionally, for IAB-nodes supporting FDM operation, the resource configuration may include an attribute of hard, soft or unavailable for a set of RBs in a symbol.  [moderator] It is proposed to add an additional paragraph on Rel-17 H/S/NA configuration once the corresponding behavior is agreed under AI 8.10.1.  Regarding the information the parent node can provide via MAC-CE information to the IAB-node, the first bullet can be clarified (underlined) to   * restricted IAB-DU Tx beams,   in line with the previous paragraph.  [moderator] This comment has been incorporated in the updated proposal. |
| ZTE, Sanechips | Support in general.  To reflect RAN1 agreement clearly, the last sub-bullet for the information provided to parent node should be updated as following:   * required IAB-MT’s uplink transmission timing mode, to facilitate IAB-MT Tx / IAB-DU Tx multiplexing.  |  | | --- | | *Agreement:*  *A child IAB-MT can inform a parent node via MAC-CE whether Case 6 timing is required for simultaneous operation.* |   [moderator] The moderator believes that since the main text preceding the bulleted list includes “to facilitate scheduling for enhanced multiplexing operation by the IAB-node, specifically:”, this proposed change is not necessary and would be inconsistent with not specifying multiplexing modes for the other bullets. |
| Samsung | In our understanding, Rel-16 TDM operation and Rel-17 FDM operation are mixed up in “10.9 IAB Resource Configuration”. So, we think sentences to explain Rel-16 TDM operation should remains as they are, for example, “Transmission/reception can occur for symbols configured as hard, whereas scheduling cannot occur, except for some special cases, for symbols configures as unavailable. For symbols configured as soft, scheduling can occur conditionally on an explicit indication of availability by the parent node via DCI format 2\_5, or on an implicit determination of availability by the IAB-node.”  But, there are no such sentences in the proposal because they were updated to explain Rel-17 FDM operation.  [moderator] This comment, also provided by other companies, is accepted. The text for Rel-16 H/S/NA configuration has been reverted in the updated proposal. It is proposed to add an additional paragraph on Rel-17 H/S/NA configuration once the corresponding behavior is agreed under AI 8.10.1. |
| AT&T | Tend to agree with the comment from Samsung that it would be beneifical to have separate sentences for H/S/NA behavior with TDM or FDM configurations for better clarity.  [moderator] This comment, also provided by other companies, is accepted. The text for Rel-16 H/S/NA configuration has been reverted in the updated proposal. It is proposed to add an additional paragraph on Rel-17 H/S/NA configuration once the corresponding behavior is agreed under AI 8.10.1.  Also, the first paragraph seems to mostly apply to Rel-16 and may be confusing when enhanced multiplexing modes are mentioned later on. It may be perhaps useful to mention these modes early on:  ~~In general,~~ If the IAB-DU and the IAB-MT of an IAB-node are subject to a half-duplex constraint, ~~as~~ correct transmission/reception by one cannot be guaranteed during transmission/reception by the other and vice versa, e.g., when collocated and operating in the same frequency. If an IAB-node suppors enhanced frequency or spatial multiplexing capabilities, additional multiplexing modes can be supported, i.e. IAB-MT Rx / IAB-DU Rx, IAB-MT Tx / IAB-DU Tx, IAB-MT Rx / IAB-DU Tx, IAB-MT Tx / IAB-DU Rx. An IAB-node can report its duplexing constraints between the IAB-MT and the IAB-DU via F1AP.  [moderator] This comment has been incorporated in the updated proposal. |

The FL appreciates the feedback and the suggestions, and most of them have been incorporated in the following updated proposal. Specific answers to all the comments are provided inline as [moderator] in the table above. Note that the yellow background highlight in the TP is to provided for ease of review of the changes w.r.t. Moderator Proposal 2 and will be removed for final agreement.

**Moderator Proposal 2b:**

**Adopt the following TP for 38.300.**

**Add a paragraph on FDM H/S/NA resource configuration after the associated behavior is agreed under AI 8.10.1.**

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| **<**Unchanged text is omitted> 10.9 IAB Resource Configuration ~~In general,~~ If the IAB-DU and the IAB-MT of an IAB-node are subject to a half-duplex constraint, ~~as~~ correct transmission/reception by one cannot be guaranteed during transmission/reception by the other and vice versa, e.g., when collocated and operating in the same frequency. If an IAB-node suppors enhanced frequency or spatial multiplexing capabilities, additional multiplexing modes can be supported, i.e. IAB-MT Rx / IAB-DU Rx, IAB-MT Tx / IAB-DU Tx, IAB-MT Rx / IAB-DU Tx, IAB-MT Tx / IAB-DU Rx. An IAB-node can report its duplexing constraints between the IAB-MT and the IAB-DU via F1AP. An IAB-node can indicate via F1AP whether or not FDM is required for an enhanced multiplexing operation.  The scheduler on an IAB-DU or IAB-donor-DU complies with the gNB-DU resource configuration received via F1AP, which defines the usage of scheduling resources to account for the aforementioned duplexing constraint.  The resource configuration assigns an attribute of hard, soft or unavailable to each symbol of each DU cell. Transmission/reception can occur in symbols configured as hard, whereas scheduling cannot occur, except for some special cases, for symbols configured as unavailable. For symbols configured as soft, scheduling can occur conditionally on an explicit indication of availability by the parent node via DCI format 2\_5, or on an implicit determination of availability by the IAB-node. The implicit determination of availability is determined by the IAB-node depending on whether or not the operation of the IAB-DU would have an impact on the collocated IAB-MT.  The resource configuration can be shared among neighbouring IAB-nodes and IAB-donors to facilitate interference management, dual connectivity, and enhanced multiplexing.  To facilitate transitioning from IAB-MT to IAB-DU operation and vice versa, guard symbols can be used to overcome potentially misaligned symbol boundaries between the IAB-MT domain and the IAB-DU domain (e.g. IAB-MT Rx boundaries are not aligned with the IAB-DU Tx boundaries). Specifically, an IAB-node can indicate to a parent node a number of desired guard symbols, while the parent node can indicate to the IAB-node the number of actually provided guard symbols for specific transitions.  An IAB-node supporting enhanced multiplexing capabilities, i.e. IAB-MT Rx / IAB-DU Rx, IAB-MT Tx / IAB-DU Tx, IAB-MT Rx / IAB-DU Tx, IAB-MT Tx / IAB-DU Rx, can provide via MAC-CE to a parent node information to facilitate scheduling for enhanced multiplexing operation by the IAB-node, specifically:   * recommended IAB-MT’s Tx/Rx beams, * desired IAB-MT Tx PSD range, * desired parent node’s IAB-DU Tx power adjustment, * required IAB-MT’s uplink transmission timing mode.   Correspondingly, the parent node can provide via MAC-CE information to the IAB-node to facilitate enhanced multiplexing at the IAB-node and/or at the parent node:   * restricted IAB-DU Tx beams, * actual parent node’s IAB-DU Tx power adjustment, * IAB-MT’s uplink transmission timing mode.   **<**Unchanged text is omitted> |

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| Company | Comments on Moderator Proposal 2b |
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