3GPP TSG-RAN WG1 Meeting #101-e R1-200xxxx

e-Meeting, May 25th – June 5th, 2020

**Agenda Item:** **7.2.3.3**

**Source: AT&T**

**Title: Summary of Mechanisms for resource multiplexing among backhaul and access links**

**Document for:** **Discussion/Approval**

# Introduction

This contribution provides a summary on maintenance issues for IAB resource multiplexing among backhaul and access links.

# Resource multiplexing among backhaul and access links

The following issues for maintenance of Rel-16 IAB are under consideration for discussion in RAN1#101-e:

1. Response to RAN2 LS on IAB Guard Symbols
2. Response to RAN3 LS on Cell-specific signals/channels configurations in IAB
3. IAB-DU/IAB-MT Transition Location/Type
4. Configuration of tdd-UL-DL-ConfigurationDedicated and tdd-UL-DL-ConfigurationDedicated-IAB-MT
5. Alignement of 38.331 and 38.213 parameters related to DCI Format 2\_5
6. Updates on IAB terminology

## Response to RAN2 LS on IAB Guard Symbols

**Source**: R1-2003252, R1-2003542, R1-2004126, R1-2004133, R1-2004280, R1-2004449, R1-2004582, R1-2004618

**Background:** During RAN2#109bis-e a LS was sent to RAN1 regarding the following RAN1 and RAN2 agreements:

RAN1#99 agreement:

Agreements:

*Desired Guard* Symbols and *Provided Guard Symbols* are provided per cell and use 3 bits for each of the 8 transitions to indicate the number of guard symbols.

* In Rel-16, a range of 0-4 symbols are supported for each transition. Additional entries are reserved for future use
* A new parameter *GuardSymbol-SCS* is also provided which indicates the reference SCS (FR1: {15kHz, 30kHz, 60kHz}, FR2: {60kHz, 120kHz}) to be used for the guard symbols.

RAN2#109-e agreement:

* RAN2 will design one single fixed-length Guard Symbols MAC CE, containing values (or indices mapped thereto) of all 8 parameters introduced by RAN1.

with the following action for RAN1:

RAN2 would very much appreciate it if RAN1 could inform RAN2 at their earliest convenience whether there is a requirement that Number of Guard Symbols should be applied to a specific cell, or if the Number of Guard Symbols applies across all the cells in the cell group.

**FL Observation:** While the RAN1 agreement states that the Number of Guard Symbols is provided per cell, in case of CA, multiple cells could in theory share a common value and thus reduce the signaling overhead of multiple MAC CEs. However the majority of companies providing feedback on the RAN2 LS indicated a desire to keep the RAN1 agreement to be applicable only to a specific cell and not to a group of cells (i.e. a TAG).

**FL Proposal 2.1.1: Inform RAN2 that the Number of Guard Symbols should be applied to a specific cell and not all the cells in the cell group.**

**Discussion:**

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| --- | --- | --- |
| **Company** | **Do you agree with Proposal 2.1.1? If the answer is No, what would be the proposed response to RAN2?** | **Comments** |
| **Huawei** | **More discussion is needed.** | **In our view, at least for typical deployment and implementations, the number of Guard Symbols are same within a TAG for an IAB node. This could also save some signaling overhead between the parent node and IAB node. It is arguable that RAN1 agreement needs to be reverted since the signaling can still be per TAG while the number of Guard Symbols assumed for all cells are the same within one TAG.** |
| Qualcomm | Yes | In principle, as noted in our contribution R1-2004449, the amount of guard symbols is really specific to each (MT cell, DU cell) pair within an IAB-node. It might be acceptable to provide guard symbols on a per MT cell basis, with the understanding that a value can be selected to work across all DU cells with a TDM constraint with the MT cell. |
| Intel | Yes | We agree with Qualcomm. Considering current resource configurations for MT and DU (D/F/U for MT and D/F/U/NA/H/S for DU) are cell-specific, the # of guard symbols to each (MT cell, DU cell) pair should also be cell-specific. |
| ZTE, Sanechips | Agree FL proposal. |  |
| LG | More discussion is needed | As provided in our contribution, we are ok with guard symbol configuration per cell-specific according to the previous agreement. However, we are open for further discussion on additional support of cell-group specific configuration due to its advantage in signaling overhead reduction. |
| NTT DOCOMO | Yes | We are fine with FL proposal. |
| Ericsson | Yes | We agree that the number of guard symbols can be applied to all cells in a TAG. But since we assume the signaling and update of provided number of guard symbols is a very rare event, we prefer keeping this signaling per cell, thus keeping the RAN1 agreement. We are also fine with the consideration of applying the number of provided guard symbols to all cells within the same TAG. |
| vivo | Yes | We are supportive to FL’s proposal. Per cell configuration provide more flexibility. Since the number of guard symbol is totally implementation determined value, different cell can be configured with different guard symbols, even some cell w/ guard symbol and some w/o. |
| Samsung | Yes | Although we don't see a clear motivation for a value per cell within cell group in Rel-16, we can go with the majority view if the majority wants per cell configuration. |

**FL Observation:** The majority preference is to agree proposal 2.1.1 as the baseline for the response to RAN2. Qualcomm/Intel point out that different numbers of Guard Symbols can be used for the same MT cell when paired with different DU cells (e.g. similar to the multiplexing capability indication). This is a little ambiguous from the RAN1 agreements:

Agreements:

A parent IAB node can be made aware of the number of symbols Ng the child IAB node would like the parent IAB node not to use at the edge (beginning or end) of a slot when there is a transition between child MT and child DU. Separately or additionally, the child IAB node can be made aware of the number of guard symbols that the parent IAB node will provide.

As a result RAN1 should confirm one of the following alternatives:

**Alt. 1 The Number of Guard Symbols is indicated for a specific MT cell and is applied across all transitions with paired DU cells within and IAB-node**

**Alt. 2 The Number of Guard Symbols is indicated and applied for a specific (MT cell, DU cell) pair within an IAB-node**

Several companies still indicate that it would be beneifical to allow per TAG/cell-group indication of the number of Guard Symbols since this may be a common scenario and RAN2 can use that information when designing the signaling. Based on this an updated response to RAN2 is formulated in FL Proposal 2.1.2 with a need to downselect between Alt. 1 (with a consequence that the same value is applied to all DU cells paired with the MT cell) and Alt. 2 where the indication applies to a give (MT cell, DU cell) pair:

**FL Proposal 2.1.2:**

**RAN1 should confirm one of the following alternatives:**

**Alt. 1) The Number of Guard Symbols can be indicated for a specific MT cell and is applied across all transitions with paired DU cells within and IAB-node**

**Alt. 2) The Number of Guard Symbols can be indicated and applied for a specific (MT cell, DU cell) pair within an IAB-node**

**Additionally inform RAN2 of the following:**

**From a RAN1 perspective, the Guard Symbols MAC CE should support that [Alt 1. or Alt. 2.]. RAN1 also acknowledges that while in certain scenarios the Number of Guard Symbols could be the same for all the MT cells in the cell group, this condition is not a requirement.**

**Discussion:**

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| **Company** | **Do you agree with Proposal 2.1.2? Is Alt. 1 or Alt. 2 preferred?** | **Comments** |
| Qualcomm | Yes, agree with Proposal 2.1.2.  See comments for Alt 1 vs. Alt 2. | We suggest to clarify the meaning of “pairing” of MT cell with DU cell in the proposal, eventually.  Alt 2 has the merit of being technically more accurate.  Alt 1 has the merit of being aligned closer with RAN2’s signaling design thus far and may hence reduce the risk of delaying completion of the WI.  Given the current situation we would give Alt 1 a slight preference. |
| Huawei | No. Alt.1 could work but we are not sure about Alt.2 | We are not sure how Alt.2 can work in ractice. As discussed in our contribution, even if the number of Guard Symbols is indicated for each (MT cell, DU cell) pair, the parent node can only apply the Guard symbols for one given MT cell at one time. The parent node does not know which DU cell the IAB node will switch from or to, it has to always assume the worst case among the (MT cell, DU cell) pairs. |
| Intel | Yes | We agree with the FL Proposal. |
| ZTE, Sanechips | Yes | We do not need to decide which Alt wins right now. |
| Samsung | Yes | HW may raise a good point and we share the point. In this sense, only Alt.1 may work. |
| vivo | Yes | It is fine to futher discuss Alt.1 and Alt. 2. Alt.1 is preferred due to simplicity. |
| LG | Yes | We agree with the FL proposal and it will be further discussed in next week for downselection. |
| Ericsson | Yes | We can see benefits with and are willing to agree to either alternative. |

## Response to RAN3 LS on Cell-specific signals/channels configurations in IAB

**Source**: R1-2003543, R1-2004449, R1-2004620, R1-2004621, R1-2004685

**Background:** RAN3 sent to RAN1 an LS on cell-specific signals/channels configurations in IAB, concerning the F1-AP signaling storm issue due to UE/MT-specific configuration of CSI-RS/SR resources. The requested action for RAN1 is given below:

ACTION: RAN3 kindly asks RAN1 to provide feedback whether the following approaches are feasible from RAN1 perspective and whether any additional alternatives should be considered.

* Explicitly configure these resources used for CSI-RS and SR as Hard at the child node or Not Available at the parent node. Meanwhile, exclude CSI-RS and SR configurations from the list of cell-specific signals/channels configurations.
* Make the CSI-RS and SR configurations as optional in the cell-specific signals/channels configurations so that they do not have to be configured if signaling storm becomes a concern.

FL Observation: The RAN1 agreement leading to the signaling in question is the following:

**RAN1 #99 Agreements:**

A parent IAB node/donor can be provided with cell-specific signals/channels configurations of each child IAB-DU. How/whether to use the information to handle any potential conflict at the parent IAB node/donor is left to network implementation

The list of cell-specific signals/channels includes:

- resources for SSB transmission at DU, including both CD-SSB and non-CD-SSB;

- configured RACH occasions for receiving at the DU

- periodic CSI-RS transmission at the DU

- scheduled resource for receiving SR at DU

The first solution presented by RAN3 effectively reverts the above RAN1 agreement by not enabling the indication of the CSI-RS and SR configurations:

* Solution 1: Explicitly configure these resources used for CSI-RS and SR as Hard at the child node or Not Available at the parent node. Meanwhile, exclude CSI-RS and SR configurations from the list of cell-specific signals/channels configurations.

The second solution presented by RAN3 is aligned with the existing RAN1 agreements since it is stated that the configurations “can” be provided and not “must be” provided:

* Solution 2: Make the CSI-RS and SR configurations as optional in the cell-specific signals/channels configurations so that they do not have to be configured if signaling storm becomes a concern.

Depending on the desired network operation there may be a need to use soft resources aligned with CSI-RS and SR configurations. Alternatively, if the signaling overhead this would entail is too large, it is reasonable to exclude those configurations. This is also in the spirit of the agreements that usage of the information exchanged is not mandatory, but left to network implementation. Contributions on this topic have so far indicated a split of views on preferences for supporting Solution 1, Solution 2, or support for both. However given the high bar for reverting RAN1 agreements, it is recommended to start discussion based on the solution which is both feasible and aligned with existing RAN1 agreements.

FL Proposal 2.2.1: Inform RAN3 that it is feasible from a RAN1 perspective to make the CSI-RS and SR configurations as optional in the cell-specific signals/channels configurations so that they do not have to be configured if a signalling storm becomes a concern.

**Discussion:**

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| **Company** | **Do you agree with Proposal 2.2.1?** | **Comments** |
| **Huawei** | **More discussion is needed.** | **We prefer Solution 1 with the understanding this may incur some confliction with RAN1 agreement. However, it should be clear that when RAN1 has the discussion, we focus on cell-specific signals/channels. CSI-RS and SR were also included but not discussed thoroughly. Though making the configuration optional could be feasible from implementation point of view, this also brings unneccessry complication to the specification.** |
| Qualcomm | Yes | At this stage it is preferred not to further change RAN1 agreements, also considering this particular agreement has already been reversed once. Making CSI-RS and SR configuration optional is actually consistent with the agreement as the whole set of child DU configuration information is optional anyway. |
| Intel | Yes | The agreement in RAN1#99 does not require ALL cell-specific signals/channels on the list be provided to parent DU, which already means they are optional on the F1AP signaling to parent DU. Therefore, Solution 2 is already supported by current RAN#1 agreements.  Solution 1 can be done by implementation and no additional spec impact on RAN1 side. |
| ZTE, Sanechips | Partially agree. | The FL proposal only mentions the 2nd solution in RAN3 LS. We agree this 2nd solution is feasible. Besides, we think the 1st solution in RAN3 LS is also feasible, because   * The RAN1 #99 agreement says “A parent IAB node/donor can be provided with…” – it does not say “A parent IAB node/donor **should/shall** be provided with …”. * The RAN1 #99 agreement also says the parent node is allowed to ignore (as implementation choice) the cell-specific signals/channels configurations.   What RAN3 LS asks is the technical feasibility of the solutions. It seems not expected by RAN3 that the 1st solution is not feasible just because it effectively reverts RAN1 agreement, which RAN3 was certainly aware of when agreeing to send the LS. Further, regardless which solution is eventually adopted by RAN3, the RAN1 specified behavior in 38.213 (copied as following) is not necessarily impacted.  “*A symbol of a slot is equivalent to being configured as hard if an IAB-node DU would transmit a SS/PBCH block, PDCCH for Type0-PDCCH CSS sets configured by pdcchConfigSIB1, or a periodic CSI-RS in the symbol of the slot, or would receive a PRACH or a SR in the symbol of the slot.*”  Our preference is to answer that both solutions in RAN3 LS are feasible. As a compromise if needed to help reach consensus, the reply LS can say that RAN1 thinks both solutions are feasible but prefers to the 2nd one if one of the two has to be selected. |
| LG | Yes | Agree with QC, we do not prefer further RAN1 specification impact. So, prefer solution 2. |
| NTT DOCOMO | Yes | We are fine with FL proposal. |
| Ericsson | No | We are not entirely convinced that Solution 1 implies reverting the RAN1#99 agreement because the resources in question can still be reserved. Furhter, for Solution 2, in a multi-vendor deployment, there is nothing preventing a CU from one vendor to cause a signaling storm in a another vendor’s DU which is highly undesirable. |
| Vivo | Yes | We agree to say solution 2 is feasible from RAN1 perspective. Regarding solution 1, this is totally singaling aspect and up to RAN3 whether to support a duplicated solution.. |
| Samsung | Yes | Same view with QC that the FL proposal is aligned with RAN1 discussion for DU configuration so far. |

**FL Observation: Feasibility from a RAN1 perspective should at least entail consistency with existing RAN1 agreements. Therefore if RAN1 wishes to reply that Solution 1 is feasible, RAN1 should also update the agreement (for a second time as pointed about by Qualcomm). In addition, as mentioned out by ZTE, if Solution 1 is adopted by RAN3 there seems to be a need to change the existing 38.213 text which enables soft resources to be treated as hard in the case of overlap with CSI-RS/SR configurations:**

“*A symbol of a slot is equivalent to being configured as hard if an IAB-node DU would transmit a SS/PBCH block, PDCCH for Type0-PDCCH CSS sets configured by pdcchConfigSIB1, or a periodic CSI-RS in the symbol of the slot, or would receive a PRACH or a SR in the symbol of the slot.*”

**At the same time, several companies indicated that this is already understood in RAN3 and rather the concerns regarding a potential signaling storm may be the critical factor impacting their decision on the signaling design.**

**A potential compromise is that RAN1 should simply reply that Solution 1 is not preferred compared to Solution 2.**

FL Proposal 2.2.2:

Inform RAN3 of the following:

The following is solution is feasible from a RAN1 perspective:

* Making the CSI-RS and SR configurations as optional in the cell-specific signals/channels configurations so that they do not have to be configured if a signalling storm becomes a concern.

The following solution is not preferred from a RAN1 perspective:

* Explicitly configure the resources used for CSI-RS and SR as Hard at the child node or Not Available at the parent node. Meanwhile, exclude CSI-RS and SR configurations from the list of cell-specific signals/channels configurations.

The latter solution does not enable the ability for the configuration of soft resources at a child node which overlap with CSI-RS and SR configurations, which was agreed to be supported in RAN1. If this solution is adopted by RAN3 instead of the former solution, RAN1 should be informed in order to update its specifications accordingly.

**Discussion:**

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| **Company** | **Do you agree with Proposal 2.1.2? Is Alt. 1 or Alt. 2 preferred?** | **Comments** |
| Qualcomm | Yes, agree with proposal 2.1.2.  The question on Alt 1 vs. Alt 2 seems a typo. | It should be noted that the first portion of the second approach suggested by RAN3, i.e explicitly configure the resources used for CSI-RS and SR as Hard at the child node or Not Available at the parent node, is feasible.  It is the second sentence that it is not preferred, since it can be interpreted as to preclude the ability to provide the child DU CSI-RS and SR configuration to the parent node (meaning no signaling support for it), which, in turn, clearly implies changing (again) the RAN1 agreement. |
| Huawei | We prefer to have more discussion | Even if Solution 1 is agreed, we don’t think the following RAN1 specification need to be changed.  “*A symbol of a slot is equivalent to being configured as hard if an IAB-node DU would transmit a SS/PBCH block, PDCCH for Type0-PDCCH CSS sets configured by pdcchConfigSIB1, or a periodic CSI-RS in the symbol of the slot, or would receive a PRACH or a SR in the symbol of the slot.*”  These resources can still be treated as hard from IAB point of view but since it is not known by the parent, there might be collisions if these resources are configured as soft/NA resources. However, if these resource are configured in the hard resources, the parent can still have this information.  For solution 2, we still have some concern on the signaling overhead considering that the UEs may be reconfigured with CSI-RS/SR resources and there will UEs entering/leaving the network. These configurations are probably never be used even they are made optional. |
| Intel | Yes | We agree with the FL proposal. |
| ZTE, Sanechips | More discussion is needed | Agree with Huawei that the existing agreement is not necessarily changed (our 1st round comment says “RAN1 specified behavior in 38.213 is not necessarily impacted”). The RAN1 spec says “A symbol is quivalent to being configured as hard”, which does not restrict the “symbol” to be semi-configured as soft or NA only. We still prefer to answer both solutions are feasible. |
| Samsung | Yes | Agree with the FL proposal because the second solution can give an impression that RAN1 wants to mandate a hard resource configuration for CSI-RS and SR. |
| vivo | Yes | We agree with the direction proposed by FL |
| LG | Yes | We agree with the FL proposal. |
| Ericsson | Discuss further | We think it’s easy to misunderstand other companies’ views without proper discussion and we think such discussion would be beneficial for the final agreement. |

## IAB-DU/IAB-MT Transition Location/Type

**Source**: R1-2003505, R1-2003544, R1-2003948, R1-2004449

**Background:** During RAN1#100-e the following conclusion was reached:

***Conclusion:*** *No consensus to adopt a TP to address the issue of transition detection or transition type determination at the parent IAB node in RAN1#100-e. Consideration of whether this issue is critical and whether specification support is necessary may be revisited in the future as several companies raised concerns that the potential impact of improper transition detection may lead to system performance degradation when guard symbols are introduced by the parent node.*

The related agreement was reached in RAN1#98:

Agreements:

A parent IAB node can be made aware of the number of symbols Ng the child IAB node would like the parent IAB node not to use at the edge (beginning or end) of a slot when there is a transition between child MT and child DU. Separately or additionally, the child IAB node can be made aware of the number of guard symbols that the parent IAB node will provide.

* Ng can be provided for each of the [8] possible transitions with potential overlap:

|  |  |  |
| --- | --- | --- |
| *MT to DU* | *DL Tx* | *UL Rx* |
| *DL Rx* |  |  |
| *UL Tx* |  |  |
| *DU to MT* | *DL Rx* | *UL Tx* |
| *DL Tx* |  |  |
| *UL Rx* |  |  |

* If Ng is not provided it is assumed to be 0

NOTE: this agreement does not introduce any performance requirement on IAB nodes.

These issues were extensively discussed during RAN1#100-e, but were not discussed during RAN1#100bis-e. Based on contributions to RAN1#101-e mentioning this topic, the following views were expressed:

Specification of MT->DU and DU->MT transition conditions:

YES: 1

NO: 3 (left to implementation in Rel-16)

Specification of parent node behavior for inserting guard symbols in case of flexible symbols at the edge of a MT->DU or DU->MT transition:

YES: 3

NO: 1 (left to implementation in Rel-16)

FL Proposal 2.3.1: Discuss specification of parent node behavior for inserting guard symbols in case of flexible symbols at the edge of a MT->DU or DU->MT transition. Determination of MT->DU and DU->MT transitions is left to IAB-node implementation in Rel-16.

**Discussion:**

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| **Company** | **Do you agree with FL Proposal 2.3.1?** | **Comments** |
| **Huawei** | **Agree** | **For issue 1, there are already two straightforward solutions on the table which have been discussed for several meetings. We can have some further discussion on which way is better.** |
| Qualcomm | Yes to the first sentence.  **No to the second sentence.** | Minimally there needs to be a discussion in which companies supporting that the determination of MT🡨🡪DU transitions can be left to implementation should explain how this would work when there is a parent node from vendor A with implementation A and a child node from vendor B with implementation B different from implementation A. |
| Intel | Agree | We agree with the FL proposal. |
| ZTE, Sanechips | No to the 1st part. Yes to the 2nd part. | RAN1 does not specify parent node behaviors. |
| LG | No to the 1st part. Yes to the 2nd part. | For these issues, it has been discussed for several meetings. Still, we are not sure if there is a need for specification (it could be left to IAB-node implementation). However, as FL suggested, we are also ok for further discussion on this issue. |
| NTT DOCOMO | Yes | Though we couldn’t reach the consensus in the past mettings, we are fine for the discussion. |
| Ericsson | Yes |  |
| vivo | Yes only to the 2nd part. | Based on current spec., if child node has UL transmission on ‘F’, the child node assume guard symbol as configured for MT UL🡨🡪DU. If child node has DL transmission on ‘F’, the child node assume guard symbol as configured for MT DL🡨🡪DU. This behavior is known by parent node, thus parent node performs proper scheduling. There is no ambiguity between child and parent node, i.e., no issue. |
| Samsung | OK with the 2nd part | In general, we think the issue may be addressed by parent node implementation. Only issue we see is about uncertaintly of flexible symbol. As several companies commented, it may be addressed by some implementations as well. But, we are open to further discuss it. |

**FL Observation: Clearly more discussion is needed, but let’s take 2.3.1 as the baseline for starting discussion. Given the email budget for IAB maintenance (2 threads), it seems acceptable to use one thread for discussion of both aspects:**

FL Proposal 2.3.2: During RAN1#101-e discuss the following:

1. Specification of parent node behavior for inserting guard symbols in case of flexible symbols at the edge of a MT->DU or DU->MT transition
2. Whether determination of MT->DU and DU->MT transitions is left to IAB-node implementation in Rel-16.

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| **Company** | **Do you agree with Proposal 2.3.2? Is Alt. 1 or Alt. 2 preferred?** | **Comments** |
| Qualcomm | Yes, agree with proposal 2.3.2.  The question on Alt 1 vs. Alt 2 seems a typo. | None. |
| Huawei | Yes | None |
| Intel | Yes | We agree with the FL Proposal. |
| ZTE, Sanechips | No | We are not convinced why RAN1 spec should specify parent node behavior. |
| Samsung | Yes | Agree with the FL proposal. |
| vivo | Yes | Fine to discuss, but our preference is 2) |
| LG | Yes | We agree with the FL proposal. |
| Ericsson | Yes | It seems to us like 1) and 2) are not mutually exclusive. |

## Configuration of tdd-UL-DL-ConfigurationDedicated and tdd-UL-DL-ConfigurationDedicated-IAB-MT

**Source**: R1-2003544

**Background:** During RAN1#100bis-e the following agreements and conclusion were made:

Agreements: TS 38.213 Section 14 should be updated with a TP capturing the following behavior when an IAB-MT is provided with tdd-UL-DL-ConfigurationDedication-IAB-MT:

* Clarification that the behaviors described in Section 11.1 of 38.213 for a UE provided with tdd-UL-DL-ConfigurationDedicated are also applicable ~~apply~~ for an IAB-node MT when provided with tdd-UL-DL-ConfigurationDedicated-IAB-MT
* The IAB-node MT does not expect to be configured with both tdd-UL-DL-ConfigurationDedicated and tdd-UL-DL-ConfigurationDedicated-IAB-MT.

**Conclusion:** The following note is not captured in 38.213 Section 14 in RAN1#100b-e:

* [Note (up to 38.213 editor to decide whether to include or not): The IAB-node MT does not expect to be configured with both tdd-UL-DL-ConfigurationDedicated and tdd-UL-DL-ConfigurationDedicated-IAB-MT.]

R1-2003544 raises the issue of potential ambiguity of the IAB-MT behavior in 38.213 as a consequence of not capturing the Note according to the RAN1#100bis-e conclusion. However given that this was extensively discussed in RAN1#100bis-e and confirmed by the 38.213 Editor that error behaviors do not need to be captured, it is proposed to not revisit this issue during RAN1#101-e unless there is consensus to do so.

FL Conclusion 2.4.1: The Agreements and Conclusion from RAN1#100bis-e regarding IAB-node MT behavior related to tdd-UL-DL-ConfigurationDedicated and tdd-UL-DL-ConfigurationDedicated-IAB-MT do not need to be revisted in RAN1#101-e.

**Discussion:**

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| **Company** | **Do you agree with FL Conclusion 2.4.1?** | **Comments** |
| **Huawei** | **Yes** | **This was discussed extensively in RAN1#100bis-e and it was agreed not to capture the error configuration into the spec hence there is no need to discuss this further.** |
| Qualcomm | Yes | In our view there might still be an issue in the sense that it is not clear where in the specs the aforementioned condition is defined as an error. However, the proposed note as is does not address the potential issue, as it simply pushes the decision to the editor and based on RAN1 #100bis-e discussion the reported feedback from the editor was not to include it under the assumption it was an error condition. |
| Intel | No | We think adding the note make it more clear. |
| ZTE, Sanechips | Not really. | We would like to know whether the following statement in the RAN1 #100bis-e agreement is still an agreement, given it is now neither captured in RAN1 spec nor informed to RAN2.  “*The IAB-node MT does not expect to be configured with both tdd-UL-DL-ConfigurationDedicated and tdd-UL-DL-ConfigurationDedicated-IAB-MT*”.   * If it is no longer an agreement, RAN1 needs to further determine the IAB-MT behavior when both IEs are configured but conflicting to each other on certain parameters. * If it is still an agreement but just not captured in RAN1 spec, RAN1 may need to at least inform RAN2 of this agreement and leave RAN2 to decide how to proceed with it. This particular issue could be just one example of general question: whether the IAB-MT could be configured at the same time with both a UE-oriented RRC parameter and a MT-oriented RRC parameter for the same signaling parameter purpose. Then RAN1 should inform RAN2 of RAN1’s understanding for a reference, otherwise, there would be a chance for RAN1 to have to specify PHY layer behaviors to handle parameter conflictions. |
| LG | Yes | We agree with the FL proposal. |
| NTT DOCOMO | Yes | We are fine with the FL proposal of following the outcome of the last meeting. |
| Ericsson | Yes |  |
| vivo | Yes |  |
| Samsung | Maybe no | We slightly prefer to make it clear. So, It would be good to capture the IAB-node MT behavior in 213 or 331. |

**FL Observation: There is consensus to keep the RAN1#100bis-e agreements. Given the 38.213 has already expressed a preference to not captured the note in 38.213, this aspect should not be revisited, however if RAN2 wishes to capture this agreement in the RRC specification, RAN1 can inform them of the agreement either via LS or via the updated RAN1#101-e NR Higher Layer Parameter list. Which approach is the best option is left to the session chair for guidance.**

**FL Proposal 2.4.2: Inform RAN2 of the following RAN1#101bis-e agreement via the following means (to be decided by the session chair):**

**Alt. 1. LS from RAN1 to RAN2**

**Alt. 2. Note in the updated RAN#101-e NR Higher Layer Parameters list.**

**Discussion:**

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| **Company** | **Do you agree with FL Proposal 2.4.2?** | **Comments** |
| Qualcomm | Yes. | None. |
| Huawei | Yes | None |
| Intel | Yes | None |
| ZTE, Sanechips | Yes |  |
| Samsung | Yes | None |
| vivo | Yes |  |
| LG | Yes | None |
| Ericsson | Yes |  |

## Alignement of 38.331 and 38.213 parameters related to DCI Format 2\_5

**Source**: R1-2003732, R1-2004133, R1-2004582

**Background:** During RAN1#100bis-e the following agreements were reached:

Agreements: Confirm that from a RAN1 perspective all Rel-15 UE common search space types are also applicable to Rel-16 IAB nodes. Signaling details are left to RAN2.

Agreements: Confirm DCI Format 2\_0 and DCI Format 2\_5 can be monitored by an IAB-MT in at least a common search space. The same number of aggregation levels and candidates can be separately configured for both DCI Format 2\_0 and DCI Format 2\_5.

Agreements: DCI Format 2\_0 is not monitored by an IAB-MT in a UE(MT)-specific search space. DCI Format 2\_5 can be additionally monitored by an IAB-MT in a UE(MT)-specific search space. Signaling details (e.g. whether the configuration is in the existing UE-specific search space configuration or a new MT-specific search space configuration is left up to RAN2).

Based on these agreements there is a need to align RAN1 specifications with the RRC configurations for an IAB-MT related to DCI Format 2\_0 and 2\_5. Specifically the following issues were identified:

1. Add reference SCSs for soft resource availability indication configuration in the RRC IE AvailabilityCombinationPerCell (R1-2003732)
2. Extensions of DCI Format 2\_5 optimzied for paired spectrum operation (R1-2003732)
3. positionInDCI-AI/dci-PayloadSize-AI used for USS (R1-2004133)
4. Relationship between DownlinkPreemption and availabilityIndicator (R1-2004133)
5. Usage of SearchSpace vs. SearchSpace-IAB in 38.213 (R1-2004582)

* Subtopics 1, 3, 4, and 5 are related to alignment of 38.213 and 38.331 parameters without need for new RAN1 agreements. Therefore they can be handled as editorial corrections in RAN1 and RAN2 without requiring dedicated RAN1 email discussions.
* Subtopic 2 is an optimization for operation in paired spectrum and is out of scope for Rel-16 based on the RAN1#100bis-e decision:

Agreements No additional specification impact for 38.213 is required for the definition of half-duplex operation in case of IAB nodes operating in paired spectrum. Further discussion of the default multiplexing capability indication for IAB nodes operating in paired spectrum can be discussed under the IAB-MT Features agenda item in the future (if needed).

FL Conclusion 2.5.1: The following issues can be considered as editorial corrections to be handled by the 38.213 and 38.331 editors

1. Add reference SCSs for soft resource availability indication configuration in the RRC IE AvailabilityCombinationPerCell (R1-2003732)
2. ~~Extensions of DCI Format 2\_5 optimzied for paired spectrum operation (R1-2003732)~~
3. positionInDCI-AI/dci-PayloadSize-AI used for USS (R1-2004133)
4. Relationship between DownlinkPreemption and availabilityIndicator (R1-2004133)
5. Usage of SearchSpace vs. SearchSpace-IAB in 38.213 (R1-2004582)

**Discussion:**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree with FL Conclusion 2.5.1?** | **Comments** |
| **Huawei** | **Yes** | **We agree with most of the proposed corrections in 1, 4, 5 while some changes are not accurate. This can be handled when all the editorial changes will summarized in the end. For the issue raised by LGE, we are not sure whether there is a need to monitor DCI format 2\_5 in CSS and USS/MSS at the same time.** |
| Qualcomm | Yes | Details can be discussed/finalized. |
| Intel | Partially | * Regarding item 2, we think it should be further discussed, since currently there is no solution/description in spec how does soft availability indication work in paired spectrum. * Regarding item 3, *positionInDCI-AI* is used to differentiate different serving cells, not to differentiate different MTs in case of one DCI format 2\_5 sending to multiple MTs.   When CSS is used for DCI format 2\_5, the configuration is supposed to be common for multiple MTs; when USS is used for DCI format 2\_5, the configuration is supposed to be MT-specific. So there will be no case that part of DCI format 2\_5 payload is used for one MT, and part of DCI format 2\_5 payload is used for another MT. |
| ZTE, Sanechips | No for issues 1 and 3. | For issue 1:  The current 38.213 statement “The IAB-node DU can assume a same SCS configuration for *availabilityCombinations* for a serving cell as an SCS configuration provided by *IAB-DU-Resource-Configuration-TDD-Config* for the serving cell” still works when DCI 2\_5 is in CSS, given the table entry pointed by the index contained in DCI 2\_5 can be interpreted per IAB-node. There is no need to have a common ref-SCS for all IAB-MT decoding DCI 2\_5 in the same CSS. In addition, RAN1 agreed that the DU resource configuration would be separately configured for DL and UL in paired spectrum, which naturally means the ref-SCS would have different copies for DL and UL in paired spectrum.  Further, the current 38.331 does not either define ref-SCS in AvailabilityCombinationsPerCell-r16. In other words, there is no misalignment between 213 and 331 for this matter at this time. In contrast, proposal of 1 just targets to build another different solution by modifying both spec.  While both the existing mechanism (ref-SCS given by *IAB-DU-Resource-Configuration-TDD-Config*) and the DCI 2\_0-alike solution (i.e., adding ref-SCS in AvailabilityCombinationPerCell) can work, there is certain difference. In the DCI 2\_0 alike solution, the spec may need to handle the relationship among three SCS’s: the actual SCS, ref-SCS in AvailabilityCombinationsPerCell-r16 and ref-SCS in *IAB-DU-Resource-Configuration-TDD-Config*, while the existing solution may only need to handle the relationship between the 1st and the 3rd ones.  For issue 3, we share the same view as Intel. |
| LG | Not needed for item 4 | * Regarding item 3, in our understanding, *positionInDCI-AI can be* configuredIAB-node DU specifically (as shown in 38.331 below) even in case of CSS is used for DCI format 2\_5. So, when an IAB-node MT detects DCI format 2-5, it carries availability indicator fields for IAB-node DU cells in the IAB-nodes with the same AI-RNTI. Therefore, the value of *dci-PayloadSize-AI* and *positionInDCI-AI* can be different according to monitoring search space, i.e., CSS or USS. In summry, it is desirable that dci-PayloadSize-AI and positionInDCI-AI are configured independently for CSS and USS.   *AvailabilityIndicator-r16* information element  -- ASN1START  -- TAG-AVAILABILITYINDICATOR-START  AvailabilityIndicator-r16 ::=    SEQUENCE {      ai-RNTI-r16                      AI-RNTI-r16,      dci-PayloadSize-AI-r16           INTEGER (1..maxAI-DCI-PayloadSize-r16),      availableCombToAddModList-r16    SEQUENCE (SIZE(1..maxNrofAssociatedDUCellsPerMT-r16)) OF AvailabilityCombinationsPerCell-r16                                                                                                        OPTIONAL, -- Need FFS      availableCombToReleaseList-r16   SEQUENCE (SIZE(1..maxNrofDUCells-r16)) OF CellIdentity           OPTIONAL, -- Need FFS      ...  }  AI-RNTI-r16 ::=                      RNTI-Value  -- TAG-AVAILABILITYINDICATOR-STOP  -- ASN1STOP  ***AvailabilityCombinationsPerCell* information element**  -- ASN1START  -- TAG-AVAILABILITYCOMBINATIONSPERCELL-START  AvailabilityCombinationsPerCell-r16 ::= SEQUENCE {      iabDuCellId-AI-r16                      IAB-DU-CellID-AI-r16,      positionInDCI-AI-r16                    INTEGER(0..maxAI-DCI-PayloadSize-r16-1)                  OPTIONAL, -- Need FFS (M)      availabilityCombinations-r16            SEQUENCE (SIZE (1..maxNrofAvailabilityCombinationsPerSet-r16)) OF AvailabilityCombination-r16,      ...  }   * According to the latest RRC CR (R2-2004287), proposed TP is already reflected. So, item 4 can be deleted from the list. |
| NTT DOCOMO | Yes (not sure for 3) | For 3, we have a similer view with Huawei, wheather UE may need to monitor CSS and USS/MSS simaltanousely or not, and if not the additional signaling is no necessary. |
| Ericsson | Yes | We are fine to discuss this although we are not convinced more than Item 5 needs to be edited. Furhter, we would like to discuss the editorial issue with HL parameter *tdd-UL-DL-ConfigDedicated-IAB-MT* as presented in our contribution. |
| Samsung | Partially | 1, 5 can be addressed by spec. editors.  3 can be further discussed.  It seems 4 was already addressed in running 331 CR. |

FL Conclusion 2.5.1: The following issues can be considered as editorial corrections to be handled by the 38.213 and 38.331 editors

5. Usage of SearchSpace vs. SearchSpace-IAB in 38.213 (R1-2004582)

6. Usage of symbols vs. symbols-IAB-MT as part of *tdd-UL-DL-ConfigDedicated-IAB-MT* configuration description in 38.213 (R1-2004582)

FL Proposal 2.5.2: Discuss during RAN1#101-e whether the following issues can be considered as editorial corrections to be handled by the 38.213 and 38.331 editors

1. Add reference SCSs for soft resource availability indication configuration in the RRC IE AvailabilityCombinationPerCell (R1-2003732)
2. positionInDCI-AI/dci-PayloadSize-AI used for USS (R1-2004133)

**Discussion:**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree with FL Conclusion 2.5.1 and FL Proposal 2.5.2?** | **Comments** |
| Qualcomm | Yes. | None. |
| Huawei | Yes | For 2.5.2, our view is there is no need to introduce additional reference SCS since it can simply follow the SCS for H/S/NA configurations. |
| Intel | Partially, has concern on item 3 | * For proposal 2.5.2 item 3, in addition to our previous comments, RRC parameter *iabDuCellId-AI* is configured in case of multiple cells in one IAB DU. Accordingly, RRC parameter *positionInDCI-AI* is pointing at DCI format 2\_5 payload for different cells in one IAB DU. Those two parameters already exist for DCI format 2\_5 sending to one IAB MT. They are not parameters to differentiate different DUs in case of one DCI format 2\_5 sending to multiple MTs.   But if other companies want to further discuss item 3 during RAN1#101-e, we can agree with the FL proposal.   * For proposal 2.5.2 item 1, in response to Huawei’s comment, if SCS for H/S/NA configuration at each DU is followed, when one DCI format 2\_5 sending to multiple IAB nodes, different IAB DU may have different SCS interpretation, which will cause one DCI 2\_5 indicating different time duration for different IAB nodes. We don’t think this is intended if DCI format 2\_5 sending to multiple IAB nodes. |
| ZTE, Sanechips | OK on 2.5.1, but 2.5.2 needs further clarification. | For 2.5.2, is the discussion just to decide whether or not the issue is considered as editorial correction? If it is not as simple as an editorial correction, would RAN1 handle it in this meeting? |
| Samsung | OK with 2.5.1 | Similar view with ZTE about 2.5.2. In our view, 2.5.2 seems not just editorial and more time is necessary for the discussion. |
| LG | Yes | For 2.5.2, we are ok for the further discussion on this issue in this meeting. |
| Ericsson | Yes to at least 2.5.1. |  |

## Updates on IAB terminology

**Source**: R1-2004280

**Background:** In the latest version of TS 38.300 the following definitions for IAB have been agreed:

**IAB-donor**:gNB that provides network access to UEs via a network of backhaul and access links.

**IAB-donor-CU**: as defined in TS 38.401 [4].

**IAB-donor-DU**:as defined in TS 38.401 [4].

**IAB-DU**: gNB-DU functionality supported by the IAB-node to terminate the NR access interface to UEs and next-hop IAB-nodes, and to terminate the F1 protocol to the gNB-CU functionality, as defined in TS 38.401 [4], on the IAB-donor.

**IAB-MT**: IAB-node function that terminates the Uu interface to the parent node using the procedures and behaviours specified for UEs unless stated otherwise. IAB-MT function used in 38series of 3GPP Specifications corresponds to IAB-UE function defined in TS 23.501 [3].

**IAB-node**: RAN node that supports NR access links to UEs and NR backhaul links to parent nodes and child nodes. The IAB-node does not support backhauling via LTE.

As a result, there is no longer a notion of a IAB-node DU or IAB-node MT, rather an IAB-node contains IAB-DU and IAB-MT functionality.

**FL Conclusion 2.6.1: All instances of IAB-node DU should be replaced with IAB-DU and all instances of IAB-node MT should be replaced with IAB-MT in TS 38.211, 38.212, and 38.213 (to be handled by the editors).**

**Discussion:**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree with FL Conclusion 2.5.1?** | **Comments** |
| **Huawei** | **Yes** | **An explicit agreement is helpful to remind the spec editor to implement the change.** |
| Qualcomm | Yes |  |
| Intel | Yes |  |
| LG | Yes |  |
| NTT DOCOMO | Yes |  |
| Samsung | Yes |  |
| Intel | Yes |  |
| LG | Yes |  |
| Ericsson | Yes | We share Huawei’s view. Furhter, as a formality, we all assume the agreement concerns FL Conclusion 2.**6**.1. |

# Summary

The following issues are considered by RAN1 during RAN1#101-e:

1. Response to RAN2 LS on IAB Guard Symbols – Deadline for LS response: 5/27
2. Response to RAN3 LS on Cell-specific signals/channels configurations in IAB– Deadline for LS response: 5/27

TBD others