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

e-Meeting, May 25th – June 5th, 2020

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

**Source: Moderator (AT&T)**

**Title: Summary of [101-e-NR-IAB-02]: Response to RAN3 LS on Cell-specific signals/channels configurations in IAB**

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

# Introduction

This contribution provides a summary of [101-e-NR-IAB-02]: Response to RAN3 LS on Cell-specific signals/channels configurations in IAB.

# 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.

A potential compromise is that RAN1 should 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.

During the preparation phase, companies expressed different views about the potential RAN1 impact of supporting Solution 1 and replying to RAN3 that it is feasible in additional to Solution 2, as a result, the following is proposed to clarify the impacts of Solution 1 on RAN1:

FL Conclusion 2.2.3:

The following are the impacts to RAN1 if Solution 1 from RAN3 is supported:

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.

1. The following RAN1 agreement needs to be reverted as follows:

**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~~

1. The following text in 38.213 should be updated:

“*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. A symbol of a slot must be configured as hard at the child node or as not available at the parent node if an IAB-node DU would transmit A symbol of a slot can be expected to be configured as hard at the child node or as not available at the parent*  *a periodic CSI-RS in the symbol of the slot, or would receive a PRACH or a SR in the symbol of the slot.*”

**Discussion:**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree with FL Conclusion 2.2.3? Any additional RAN1 impact? If you do not support FL Proposal 2.2.2, what would be the suggested alternative?** | **Comments** |
| Qualcomm | Yes, in principle, with some modifications / simplications | We agree with Proposal 2.2.2 and most of Conclusion 2.2.3. To us this part is not strictly necessary: “*Explicitly configure the resources used for CSI-RS and SR as Hard at the child node or Not Available at the parent node*”, as, from a RAN1 perspective, we have not imposed constraints on the the DU resource configuration, relying on a suitable network implementation. The general design philosophy adopted thus far was that conflicts are allowed and left to the IAB-node to resolve, if indeed allowed by the network. RAN1.  This information about the child DU configuration was agreed to be optionally provided. So if we wanted to avoid conflicts by specification, then we ought to specificy that if such information about the child DU special (i.e. NA exempt) signals/channels is not provided to the parent, then the network should adjust the resource configuration accordingly so that there is no conflict at the child node.  As a result the second proposed change “*A symbol of a slot must be configured as hard at the child node or as not available at the parent node if an IAB-node DU would transmit*”. Moreover, as written, this has additional complications because it introduces a specification on network/CU behavior in a paragraph that was focused on DU behavior.  On a related note, it is observed that the first portion of the second solution listed 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 always a possibility, as it is a network choice. So the issue with this solution is really about the second sentence, which would require a RAN1 agreement amendment, as noted. |
| **ZTE, Sanechips** | **Agree on 1) (change of RAN1 agreement) but not on 2) (change of RAN1 spec).** | **Although the mentioned RAN1 agreement could be indeed reverted, which is a normal coordination procedure across RAN WGs, we do not think the current RAN1 spec has to be modified by either solution in RAN3 LS. Without changing current RAN1 spec, “**Explicitly configure the resources used for CSI-RS and SR as Hard at the child node or Not Available at the parent node**” can be**   * **Either put in RAN3 spec.** * **Or treated as implementation issue.**   **In addition, it does not seem conventional for RAN1 spec to say the MT either does not expect or definitely needs a specific configuration over RAN3 signaling, because RAN3 signaling is never mandatory upon a specific way. This could be different from RAN2 RRC.**  **Thirdly, in comparison of the following two situations respectively derived from the two solutions in RAN3 LS, the 1st one may not be necessarily worse than the 2nd:**   * **CSI-RS/SR configurations are always off the list and CSI-RS/SR are safely in Hard at child or NA at parent.** * **CSI-RS/SR configurations are optional in the list but could be non-present for 50% of time with CSI-RS/SR allowed being in conflict resources.**   **So it is not preferred to put a lower weight or weaker preference tone on the 1st one in reply LS.**  **At last, if RAN1 can agree the current RAN1 spec can maintain unchanged, it seems not necessary to request RAN3 to further inform RAN1 of their decision between two solutions.**  **So, our preference is to respond RAN3 that**   * **From RAN1 perspective, both solutions in RAN3 LS are feasible.** * **The 1st solution in RAN3 LS, if adopted by RAN3, would automatically revert RAN1 #99 agreement and modify the higher layer parameter spreadsheet provided by RAN1 accordingly.** |
| **Nokia** | **Both options are feasible.** | We do not think that changing the agreement is required. The information about all (or some) cell-specific signals/channels may not be needed at the parent side when the CU configuring all (or some) cell-specific signals as hard, which is one implementation option. For example, if all cell-specific channels are configured as hard, the child DU resource configuration is sufficient at the parent node (if the parent is not configured with NA resources corresponding to hard resources of IAB DU).  Also, as RAN1 agreement mentioned that “can be provided” and “How/whether to use the information to handle any potential conflict is left to the implementation”. From our understanding, this is already flexible enough to support solution 1 mentioned by RAN3.  On updating text in 38.213: Similar explanation as before, it is not necessary to add one implementation option to cover a case where F1-AP signalling overhead becomes an issue. Network implementation has the flexibility to configure any resource as hard, which includes periodic CSI-RS and SR. We could reply to Ran3 that both options are feasible. |
| NTT DOCOMO | Yes | As mentioned by companies, the feature is optional, so that the solution2 from RAN3 may be sufficient to align with the RAN1 agreement. And if RAN3 prefer the solution 1, then reverting the agreement as in FL Conclusion 2.2.3 may be necessary. |
| Huawei | Both options are feasible | We tend to agree that both options are feasible from RAN1 point of view. RAN3 can further decide which way to go.  Regarding the RAN1 specification impact, we agree with the first bullet in FL proposal 2.2.3 to update the previous RAN1 agreement.  For the second bullet, there are two possible alternatives:   * Alt.1: Keep the spec as it is. In this case, if RAN3 finally decides to go with Solution 1, the only issue is that there may be resource collisions if the CSI-RS or SR collides with the soft or N/A resources of IAB-DU. This case is not different from the case where the parent node is not provided with the child node DU resource configuration. The conflict has to be handled by implementation. * Alt.2: Update the spec in the following   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~~.  In this case, the CSI-RS and SR resources will not be treated as Hard if they overlap with NA/soft resources of IAB-DU. To avoid resource collisions between parent node and IAB node, the CU has to make sure CSI-RS and SR are configured in Hard resources of IAB-DU and at the same time provides the IAB-DU resource configuration to the parent node. Note that this is also possible even if Alt.1 is agreed.  Comparing the two alternatives, Alt.1 provides more flexibility to IAB-DU with respect to CSI-RS and SR configurations but at the same time has to handle potential resource conflictions. We have a slight preference to Alt.2. |
| Samsung | Yes | We agree with the FL’s proposal 2.2.2 because it is clear to us that solution 2 can address the RAN3 issue without further RAN1 impacts. Also, we agree with the FL’s assessment 2.2.3 on the potential RAN1 impacts for the solution 1. Actually, we are not sure RAN1 needs to say the solution is also feasible in spite of the potential RAN1 impacts given the solution 2 is already feasible. |
| vivo | Alt.1(feasible, not preferred), Alt.2(feasible, preferred) | Proposal 2.2.2 should be kept. Reason as following, regarding Alt.1, the first half is always possible to configure CSI-RS and SR as Hard via configuration. However, the RAN1 spec. change mentioned by second half is really not necessary, if CSI-RS and SR configuration is optional choice.  In proposal 2.2.3, the assessment is correct. |
| LG | Yes | We support the FL’s proposal 2.2.2., but not preferred Solution 1 from RAN3 which requires RAN1 impact. As many companies commented, configuring CSI-RS and SR as Hard resource is possible network option, but excluding CSI-RS and SR configurations from the list of cell-specific signals/channels configurations is reverting previous RAN1 agreement. |
| Ericsson | Both options are feasible | In general, we prefer Solution 1 in the LS from RAN3 in the way that configuring resources used for CSI-RS and SR as Hard can resolve the issue. However, we think the TP in the second bullet in Conclusion 2.2.3 imposes unnecessary restrictions from RAN1 perspective and we would prefer a wording like  *A symbol of a slot can be expected to be configured as hard at the child node or as not available at the parent*  with the exclusion of the PRACH reference from this sentence.  We also agree with the first bullet in FL proposal 2.2.3 to update the previous RAN1 agreement. |
| Intel | Both solutions are feasible, Solution 2 is preferred. | As many companies have commented, we want to inform RAN3 that   1. Both solutions are feasible. 2. Solution1 has RAN1 spec impact. 3. Solution 2 is preferred on RAN1 side. |

FL Agreement 2.2.4:

Inform RAN3 of the following:

The following solution is currently not feasible 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 following is solution is currently 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 first 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 and there is currently no consensus to revert this agreement. If this solution is adopted by RAN3 instead of the second solution, RAN1 should be informed in order to determine the impact on its specifications.

FL Working Assumption 2.2.5:

The following are the impacts to RAN1 if Solution 1 from RAN3 is supported:

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.

1. The following RAN1 agreement needs to be reverted as follows:

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- ~~periodic CSI-RS transmission at the DU~~

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1. The following text in 38.213 should be updated as follows:

“*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 pdcchConfigSIB, or would receive a PRACH in the symbol of the slot.* *A symbol of a slot can be expected to be configured as hard at the child node or as not available at the parent* *if an IAB-node DU would transmit a periodic CSI-RS in the symbol of the slot, or would receive a SR in the symbol of the slot.*”

# Summary

TBD