**3GPP TSG-RAN WG3 Meeting #117bis-e R3-225939**

**Online, 10th – 18th Oct, 2022**

**Agenda Item: 13.4**

**Source: Lenovo (moderator)**

**Title: CB: # IAB4\_IntMit**

**Document for: Approval**

# Introduction

This paper provides the summary for following offline discussion:

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| **CB: # IAB4\_IntMit**  **- Should specific solutions for PCI collision avoidance/resolution be adopted on top of existing ones?**   * **Discuss PCI Space Partitioning: should it be OAM controlled?** * **Discuss network-controlled PCI change on the mobile IAB-DU** * **Discuss PCI collision predictions: is this in scope of the WI?** * **Dependencies on RAN2 work?** * **Is there a need to check with RAN1 on UE impacts of PCI changes during mIAB operations? Or can such impacts be evaluated and described, e.g. RLF?**   **- Note last meeting´s agreement on RACH: “From RAN3 perspective, no enhancements are needed for RACH collision avoidance unless requested by other WGs.”**  (Lenovo - moderator)  Summary of offline disc [R3-225939](file:///C:\Users\zhuoyb1\AppData\Local\Temp\7zO496BE4EB\Inbox\R3-225939.zip) |

Phase I: Please give your feedback before Wednesday, 12th October 2022, 12:00 UTC. This allows us to give some inputs for Thursday’s online session (13th October 2022).

Phase II: TBD.

# For the Chairman’s Notes

Based on the comments below, following potential proposals are achieved.

**Proposal 1: PCI collision is detected by the F1-terminating IAB-donor of the mobile IAB-node.**

**Proposal 2: PCI collision prediction is in the scope of WI.**

**Proposal 3: PCI Space Partitioning is performed by OAM and up to implementation.**

**Proposal 4-1: As baseline, F1-terminating IAB-donor reconfigures PCI for the cell of mobile IAB-DU via existing F1AP message to avoid PCI collisions.**

**Proposal 4-2: PCI-change on the IAB-node to be supported via handover of connected UEs between logical cells using old and new PCI, respectively.**

**Proposal 5: FFS for the PCI reconfiguration in case of IAB-donor and IAB-node with different OAMs.**

# Discussion – 1st Round

## PCI collision detection / prediction

Based on the agreements from RAN3 117e meeting, existing mechanism can be used for PCI collision detection in mobile IAB scenario from RAN3 perspective. And in this meeting, several companies ([1]-[6] and [9]) think it’s the IAB-donor to perform PCI collision detection for the mobile IAB-node. In addition, one other company ([7]) thinks the PCI collision may be also detected by the mobile IAB-node itself, for example, if the candidate PCI list can pre-configured to the mobile IAB node, the IAB-node can pick a new PCI if the PCI collision or potential PCI collision is detected.

***Q1-1: Do you agree that the PCI collision is detected by the F1-terminating IAB-donor of the mobile IAB-node?***

***Q1-2: Do you agree that the PCI collision can be also detected by the mobile IAB-node?***

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| Company | Yes/No | Comment |
| Huawei | Q1-1: Yes  Q1-2: Yes | The current PCI collision detection is performed by the donor CU, this is applicable to the mobile IAB also. The PCI collision can also be detected by the mobile IAB-node itself, it will be faster to update the new PCI, if collision is detected by the IAB-node and a PCI list is preconfigured, and the impact to the UE’s traffic will be limited. |
| **Ericsson** | **Q1-1: Yes**  **Q1-2: No** | Regarding Q1-2, determining the PCI requires decoding SSBs. **The mIAB-MT cannot be assumed to receive SSBs transmitted from other IAB-nodes**. In fact, RAN1, in Rel-16, has specified IAB-specific SSB configurations for that reason. |
| Qualcomm | Q1-1: Yes  Q1-2: Yes | The PCI collision can be detected by the CU based on UE measurement reports. The IAB-MT may also detect PCI collisions from measurements of other IAB-nodes (using IAB-specific STC/SMTC configurations). It may not detect PCI collisions with other stationary gNB-DUs (because gNB-DUs do not support IAB-specific STC/SMTC configurations). |
| Lenovo | Q1-1: Yes  Q1-2: No | It’s the IAB-donor to detect the PCI collision and perform PCI reconfiguration as legacy. For the IAB-node, how can IAB-node to detect the collision needs to be further studied, there is no inter-IAB-node message to help the IAB-node to detect the potential PCI collision now. If the assistance info for PCI collision detection is provided by the IAB-donor, IAB-donor can directly declare the PCI collision rather to send the assistance info to the IAB-node. |
| Nokia | Q1-1: Yes  Q1-2: see comment | Q1-2; IAB-MT can search and report cells the same way as UE. With IAB-MT measurements the detection may be **too late** as the cells with the same PCI may already be overlapping. So this should not be preferred. |
| Xiaomi | **Q1-1: Yes**  **Q1-2: No** | We agree that IAB-MT can perform measurements, but we believe F1-terminating IAB-donor have more comprehensive measurements received from UEs served by the IAB-node, which means F1-terminating IAB-donor can have a more precise detection. |
| Fujitsu | Q1-1: Yes  Q1-2: No | F1-terminating CU can detect PCI collision through the report from UEs or mobile IAB-MT.  It’s possible that the mobile IAB-MT can detect the PCI collision between surrounding cells and itself. But the mobile IAB-node should not determine whether to change the PCI or not.  It’s helpful that the mobile IAB-MT reports the detecting result to the F1-terminating CU as the F1-terminating CU has more information on PCI collision. The F1-terminating CU should determine whether reconfiguration of PCI for the mobile IAB-DU is necessary based on the reported information. |
| Samsung | Q1-1: Yes  Q1-2: Yes | Similar view with QC |
| Deutsche Telekom | Q1-1: Yes  Q1-2: Yes |  |
| ZTE | Q1-1: see comments  Q1-2: No | We think PCI collision can be detected by the F1-terminating donor using legacy mechanisms. In addition, for partial migration, the F1-terminating donor may be not able to detect the potential PCI collision especially when there is no Xn interface between the F1-terminating donor and the target donor. It’s not clear how F1-terminating donor can detect PCI collision in this case which needs to be further discussed.  For Q1-2, it’s not clear how PCI collision can be detected by the mobile IAB-node. |
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Summary:

For Q1-1, most companies (9 of 10) support that the PCI collision is detected by the F1-terminating IAB-donor of the mobile IAB-node. And only one company has the concern on the case of partial migration where the F1-terminating IAB-donor may have no Xn interface with the target IAB-donor. Moderator thinks that F1-terminating IAB-donor can detect the potential PCI collision based on the UE’s report in this case. So, we can have the potential proposal below.

**Proposal 1: PCI collision is detected by the F1-terminating IAB-donor of the mobile IAB-node.**

And for Q1-2, only 4 of 10 companies support PCI collision detection by the mobile IAB-node, no conclusion will be made for this question.

Based on the agreement from RAN3 117-e meeting, further enhancement for PCI collision detection is FFS. In contributions [5] and [6], it’s proposed that the PCI conflict detection is already supported by IAB-donor as defined in the /PCI Optimisation Function and it can be used as the baseline for mobile IAB.

And some other enhancements are proposed by companies for PCI collision detection, e.g., based on the IAB-MT’s location [2][3] or based on the movement info of mobile IAB-node [9]. And some other companies [3][6] and [9?] support to exchange the serving cell info or neighbour cell info in the XnAP message to assist the IAB-donor to perform PCI collision detection, and [4] proposes to include the cell info in the HO preparation phase to accelerate the PCI collision detection. In addition, in contributions [3][4] and [6], they think IAB-donor can also perform PCI collision detection based on the cell info included in the F1 setup request message in case of IAB-node mobility. While [2] thinks the PCI collision detection is in the scope of RAN2.

***Q2: Please share your view and preference on the following options for PCI collision detection. And for each option (1-4), whether the existing IE is enough, or we need to introduce new specific IE for mobile IAB?***

* ***Opt.1: UE or IAB-MT’s report for potential collided PCIs [2] [3] [4] [5] [6]***
* ***Opt.2: IAB-MT’s location [2] [3] [9 – movement info]***
* ***Opt.3: XnAP message for potential collided PCIs [3] [4 – HO preparation phase] [6] [9?]***
* ***Opt.4: F1 setup request for potential collided PCIs [3] [4] [6]***
* ***Opt.5: RAN2’s scope [2]***

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| --- | --- | --- |
| Company | Option(s) | Comment |
| Huawei | Option 1 and Option 6 | Option 1 can use existing message.  Option 3: reuse existing XnAP message, e.g. Xn setup request/NG-RAN NODE CONFIGURATION UPDATE ACKNOWLEDGE  Option 6: donor CU may provide neighboring cell list to the mobile IAB-node, and the mobile IAB-node can detect whether there will be potential PCI collision. |
| **Ericsson** | **5** | **This is RAN2 scope.**  Purely technically speaking, Opt2 seems preferable. |
| Qualcomm | All legacy options | There are various mechanisms in place for PCI collision detection, e.g., Opt.1, Opt.2 (using MDT for IAB-MT), NRT info, etc.  Most of this discussion is in RAN2 scope. If there is anything in RAN3 scope, it would be: Add the mobile-IAB status to the Neighbour Information NR IE so that it is available in the NRT.  **Proposal: To assist PCI collision detection, the Mobile-IAB status indicator to be included in the Neighbour Information NR IE in Xn Global Procedures.** |
| Lenovo | Options 1,3 and 4 | Option 1,3,4 can leverage the exist message in the measurement report, XnAP signaling and F1 setup request.  And we agree that this can be firstly discussed by RAN2.  While for the proposal provided by Qualcomm, whether the IAB-node is mobile or not has no impacts on the PCI collision detection. |
| Nokia | No with comments | We are not sure at the question. Current PCI optimization mechanism includes “reported by Ues, reported over the Xn interface by neighboring gNBs, and/or acquired through other methods, e.g. detected over the air using a downlink receiver.” So it is enough, and there is NO preference on reported by UE, or via Xn, etc.  Please clarify the specific issues to be addressed by RAN3. |
| Xiaomi | Option 2 | We agree all the legacy options, and option2 i.e. movement info (e.g. the route of the mobile IAB) can be useful |
| Fujitsu | Option ½/3/4 | For more clarification:  Opt.3:  When RRC terminating CU and F1-terminating CU for the mobile IAB-node are not the same node, e.g., in partial migration, the information of PCI collision detected by the mobile IAB-MT is reported to the RRC terminating CU. That the F1-terminating CU cannot derive the information reported by the mobile IAB-MT. The information should be delivered from the RRC terminating CU to the F1-terminating donor-CU, so that the F1-terminating donor-CU can determine the PCI or whether to reconfigure PCI for the mobile IAB-DU based on the information reported by mobile IAB-MT.  Opt. 4:  In mobile IAB integration or when F1-terminating CU of the mobile IAB-node is changed, e.g., in full migration, the mobile IAB-DU can report the present PCI to the (new) F1-terminating donor-CU via F1 Setup Request message, so that the (new) F1-terminating donor-CU can determine whether to reconfigure the PCI based on the present PCI as well as some information, such as location of mobile IAB-MT, information reported by the mobile IAB-MT or Ues. |
| Samsung | See comments | Options for PCI collision detection should be discussed case by case. It is related to which entity detects PCI collision first. |
| Deutsche Telekom | See comments | We share Samsung’s view. |
| ZTE | Option 1, 3, 4 | We think PCI collision can be detected via existing methods, i.e. option 1 and 4. In addition, after one or more partial migration, the F1-terminating donor may be not aware of the PCIs used by the neighbour cells of the mobile IAB cell, especially when there is no Xn interface between the F1-terminating donor and the target donor. In this case, PCI of IAB-DU cell can be informed to the target donor CU so that target donor CU could detect the potential PCI collision. |
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Summary:

Since we have already agreed in last meeting that, from RAN3 perspective, existing mechanism can be used for PCI collision detection in mobile IAB scenario. And based on the comments above, all enhancements beyond existing mechanism don’t get support by majority companies. And 3/10 companies think this is in scope of RAN2. So, we may not make any conclusion for enhancement mechanisms by now.

In contribution [8], it’s proposed that PCI collision prediction should be considered by RAN3 to avoid impact on UEs. And as summarized by the chairman, we need to discuss whether the PCI collision prediction is in the scope of WI.

***Q3: Do you agree that PCI collision prediction is in the scope of WI?***

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| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | Maybe yes | We guess the prediction is to avoid the real PCI collision and avoid impact to Ues, in this sense, it is in the scope about the interference mitigation. |
| **Ericsson** | **No** | Assuming PCI partitioning is already possible, PCI collision prediction is beyond the WID scope and is more of a hypothetical optimization. |
| Qualcomm | Yes | Why do we discuss this? The WID has an explicit objective on this. |
| Lenovo | Maybe Yes | Both PCI collision prediction and PCI collision detection are the implementation of IAB-donor. We can only fucus on the information for IAB-donor-CU to perform detection/prediction. |
| Nokia | No | Please clarify the specific RAN3 issues not addressed by existing mechanism, e.g. PCI info exchanged over Xn, OAM, PCI partition, etc. |
| Xiaomi | Maybe yes | Depends on how to understand the prediction, in our understanding, the prediction is that known some info in advance to avoid potential collision, e.g. if the IAB-donor know the route of the mobile IAB-node in advance, it can take it into account when reconfigure the PCI to avoid potential PCI collision in the near future. |
| Fujitsu | Not sure | The scenario and possible solutions should be further clarified. |
| Samsung | Yes | The objective of WI is list as below:  “Mitigation of interference due to IAB-node mobility, including the avoidance of potential reference and control signal collisions (e.g. PCI, RACH). [RAN3, RAN2]”  In our understanding, there are 2 ways for avoidance of PCI collision: one is that PCI collision already happens and is detected, OAM or source donor CU can reconfigure PCI for mobile IAB node; the other is that PCI collision is predicted before PCI collision actually happens，OAM or source donor CU can reconfigure PCI for mobile IAB node in advance. No restrictions on methods for avoidance of PCI collision in WI, and PCI collision prediction should not be precluded. |
| Deutsche Telekom | Maybe | We see prediction as a possible optimization step, but it has to be differentiated according to the deployment scenario. If a vehicle in public transport is always running along a fixed track, potential collisions with fixed NW nodes can be evaluated in advance and conflict resolutions can be set by OAM. But for other vehicles with more random movements or also for PCI collisions between mobile IAB nodes on known tracks, this would require a more dynamic handling. |
| ZTE | Yes | In our understanding PCI collision prediction is to detect the potential PCI collision in advance before the PCI collision occurs so that PCI collision could be avoided. And this is certainly in the scope of the R18 IAB WI. |
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Summary:

Majority companies (7/10) tend to agree that the PCI collision prediction can be used for avoidance of potential PCI collision. Moderator thinks that both PCI collision prediction and PCI collision detection are the implementation of IAB-donor based on the existing information (or any enhancement information agreed in future) for PCI collision detection, and it’s in the scope of interference mitigation defined in the WID. So, we may propose:

**Proposal 2: PCI collision prediction is in the scope of WI.**

## PCI space partitioning

As agreed in last meeting, PCI space partitioning via OAM configuration can be used in some cases for avoidance of PCI collisions. And as summarized by the chairman, we need to further check that should the PCI space partitioning be controlled by OAM.

***Q4: Do you agree that the PCI Space Partitioning is controlled by OAM?***

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| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | See comment | The PCI partition can be OAM based, but up to operator’s implementation. |
| **Ericsson** | Can be | Similar view as Huawei. |
| Qualcomm | See comment | Static PCI partitioning can be OAM-based. What we need to discuss is whether and how dynamic PCI change is performed. |
| Lenovo | Yes | Up to operator’s implementation. And dynamic PCI change is discussed in Q5. |
| Nokia | Yes | This is up to configuration/implementation. |
| Xiaomi | Yes |  |
| Fujitsu | Yes |  |
| Samsung | Yes |  |
| Deutsche Telekom | Yes | Controlled by OAM based on operator’s settings/demands. |
| ZTE | Yes |  |
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Summary:

All companies share the view that PCI Space Partitioning is controlled by OAM, and it’s up to the operator’s implementation.

**Proposal 3: PCI Space Partitioning is performed by OAM and up to implementation.**

## PCI reconfiguration

All companies share the same view that PCI space partitioning can be only used to prevent PCI conflicts between stationary nodes and mobile IAB-nodes or in case of mobile IAB-node with predictable trajectory.

In case of potential PCI collision is detected, majority companies [2] [3] [4] [6] [9] [10] think F1-terminating IAB-donor can dynamically reconfigure the PCI to the mobile IAB-node to avoid the PCI collision. And [7] and [9] think mobile IAB-node can select a new PCI in a pre-configured candidate PCI list to avoid the PCI collision. In [2] and [10], they propose to use network-controlled PCI change on the mobile IAB-DU (or named as smooth PCI change) to reduce the service interruption for the served Ues, where a new (logical) PCI is activated in the (second logical IAB-DU of) mobile IAB-node and all Ues can be handed over to the new (logical) PCI if potential PCI collision is detected by the IAB-donor in source PCI, and it can reuse a subset of the inter-donor IAB-DU migration procedure. In addition, [4] proposes a PCI collision detection procedure in HO preparation and target IAB-donor can re-assign a new PCI in the RRCReconfiguration message. And in [8], they think frequent PCI re-assignment introduce more signaling overhead, and some enhancements to the existing mechanisms should be proposed. While [1] assumes that PCI conflict between two mobile IAB-nodes will be short-lived and suggests waiting for RAN2 progress on PCI conflict resolution.

***Q5-1: Do you agree that, as baseline, F1-terminating IAB-donor reconfigures PCI for the cell of mobile IAB-DU via existing F1AP message to avoid PCI collisions?***

***Q5-2: Please share your view and preference on the following enhancement options for PCI collision avoidance. For each option selected, PLEASE further provide potential specification impacts.***

* ***Opt.1: mobile IAB-node changes the PCI in a pre-configured candidate PCI list [7][9]***
* ***Opt.2: network-controlled PCI change on the mobile IAB-DU (smooth PCI change) [2][10]***
* ***Opt.3: target IAB-donor reconfigure the PCI in the RRCReconfiguration message [4]***
* ***Opt.4: some other enhancements [8]***
* ***Opt.5: wait for RAN2 [1]***

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| Company | Yes/No | Comment |
| Huawei | Q5-1): Yes  Q5-2): option 1 | For Q5-1: the IAB-DU can activate cells with new PCI if configured by the F1-terminating CU, and to avoid RLF for Ues, the Ues can perform intra-DU/inter-DU(if IAB has two logical Dus) HO from cell identified by old PCI to the cell identified by new PCI.  For Q5-2: the specification impact of option 1 will be: the condition of applying new PCI among the pre-configured PCI lists for the mobile IAB-node needs to be specified. |
| **Ericsson** | **Q5-1: Yes**  **Q5-2: Opt.5** | We should not assume anything until RAN2 concludes or at least makes initial conclusions on the issue. |
| Qualcomm | Q5-1: Not sure  Q5-2: Opt 2. This works differently than summarized here! | On Q5-1: Legacy F1AP-based PCI reconfiguration leads to RLF for all Ues connected. It can be used if there are no Ues connected. However, this is not a good baseline.  On Q5-2: We need to decide on HOW the PCI can be changed WIHOUT causing RLF for connected Ues. To our understanding, this is only provided by Opt 2.  Opt. 2 as described in [2] allows PCI change without UE RLF by reusing aspects of DU migration. We propose:  **Proposal: PCI-change on the IAB-node to be supported via handover of connected Ues between logical cells using old and new PCI, respectively.** |
| Lenovo | Q5-1: Yes  Q5-2: See comments | For Q5-1, it’s already supported by the existing signaling in F1AP.  For Q5-2, all options can be considered as the optimization for PCI reconfiguration.  Opt.1 can be considered only when IAB-node can perform PCI collision detection. For opt.2, it’s just the implementation of IAB-donor and all the procedure can be realized by the existing handover procedure. And for opt.3, source IAB-donor may detect the potential PCI collision based on the measurement report in case of handover, there may no need to perform PCI collision detection and reconfiguration during HO preparation phase. |
| Nokia | Q5-1: yes  Q5-2: opt. 5 | Agree with QC proposal (copied as below)  **Proposal: PCI-change on the IAB-node to be supported via handover of connected Ues between logical cells using old and new PCI, respectively.** |
| Xiaomi | Q5-1): Yes  Q5-2): option 1 and option 2 | Option 1 can be one possible solution, i.e. PCI is reconfigured by IAB-node according to some assistance info, but we’re also open to discuss the possibility that IAB-donor reconfigure the PCI value according to the detection result if Q1-1 is agreed.  Option 2 can also be further considered if the PCI is decided to be changed. |
| Fujitsu | Q5-1: Yes  Q5-2: Opt.2 is possible, but | We believe F1-terminating IAB-donor reconfiguring PCI for the cell of mobile IAB-DU should be the baseline.  Opt.1 requires the mobile IAB-node detecting PCI collision and changing the PCI configured by itself just like gNB. We are not sure the feasibility and whether it’s necessary to introduce that complexity to the mobile IAB-node.  For smooth PCI change in Opt.2, we understand the motivation and possibility, while the feasible is a little questionable. In order to achieve the smooth handover of UE, the frequency used by the second logical DU should be different with that of the first logical DU. We must make sure the frequency used by the second logical DU is permitted by operator.  Opt.3 is RAN2 scope. |
| Samsung | Q5-1): Yes  Q5-2): option 5 | Same view with Ericsson |
| Deutsche Telekom | Q5-1): Yes  Q5-2): opt. 5 |  |
| ZTE | Q5-1): Yes  Q5-2): option 3 | After one or more partial migration, there may be no Xn interface between the F1-terminating donor and the target donor. And the measurement reported by UEs will be sent to the target donor rather than the F1-terminating donor. In this situation, the F1-terminating donor may be not aware of the PCIs used by the neighbour cells of the mobile IAB cell. In this case, PCI of IAB-DU cell can be informed to the target donor CU so that target donor CU could detect the potential PCI collision and reconfigure the PCI for mIAB-DU cell in the RRCReconfiguration message. |
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Summary:

For Q5-1, all companies agree to use the existing F1AP message to reconfigure the PCI of mobile IAB-node, while one companies has the concern that PCI reconfiguration will lead to RLF for all UEs connected. Moderator thinks we can use it as the baseline and further consider other enhancements.

**Proposal 4-1: As baseline, F1-terminating IAB-donor reconfigures PCI for the cell of mobile IAB-DU via existing F1AP message to avoid PCI collisions.**

And for Q-2, based on the comments from Q7 and Q7b, all companies (8/8) agree that UE handover between two logical cells with different PCI as applied during the DU migration procedure can also be used to change the IAB-node’s PCI. And this solution can avoid the RLF for the served UEs. Then, we may agree with the proposal suggested by Qualcomm.

**Proposal 4-2: PCI-change on the IAB-node to be supported via handover of connected UEs between logical cells using old and new PCI, respectively.**

As for other enhancement options (e.g., opt.1 and opt.2), they don’t get strongly support from majority companies.

As for the dynamic PCI reconfiguration, in contribution [9], it’s proposed that following enhancements are needed in case of the IAB-donor and IAB-node with different OAMs.

* For centralized PCI assignment, IAB-donor CU detects PCI conflict of NR cells, IAB-donor should notify the IAB-node, and then the IAB-node that have connection with OAM can reports the PCI conflict to OAM. After that, the OAM can reassign new PCI for the cells in the IAB-node to avoid PCI conflict.
* For distributed PCI assignment, OAM assigns a list of PCIs for the cells and send the configured PCI list to the IAB-node, if the IAB-donor detects PCI conflict, either IAB-donor or IAB-node can be responsible for selecting a new PCI value from the preconfigured PCI list.

***Q6: Do you agree following enhancements for PCI reconfiguration in case IAB-donor and IAB-node with different OAMs.***

* ***E1: For centralized PCI assignment, IAB-donor CU detects PCI conflict of NR cells and notify the collision to the IAB-node***
* ***E2: For distributed PCI assignment, if the IAB-donor detects PCI conflict, either IAB-donor or IAB-node can be responsible for selecting a new PCI value from the preconfigured PCI list***

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| Company | Yes/No | Comment |
| Huawei | Prefer Variation of E2 | The mobile IAB-node detects the PCI collision, and select one from the pre-configured PCI lists. This is also distributed PCI assignment. |
| **Ericsson** | **Discuss later** | We should discuss this after we conclude on the basic case, i.e., same OAMs. |
| Qualcomm | See comments | We do not agree on the above description of centralized and distributed PCI assignment.  **For any dynamic PCI change/reconfiguration scheme, OAM is out of the picture since it would not provide inter-vendor interoperability (i.e., network nodes have different OAMs that do not communicate with each other).**  Further, it is the CU that needs to determine the new PCI value since it is the one that knows which other PCIs are used in the neighborhood. The mobile IAB-node has no clue about this. The OAM of one vendor does not know the PCIs configured by OAMs of other vendors. |
| Lenovo | E1: Yes  E2: See comments | For E2, it’s the IAB-donor to detect the PCI collision and perform PCI reconfiguration. If IAB-donor and IAB-node with different OAMs, IAB-node will report the PCI list to the IAB-donor. Once the IAB-donor detects the collision, it selects a new PCI value from the PCI list. |
| Nokia | No | Why is this an issue? Normal gNB-DU and gNB-CU can use different OAM.  Again, please clarify the specific RAN3 issues not addressed by current standard. |
| Xiaomi | E1 and E2 with rewording | It is possible that IAB-node and IAB-donor have different OAMs, but we can discuss this later.  To make the discussion clearer, we prefer to discuss which entity is responsible for assigning new PCI value in centralized PCI assignment and distributed PCI assignment, and then consider the case of different OAMs.  According to current PCI Optimisation Function, OAM of the IAB-node is responsible for assigning new PCI value in case of centralized PCI assignment, and IAB-donor-CU is responsible for assigning new PCI value in case of distributed PCI assignment.  Thus, we suggest to rewording the proposals as follows:  **E1, for centralized PCI assignment, OAM of the IAB-node is responsible for assigning new PCI value.**  **E2, for distributed PCI assignment, IAB-donor-CU is responsible for assigning new PCI value.** |
| Fujitsu | No | E1: We believe the PCI should be reconfigured by the IAB-donor CU rather than the OAM.  E2: After the IAB-donor detects the PCI collision, the IAB-donor CU rather than the mobile IAB-node should be responsible for selecting a new PCI from a preconfigured PCI list. |
| Samsung | E2: See comments | We prefer distributed PCI assignment, but IAB-donor should be responsible for selecting a new PCI value, not mobile IAB node. |
| Deutsche Telekom | Discuss later | Similar to E///, we also prefer to initially focus on the case of having a single OAM.  And from operator’s perspective, there is always the request that OAM systems from different vendors has to be coupled if equipment is deployed in same area (e.g. via an operator-owned tool). |
| ZTE | No | The issue is not specific to mobile IAB scenario. In CU-DU split architecture, the DU and CU may connect to different OAMs currently. We believe this issue could be resolved by existing mechanism. |
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Summary:

Based on the operator’s inputs, OAM systems from different vendors has to be coupled if equipment is deployed in same area. In addition, some companies (3/10) think we can firstly focus on the scenario with the same OAM. And companies have convergence the entity to perform PCI collision detection and PCI change, which are already covered by the issues above. So, moderator suggest that we can first study the mechanism with the same OAM and discuss the scenario with different OAM later.

**Proposal 5: FFS for the PCI reconfiguration in case of IAB-donor and IAB-node with different OAMs.**

For the UE impacts when PCI changes on the serving cell of the mobile IAB-node, [1] propose that RAN3 shall send an LS asking RAN1 about the possible UE impacts. And in [2], PCI reconfiguration will lead to RLF for all Ues connected. As instructed by the chairman, we need to discuss the following issue in this CB.

* **Is there a need to check with RAN1 on UE impacts of PCI changes during mIAB operations? Or can such impacts be evaluated and described, e.g. RLF?**

***Q7: What UE impacts do you see in case PCI changes during mIAB operations? Please share your view on the following options.***

* ***Opt.1: check with RAN1 on the UE impacts***
* ***Opt.2: agree that all connected Ues suffer RLF once PCI changes on the serving cell of the mobile IAB-node***
* ***Opt.3: any other UE impacts***

|  |  |  |
| --- | --- | --- |
| Company | Option(s) | Comment |
| Huawei | See comments | Even without mobile IAB, the PCI of normal gNB-DU may be changed also, e.g. in SON topic for PCI optimization. So, the impact to UE served by mobile IAB-node when PCI changes is same as the PCI changes for a normal gNB-DU.  On the other hand, as we answered in Q5, there is some way to avoid UE RLF due to the PCI change, e.g. the IAB-DU can activate cell with new PCI if configured by the F1-terminating CU, and Ues perform intra-DU/inter-DU(if IAB has two logical Dus) HO from cell identified by old PCI to the cell identified by new PCI.  Based on the above analysis, we do not see the necessary to send the LS to RAN1. |
| **Ericsson** | **Opt.1** | It is not up to RAN3 to conclude how Ues are impacted by intermittent PCI collisions and in case of frequent changes of PCI. It is RAN1 that should evaluate the impact.  We cannot always assume that it will be possible to apply the migration-based approach to avoiding UE RLF due to PCI change. |
| Qualcomm | See comments | UE RLF needs to be avoided. This is a procedural problem and it is in RAN3 realm. It is easy to solve since we already solve exactly the same problem for DU migration.  [2] describes how it works. Here is the proposal:  **Proposal: PCI-change on the IAB-node to be supported via handover of connected Ues between logical cells using old and new PCI, respectively.** |
| Lenovo | Opt.2 | From RAN3 point of view, we can consider all connected Ues suffer RLF once PCI changes.  PCI reconfiguration via legacy F1AP can be the baseline to avoid PCI collision. And PCI reconfiguration is not a specific issue for mobile IAB-node, so there is no need to send the LS to RAN1 to check the UE impacts on PCI change.  While for the solution to avoid UE RLF, it’s just an optimization for PCI reconfiguration. |
| Nokia | See comments | PCI change can use the HO between the Dus. What are the other UE impacts? BTW, the UE part should be discussed in RAN1/2. |
| Xiaomi | See comments | This issue is not new, it happens for normal PCI change, and also happens in NTN, according to the history discussion, we believe HO of all the Ues is not the only way to solve the issue (since it will also face issues of group mobility), other options can also be considered. |
| Fujitsu | See comments | Case 1: When the PCI change is performed through the method of Option 2 in Q6, i.e., PCI is changed with changing frequency, the Ues can be handed over smoothly and will not suffer from RLF.  Case 2: **The PCI is changed without changing frequency, Ues may suffer from RLF.**  That is because all the HO commands for Ues should be delivered before the PCI is changed but the HO completion can only be successful after the PCI is changed. That will introduce a service interruption or even RLF in UE. We believe that is a RAN2 issue. The impact and the solution should be studied by RAN2. |
| Samsung | See comments | Same view with Xiaomi. |
| Deutsche Telekom | See comments | We share Huawei’s view. |
| ZTE | See comments | It depends on how to implement the PCI change. And UE RLF should be avoided anyway. |
|  |  |  |

In the inter-donor IAB-DU migration procedure, the UE hands over between two logical cells with different PCI, and without causing RLF.

**Q7b: Do you agree that UE handover between two logical cells with different PCI as applied during the DU migration procedure can also be used to change the IAB-node’s PCI?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Qualcomm | Yes | This is a trivial solution, and we will support it anyway for DU migration. |
| Lenovo |  | This is an optimization for PCI reconfiguration. And this can be implemented by the IAB-donor. |
| Nokia | Yes |  |
| Xiaomi | Yes | It can be used but still have problems of group mobility, other ways can also be further considered. |
| Fujitsu | Yes, but | As the answer to previous Q7, it can be used but may cause RLF in UE if the PCI is changed without changing frequency. |
| Samsung | Yes |  |
| Deutsche Telekom | Yes |  |
| ZTE | Yes |  |
|  |  |  |

Summary:

Q7 and Q7b can be reflected in potential proposal 4-2.

## RACH collision avoidance

In contribution [9], it’s proposed that the enhancement for PCI conflict can also be used for RACH resource configuration conflict. However, as agreed in last meeting, no enhancements are needed for RACH collision avoidance unless requested by other WGs from RAN3 perspective. And in contribution [2], they think RAN3, as the leading WG, should liaise RAN1 and RAN2 on its decision that no enhancements are needed for RACH configuration collision avoidance unless requested by other WGs.

***Q8: Do you agree that RAN3 should send an LS to RAN1 and RAN2 for agreements on RACH configuration collision avoidance?***

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | No | We do not see the necessary to send the LS because there is no issue identified by RAN3. |
| **Ericsson** | **No** | Neither an action is required from other WGs nor do they expect our input on this matter. |
| Qualcomm | Yes | RAN3 is the leading WG. We should liaise RAN1 on this matter and ask them if they see any issue. Note that RAN1 does not have Tus allocated to mobile IAB, so they would not do anything without being asked. |
| Lenovo | No | Agree with Huawei and Ericsson. |
| Nokia | No | Agree with HW/Eri |
| Xiaomi | See comments | Don’t see the need to send the LS.  But at least we RAN3 should have the same understanding on the RACH collision. In our understanding, there’re two kinds of RACH collision:   * **Case 1, RACH collision happens during group UE mobility** * **Case 2, RACH resource configuration collision during IAB-node mobility**   For case1, we discussed in the last meeting, RACH-less can be potential solution and it’s in RAN2 scope. But we hadn’t discussed case 2, and in our view, case2 faces the same issue as PCI collision, as we know that, the legacy PCI planning and RACH planning are based on the fact the cells are static, but in mobile IAB, the cells are moving, RACH resource configuration collision should also be considered and discussed in RAN3, just the same as PCI collision. |
| Fujitsu | Yes, need a LS to RAN1 | Need an LS to RAN1 asking whether there is impact to Ues if RACH is collided between the mobile IAB cell and the surrounding cells. RAN1 should confirm there is issue, otherwise RAN3/RAN2 will not study the solutions. |
| Samsung | No |  |
| Deutsche Telekom | No |  |
| ZTE | No | No LS is needed currently since no specific issue has been identified so far. |
|  |  |  |

Summary:

Based on the comments from majority companies (8/10), there is no need to send LS to RAN1 now since RAN3 has not identified any specific issue.

# Discussion – 2nd Round

[TBD]

# References

|  |  |  |
| --- | --- | --- |
| [1] | [R3-225348](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225348.zip) | PCI Collision Avoidance for Mobile IAB-Nodes (Ericsson) |
| [2] | [R3-225361](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225361.zip) | PCI collision avoidance for mobile IAB (Qualcomm Inc.) |
| [3] | [R3-225437](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225437.zip) | Avoidance of resource collisions due to IAB-node mobility (Fujitsu) |
| [4] | [R3-225442](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225442.zip) | Discussion on enhancement for PCI collision avoidance for mobile IAB (ZTE) |
| [5] | [R3-225456](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225456.zip) | Mobile IAB interference mitigation (Nokia, Nokia Shanghai Bell) |
| [6] | [R3-225492](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225492.zip) | Interference mitigation of mobile IAB-node mobility (Lenovo) |
| [7] | [R3-225684](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225684.zip) | Discussion on the PCI collision and TAC/RANAC issue for mobile IAB (Huawei) |
| [8] | [R3-225717](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225717.zip) | Discussion on mitigation of interference (Samsung) |
| [9] | [R3-225754](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225754.zip) | Discussion on mitigation of interference (Xiaomi) |
| [10] | [R3-225549](file:///D:\会议硬盘\TSGR3_117bis-e\Docs\R3-225549.zip) | PCI Collision Avoidance with Mobile IAB (CANON Research Centre France) |