**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%3A%5CUsers%5Czhuoyb1%5CAppData%5CLocal%5CTemp%5C7zO496BE4EB%5CInbox%5CR3-225939.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

# 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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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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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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## 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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## 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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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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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***

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## 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?***

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# Discussion – 2nd Round

[TBD]

# References

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| [1] | [R3-225348](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225348.zip) | PCI Collision Avoidance for Mobile IAB-Nodes (Ericsson) |
| [2] | [R3-225361](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225361.zip) | PCI collision avoidance for mobile IAB (Qualcomm Inc.) |
| [3] | [R3-225437](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225437.zip) | Avoidance of resource collisions due to IAB-node mobility (Fujitsu) |
| [4] | [R3-225442](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225442.zip) | Discussion on enhancement for PCI collision avoidance for mobile IAB (ZTE) |
| [5] | [R3-225456](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225456.zip) | Mobile IAB interference mitigation (Nokia, Nokia Shanghai Bell) |
| [6] | [R3-225492](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225492.zip) | Interference mitigation of mobile IAB-node mobility (Lenovo) |
| [7] | [R3-225684](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225684.zip) | Discussion on the PCI collision and TAC/RANAC issue for mobile IAB (Huawei) |
| [8] | [R3-225717](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225717.zip) | Discussion on mitigation of interference (Samsung) |
| [9] | [R3-225754](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225754.zip) | Discussion on mitigation of interference (Xiaomi) |
| [10] | [R3-225549](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_117bis-e%5CDocs%5CR3-225549.zip) | PCI Collision Avoidance with Mobile IAB (CANON Research Centre France) |