3GPP TSG-RAN WG3 Meeting #111-e R3-210994

E-meeting, 25 January – 4 February, 2021

**Agenda item: 10.2.1.7**

**Source: Nokia (moderator)**

**Title: CB: # 1006\_SONMDT\_RACH - Summary of email discussion**

**Document for: Approval**

# 1 Introduction

This paper provides summary of discussions at RAN#111-e on:

**CB: # 1006\_SONMDT\_RACH**

**- SN indicates the availability of RACH report of a set of UEs?**

**- Xn: Access and Mobility Indication is enhanced to deliver RACH reports for specific UEs identified by SN?**

**- RACH failure rate in Xn**

**- “NR Cell PRACH Configuration” IE is added to “NR Neighbour Information” for TS 36.423 with information about the location and bandwidth of carriers, the TDD pattern and the number of SSB?**

**- Assistance information from gNB-CU for conflict resolution?**

**- F1 signaling indication about conflicting cells?**

**- DU indicates to the CU the occurrence of RACH for cases when the RACH procedure is not known to the gNB-CU?**

**- Neighbor PRACH Configuration in F1 SETUP RESPONSE?**

**- Maximum 512 neighbor PRACH Configurations sent from gNB-CU to gNB-DU?**

**- Trigger from gNB-DU to gNB-CU for retrieval of a UE RACH Report?**

**- RACH failure rate in F1**

**- May also discuss other issues based on papers submitted**

**- Try to reach high-level agreements in the first phase, proceed to TPs in the second phase of the email discussion**

(Nok - moderator)

Where possible we have kept the discussion structure and identified issues from previous meetings and tried to map the submitted proposals to this structure. Note that, Issue 1 on “PRACH Coordination in Shared Spectrum between LTE and NR” is not anymore in the scope of this WI. Note also, that a new aspect is brought up during this meeting, namely MR-DC aspects in RACH Optimization.

**Companies are kindly requested to provide input to the first stage of this discussion by** **8:00 UTC on Friday, January 29, so that we can take it into account during the online session the same day.**

# 2 For the Chairman’s Notes

[To be completed]

# 3 Discussion

## 3.1 Phase 1: High-Level Agreements

### 3.1.1 MR-DC aspects in RACH Optimization

**Related proposals in submitted papers:**

0678 discusses RACH access in MR-DC scenario. A RACH Report logged by a UE will contain RACH procedures over both MN and SN but the MN is not aware of the RACH procedures that took place at SN. A mechanism is proposed where SN indicates availability of RACH Reports from a set of UEs to make MN aware of RACH procedures that took place at SN.

**Please provide your views on whether SN should indicate the availability of RACH Reports from a set of UEs to MN.**

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| Company | Comment |
| Huawei | We noticed that this may relate to the discussion on UE rach reporting in MR-DC in RAN2 and ran2 does not make the decision yet. Since the RAN2 agreement will impact on RAN3 solution to be chosen, we prefer to wait for RAN2 progress for now. |
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**If SN should indicate the availability of RACH Reports from a set of UEs to MN, please provide your views on whether** **Access and Mobility Indication procedure over Xn should be enhanced with NG-RAN node UE XnAP ID to allow RACH Report delivery from the indicated UEs.**

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| Company | Comment |
| Huawei | Agree, the Access and Mobility Indication procedure could be reused. |
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### 3.1.2 Issues 2 and 3 – PRACH configuration conflict detection: transmission of NR PRACH configuration info for neighbour cells

**Main options submitted to this meeting:**

1. a) "High" number (512, 1024) of configurations sent from CU to DU versus b) "Low" number (e.g. 16) of configurations sent from CU to DU with assistance information from DU to CU.

2. Association of Neighbour PRACH Configuration with serving cell at recipient gNB.

3. Introduction of Neighbour PRACH Configuration in F1 SETUP RESPONSE.

**Related proposals in submitted papers:**

0309 proposes:

* For F1, a flat list of 512 neighbour PRACH configurations to be included in “Cell Information Notification List IE” in the following messages: F1 SETUP RESPONSE, GNB-DU CONFIGURATION UPDATE ACKNOWLEDGE and GNB-CU CONFIGURATION UPDATE. Maximum Length of the Cell Information Notification List is *maxCellingNBDU*. Each PRACH configuration is associated to a cell (NR CGI) to indicate which cell served by the DU is a neighbour to cell whose PRACH Configuration is included in the message. No assistance information from DU to CU.
* For X2: add an optional *NR Cell PRACH Configuration* IE into the *NR Neighbour Information* IE, as well as some necessary IEs to deliver the location and bandwidth of carriers, the TDD pattern and the number of SSB.

0442 proposes to:

* Introduce a high number of, up to 512, PRACH configurations sent from CU to DU.
* Associate neighbour PRACH Configuration with served cell in the DU in GNB-CU CONFIGURATION UPDATE message.

0665 proposes:

* For F1, a flat list of a high number (up to 512) of neighbour PRACH Configurations from CU to DU. CU can limit the neighbour PRACH Configurations it sends to a DU by utilizing RACH Failure Rate information
* To associate Neighbour PRACH Configuration with serving cell at recipient gNB in F1 SETUP RESPONSE, GNB-DU CONFIGURATION UPDATE ACKNOWLEDGE and GNB-CU CONFIGURATION UPDATE. Repetitions of neighbour PRACH Configuration over different cells can be avoided by factoring out the common parts, e.g., those related to frequency and time resource information.

0679 proposes:

* Use F1 SETUP RESPONSE to send a limited set (up to 16) of neighbour PRACH Configurations from CU to DU. To facilitate progress, they could support up to 64 neighbour PRACH Configurations.
* A DU can use dedicated signaling to additionally request PRACH Configuration on conflicting cells. This can be done using GNB-DU CONFIGURATION UPDATE procedure.

**Please provide your further views on whether a high number of** **Neighbour PRACH Configurations should be sent between CU and DU versus a low number of Neighbour PRACH Configurations with assistance information. Should a DU request PRACH Configuration on conflicting cells from its CU?**

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| Company | Comment |
| Huawei | The high number is a maximum value. It does not mean that the CU will always sends the Neighbour PRACH Configurations with the max value. It relies on the CU implementation.We don't see any issue to define a high maximum number 512 here.Since it is very likely that the CU may only send a few number of Neighbour PRACH Configurations even we define a high number for the maximum value, from this point of view, the request from DU seems needed in some cases. |
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**Please provide your further views on whether to associate** **Neighbour PRACH Configuration with serving cell at recipient gNB.**

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| Company | Comment |
| Huawei | Yes. In the message, totally 512 Neighbour PRACH Configurations are delivered. In each Neighbour PRACH Configuration, a list of DU’s serving cells could be attached to manage the message size. |
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**Please provide your further views on whether to introduce Neighbour PRACH Configuration in F1 SETUP RESPONSE.**

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| Company | Comment |
| Huawei | Yes. It may be needed in case that the DU is introduced to an operating network. |
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**Please provide your views if an optional NR Cell PRACH Configuration IE as well as IEs to provide location and bandwidth of carriers, TDD pattern and number of SSBs are needed in NR Neighbour Information IE over X2.**

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| Company | Comment |
| Huawei | Shouldn't this be discussed in TEI 17 as per the agreement of last meeting? |
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### 3.1.3 Issue 4 - PRACH configuration conflict detection - retrieval of UE RACH Reports

Options under discussion have been:

1. DU triggers the CU to retrieve UE RACH Reports from a UE.

2. No trigger from DU is needed -CU is triggered by the UE to retrieve UE RACH Reports.

**Related proposals in submitted papers:**

Option 1:

* 0566 proposes that DU sends indication to CU to trigger retrieval of one or more UE RACH reports by the CU over Uu interface. A list of UE IDs can be provided from DU to CU to retrieve multiple UE Reports without requesting RACH Reports from all UEs.
* 0679 proposes that DU triggers CU to retrieve UE RACH Reports by indicating a RACH occurrence in case the RACH procedure is not known to the CU.

Option 2:

* 0665 proposes that the trigger for RACH Report retrieval by the network should be UE-based (and no trigger is needed from DU to CU).

**Please provide your further views on Option 2 vs Option 1, and in case of Option 1, whether it is needed to always retrieve RACH report from all UEs.**

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| Company | Comment |
| Huawei | If we rely on the UE to trigger the UE RACH report retrieval, the UE may discard the UE RACH report if the list is full of 8 reports. |
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### 3.1.4 Issue 5 - PRACH configuration conflict resolution

The following options further build on "*DU resolves PRACH configuration conflicts locally*" (option 1, agreed at RAN3#110-e):

* Option 2: DU resolves PRACH configuration conflicts locally, but may flag the presence of a conflict to the CU so that CU can send assistance information.
* Option 3: DU resolves PRACH configuration locally whenever possible, and informs about RACH failure rate for mitigation of interference scenarios.

**Related proposals in submitted papers:**

0309 proposes that:

* There is no need for DU/en-gNB to report upon every event of “MSG1 without consecutive MSG3”.

0679 proposes two alternatives:

* In the absence of assistance information from CU to DU, then DU detects and resolves RACH conflicts locally.
* If assistance information from CU to DU is allowed, then CU provides DU a limited and filtered set of assistance information. This information can be sent in F1 Setup Response.

0665 proposes that:

* DU resolves PRACH Configuration conflicts locally whenever possible.
* DU may further receive RACH Failure Rate information from other DUs through Xn and F1 interfaces. RACH Failure Rate is calculated locally at a DU using internal information on RACH successes and the received RACH Reports and helps DU determine whether it is an aggressor to other DUs.

**Please provide your further views on Options 1, 2,3, e.g. the capability of each option to solve PRACH configuration conflicts.**

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| Company | Comment |
| Huawei | Option 2 seems already covered by issue 2 and 3?Regarding the RACH failure rate information. It could be one of the metrics that can be used by the DU to evaluate the RACH performance. In LTE stage, I remember that we studied several other metrics, such as Access Probability, etc. However, which to use by the DU is up to implementation.Another issue of the RACH failure rate is that it’s difficult to determine which cell is the aggressor cell which interferes to the victim cell having a high RACH failure rate. |
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**Please provide your further views on whether you support to introduce a metric beyond a binary flag to determine RACH Configuration Conflicts among DUs.**

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| Company | Comment |
| Huawei | Need further study how it works. |
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## 3.2 Phase 2: TP approval

[TBD]

# 4 Conclusion, Recommendations [if needed]

If needed

# 5 References

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| [R3-210309](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210309.zip) | Discussion on Rel-16 leftover issues for PRACH coordination (CATT) | discussion |
| [R3-210310](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210310.zip) | (TP on SON for 38.473) TP on PRACH coordination for F1AP (CATT) | other |
| [R3-210311](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210311.zip) | (TP on SON for 36.423) TP on PRACH coordination for X2AP (CATT) | other |
| [R3-210442](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210442.zip) | (TP for SON BL CR for TS 38.473): Left overs on RACH Optimization Enhancements (Huawei) | other |
| [R3-210443](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210443.zip) | (TP for SON BL CR for TS 38.401):Stage 2 update for RACH Optimization (Huawei) | other |
| [R3-210566](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210566.zip) | Left issue for Rel-16 RACH Optimization (ZTE) | discussion |
| [R3-210665](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210665.zip) | RACH Optimization Further Discussion (Nokia) | discussion |
| [R3-210666](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210666.zip) | (TP for SON BL CR to TS 38.423) Enhancement of RACH Conflict Resolution (Nokia) | other |
| [R3-210667](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210667.zip) | (TP for SON BL CR to TS 38.473) Enhancement of RACH Conflict Resolution (Nokia) | other |
| [R3-210678](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210678.zip) | (TP for SON BL CR for TS 38.423): On delivering SN related RACH reports to the SN (Ericsson) | other |
| [R3-210679](http://ftp.3gpp.org/tsg_ran/WG3_Iu/TSGR3_111-e/Docs/R3-210679.zip) | (TP for SON BL CR for TS 38.473): RACH conflict resolution and RACH report availability indication over F1 interface (Ericsson) | other |