**3GPP T****SG-RAN WG3 Meeting #117bis-e R3-225909**

**Online, 10th – 18th October 2022**

Agenda Item: 10.2.3

Source: CMCC (Moderator)

Title: Summary of offline discussion on RACH optimization

Document for: Discussion and Decision

# Introduction

**CB: # SONMDT3\_RACH**

**- RAN2 to discuss RACH partitioning?**

**- RACH report retrieval, UE/or NW based solution?**

**- RACH report in MR-DC, reply LS to RAN2?**

**- Capture agreements and open issues**

(CMCC - moderator)

Summary of offline disc [R3-225909](Inbox\R3-225909.zip)

The discussion will be organized to two phases,

**Phase I: Discuss and try to achieve agreements**

**Phase II: Work on reply LS and potential TPs**

The deadline for the phase I discussion is Thursday 13th Oct. UTC 10:00

The deadline for the phase 2 discussion is Monday 17th Oct. UTC 08:00

# For the Chairman’s Notes

**To be added**

# Discussion

3.1 RACH partitioning

Based on the reference papers, there are two types of RACH optimization for RACH partitioning, one is RACH report enhancement and the other is network interface enhancement.

**RACH report enhancement**

The contents of RACH report from UE are basically decided by RAN2. RAN2 has agreed to discuss RACH partitioning for RACH report enhancement. So some companies propose RAN3 could let RAN2 to discuss the RACH report content first. However, some companies still think RAN3 can discuss the information that should be carried in the RACH report and ask RAN2 to evaluate these information.

It would be better to have a common understanding on the work split first.

**Q1: Which group do you think should discuss the RACH report contents first for RACH partitioning, RAN3 or RAN2?**

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| **Company** | **RAN3 or RAN2 or both?** | **Comments** |
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Some companies provided detailed information to be included in the RACH report, including [5][6]

1. Feature priorities configured by network, which is the determining factor for selection of RACH partition for feature combination;
2. RA resources configured with feature indicator(s), which is the pool of RACH resources for RACH feature of feature combination;
3. a feature or feature combination triggering/initiating the random access procedure, which is the feature/feature combination UE intends to initiate;
4. a feature or feature combination applicable to the RACH procedure initiated with selected RA resource, which is the feature/feature combination UE finally successfully initiates;
5. Configuration info per RA attempt or the time from RA attempt to reporting
6. The actual information per RA attempt, such as SSB RSRP and MSG3 RSRP

**Q2: If we decide RAN3 to discuss the RACH report content first, which information of the above do you think should be included in the RACH report for RACH partitioning optimization?**

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| **Company** | **Views** | **Comments** |
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**Network interface enhancement**

The following two proposals for F1/Xn interface has been raised,

**P1: Exchange the additional RACH configurations (feature and feature combination specific RACH configurations) over Xn and F1 [2]**

P2: The gNB-DU shall be able to indicate to the gNB-CU [3]:

* either the result of local actions for PRACH conflict avoidance and resource optimisation,
* or the need of more neighbors’ PRACH reconfigurations to resolve a persistent PRACH conflict.

**Q3: Do you support the above proposals on network interface enhancement?**

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| **Company** | **Yes or No for P1 and P2？** | **Comments** |
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3.2 RACH report retrieval

In the current spec, there is no RA report availability indication over Uu and gNB-CU retrieves the RA report only based on its implementation. There are also some RACH causes e.g., beam failure recovery failure, no UL synchronization which are not aware of the gNB-CU. Hence gNB-CU might fail to retrieve the RA report in time. This issue was discussed in Rel-16/Rel-17 for a long time and was de-prioritized to Rel-18.

Basically, there are two candidate solutions to resolve the issue [2][4][5][7][8][9]

1. **Solution 1: UE based solution.**

UE indicates a RACH report availability indication to the network

1. **Solution 2: Network based solution**

gNB-DU indicates to gNB-CU about the availability of RACH reports when the occurrence of the RACH procedure is not known to the gNB-CU

Based on the reference papers, it seems there is still no consensus on which solution to select. It is beneficial to collect views on the pros and cons of each solution

**Q4: Which solution do you prefer and indicate the reasons?**

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| **Company** | **Solution 1 or 2 or both?** | **Reasons** |
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Another issue was brought up at this and last meeting that RA Report collected for the SN cells are not visible by the MN. Hence MN may not fetch the RACH reports pertinent to the SN unless it is notified of their existence and hence some Xn enhancements are needed for timely RA report retrieval of SN RA Reports.

**It is proposed in [2][3] that SN indicates the availability of RA reports to the MN, MN can fetch the RA report and transfer it to SN.**

**Q5: Do you agree with the above proposal?**

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| **Company** | **Yes or no?** | **Comments** |
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3.3 SN RACH report in MR-DC

RAN2 status in Rel-17

For SN RACH report in MR-DC, it is agreed in Rel-17 that UE reports the SN RACH report to the MN, and then MN sends the SN RACH report to SN. However, due to the time limitation, only NR-DC scenario is supported in RAN2.

RAN3 status in Rel-17

In Rel-17, based on RAN2 agreements, RAN3 worked on network interface signaling to support the RACH report for SN, i.e., introducing a new X2/Xn AP message i.e. ACCESS AND MOBILITY INDICATION to transfer the RACH Report from MN to SN.

However, regarding whether RAN3 has supported all the scenarios, i.e., EN-DC, (NG)EN-DC, NE-DC and NR-DC, companies still has different views. At least two companies point out that the RACH Report container over Xn interface in the current TS 38.423 contains only the RACH report in NR format [8][9], so they think NE-DC scenario is still not supported.

In RAN2#119-e, RAN2 discussed Rel-18 scope for SN RACH report enhancements and agreed to focus only on leftover issues for completing the work done in RAN3 in Rel-17 for the SN RACH reporting.

To reply to RAN2, it is firstly to have common understanding on the work that has been done in RAN3 in Rel-17 and then to identify the left issues that may impact RAN2 specification.

**Q6: Whether RAN3 has finished the work on network signaling in Rel-17 to forward the SN RACH report from MN to SN for all the MR-DC scenarios, i.e., EN-DC, (NG)EN-DC, NE-DC and NR-DC scenarios?**

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| **Company** | **Yes or No?** | **Comments** |
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**Q7: Do you agree to support SN RACH report for EN-DC, (NG)EN-DC and NE-DC scenarios as well in Rel-18?**

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| **Company** | **Yes or No?** | **Comments** |
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**It is proposed in [2][5][9] that UE should report the PScell identity outside the RACH report to help the network forward the report to the correct node. This could avoid MN to interpret the RA report from another RAT. Ask RAN2 to provide support in the reply LS.**

**Q8: Do you agree with the above proposal?**

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| **Company** | **Yes or No?** | **Comments** |
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3.4 Other cases for RACH report optimization

It is proposed in [6] and [9] to consider RACH optimization for SDT in Rel-18.

Rel-17 has specified SDT mechanism to allow UE to transmit small data during 2-step/4-step RACH or configuration grant procedure. But whether and how the UE could send small data through RACH procedure follows the configuration from the gNB, e.g., RSRP threshold, data volume threshold to select SDT or non-SDT and time/frequency resources. All these configurations are different from normal RACH procedure. Improper configuration may deteriorate the performance of SDT. So SON optimization could be utilized to improve the performance of SDT.

**Q9: Do you support RACH optimization for SDT in Rel-18?**

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| **Company** | **Views** |
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# Conclusion, Recommendations

# Reference

1. R3-225312, LS on SN RACH report status in R17 (RAN2) LS in
2. R3-225407, RACH optimization enhancements (Qualcomm Incorporated)
3. R3-225552, RACH Optimization enhancement (Ericsson)
4. R3-225592, On RACH Report retrieval (Nokia, Nokia Shanghai Bell)
5. R3-225642, (TPs to TS 38.473 and TS 38.423 BL CRs): Discussion on RACH optimisation (Huawei)
6. R3-225698, Discussion on SON for RACH (Samsung)
7. R3-225775, RACH report optimization (Intel Corporation)
8. R3-225791, Discussion on RACH enhancement (CATT)
9. R3-225807, SONMDT enhancement for RACH report (CMCC)
10. R3-225809, draft reply LS on SN RACH report status in Rel-17 (CMCC) LS out To: RAN2
11. R3-225867, Discussion on RACH report (ZTE)
12. R3-225508, Reply LS on SN RACH report status in R17 (Ericsson) LS out To: RAN2