**3GPP TSG RAN2 #120 R2-22xxxxx**

**Toulouse, France, 14th – 18th November, 2022**

**Agenda Item:**  **8.13.6 RACH enhancement**

**Source: Huawei (email rapporteur)**

**Title:** **Report of [Post119bis-e][877][R18 SON/MDT] RACH enhancement (Huawei)**

**Document for: Discussion and Decision**

# 1 Introduction

This is the email report of [Post119bis-e][877]:

* [Post119bis-e][877][R18 SON/MDT] RACH enhancement (Huawei)

 Focus on P2/7/8 in R2-2210793. Discussion can be used to collect companies’ opinions on these topics.

 Intended outcome: Report

 Deadline: Nov 3rd

Companies providing input to this email discussion are requested to leave contact information below.

|  |  |  |
| --- | --- | --- |
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# 2 Discussion

## 2.1 Enhancements of the RA report based on some features

In the previous report [16], P2 was made.

|  |
| --- |
| **Summary proposal 2: RAN2 discuss enhancement of the RA report based on the specific features such as Msg3 repetition, SDT operation, Slicing, Redcap, SCG Activation/Deactivation.** |

It can be seen that 5 features are mentioned in the above proposal, and they are from some contributions at RAN2#119b-e meeting. So it is proposed to check these features one by one.

### 2.1.1 Msg3 repetition

At RAN2#119b-e meeting, some proposals are related to Msg3 repetition, and here is a summary:

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| --- | --- |
| **Tdoc** | **Proposals** |
| [12], ZTE | Proposal 5: UE includes indication to indicate whether RSRP of selected beam is above rsrp-ThresholdMsg3 or not per RA attempt.Proposal 6: Include Msg3 repetition number configured and applied for the RA procedure.  |
| [8], NEC | Proposal 3: RAN2 also considers to store and report RA related information with regarding the following RACH enhancement in Rel-17 Msg3 repetition |
| [5], Samsung | Proposal 3: Include RACH information related to features involving RA partitioning (SDT, slicing, msg3 repetition and Redcap) in RACH report. |

It can be seen that the contribution [12] provided some specific proposals, so it is suggested to discuss them.

**Q1: Do companies agree with P5 and P6 in [12]? Please provide your comments in the comment column if any.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No  | rsrp-ThresholdMsg3 has nothing to do with RA partitioning. In our view, this should be deprioritized. |
| Apple | No (also see comments) | We have only agreed to support RA partitioning related information, so in the context of that agreement msg3 repetition should be supported. But not additional information, which we haven’t even discussed yet.  |
| Xiaomi | No | RAN2 only agreed to consider the RACH report enhancement for RACH partitioning. As such, other RACH information except for the RACH partitioning related parameters can be deprioritized in R18 SON/MDT enhancement. |
| Ericsson | We can discuss it |  |
| NEC | We can discuss it | We support to discuss RA report enhancements for other Rel-17 features. And what information can be reported for rsrp-ThresholdMsg3 adjustment needs further discussion. |
| Samsung | See comments | UE selects RA partition for MSG3 repetition only if the RSRP of the downlink pathloss reference is less than rsrp-ThresholdMsg3. Thus if the feature is part of triggered feature combination, there is no need for separately reporting whether DL pathloss is less than rsrp-ThresholdMsg3. It could be useful to include the number of msg3 repetitions configured and the number of msg3 repetitions performed.Since the configured number of msg3 repetition is closely related to MCS,we may include that as well.  |
| Lenovo | Yes to discuss them | We can discuss what information can be reported for Msg3 repetition case. |
| Huawei, HiSilicon | Ok for P6 | We think the configured Msg3 repetition number and applied number are useful for network, e.g. to optimize the repetition number.For other information, we are open for discussions. |
| ZTE | Yes (Proponent) | First, Msg3 repetition is part of featureCombination trigger, thus whether UE has make sufficient usage of RA resource configrued for this combination relevant to the RACH performance of certain feature. Therefore the discussion is aligned with current agreed scope. As indicated in our paper, P5 can help NW to evaluate whether the threshold is set properly so that the target UE can make use of RA resource reserved for Msg3 repetition. And P6 can help NW to optimize the applied Msg3 repetition, together with other information (e.g., number of RA attempts) NW can know if configured repetition number is appropriate so that improve the resource efficiency. |
| CATT | No | Msg3 repetiton is one of RACH feature/feature combinations. It is useful to report the related information to the network to improve the performance for Msg3 repetion.But we agree with QC this is not useful for RA partitioning.Furthermore, the number of repetitions is determined by the channel quality. So we share the same view to deprioritize this. |
| vivo | Yes to discuss them | Enhancement of RACH report for other R17 features can be discussed after we conclude on the enhancement for RACH partitioning.For P5, the info can be used to optimize the RSRP threshold of Msg3;For P6, the info can be used to optimize the Msg3 repetition number. |
| DOCOMO | Yes | Agree with ZTE’s view. |
| CMCC | We can discuss it | We see some benefits for P5 and P6. |

### 2.1.2 SDT operation

At RAN2#119b-e meeting, some proposals are related to SDT operation, and here is a summary:

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| **Tdoc** | **Proposals** |
| [5], Samsung | Proposal 3: Include RACH information related to features involving RA partitioning (SDT, slicing, msg3 repetition and Redcap) in RACH report. |
| [10], Ericsson | Proposal 4 UE includes RA and SDT information in RA report when an SDT operation fails. |

It can be seen that the contribution [10] provided a specific proposal, so it is suggested to discuss it.

**Q2: Do companies agree with P4 in [10]? Please provide your comments in the comment column if any.**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No  | For SDT, I believe only RACH information involving RA partitioning should be included in the RA report. Other information relevant to SDT procedure optimization can be deprioritized.  |
| Apple | No (also see comments) | We have only agreed to support RA partitioning related information, so in the context of that agreement SDT should be supported. But not additional information, which we haven’t even discussed yet.  |
| Xiaomi | No | RACH information other than RACH partitioning related parameters can be deprioritized in R18 SON/MDT enhancement. |
| Ericsson | Yes | As of now and according to the RRC spec, the UE does not log SDT initiated RA report in particular when SDT operation (or RA procedure concerning SDT) fails. If the UE does not log RA report for the failed SDT operation how we expect the UE logs partitioning information for the triggering feature?So we suggest to update the spec to log the RA report when RA procedure fails for the SDT operation. This problem is the same as logging RA report for the failed SI request, that spec has been updated to reflect it. |
| NEC | Yes | We support to discuss RA report enhancements for other Rel-17 features. |
| Samsung | Yes | We need to consider SDT related information relevant to RA partitioning. |
| Lenovo | Yes | We can discuss it. |
| Huawei, HiSilicon | No (see the comments) | On one hand, if SDT operation fails means RA-SDT fails, it is the same as unsuccessful RA procedure. Basically RA report normally logs successful completed RA procedure and RLF/CEF logs unsuccessful RA procedure. We are reluctant that RA report log info for unsuccessful completed RA procedure related to RACH feature/feature combination.On the other hand, if SDT operation fails means RA-SDT succeeds and data transmission fails due to maximum RLC retransmission, it has nothing to do with RA procedure. |
| ZTE | Open to discuss |  |
| CATT | Yes | We can discuss it. |
| vivo | Yes to discuss them | Enhancement of RACH report for other R17 features can be discussed after we conclude on the enhancement for RACH partitioning.The explicit info and usage shall be further clarified. |
| DOCOMO | Yes | Agree with Ericsson’s view. |
| CMCC | Yes | We can discuss it. |

### 2.1.3 Slicing

At RAN2#119b-e meeting, some proposals are related to Slicing, and here is a summary:

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| --- | --- |
| **Tdoc** | **Proposals** |
| [5], Samsung | Proposal 2: When the applicable feature is slicing, include NSAG Id and NAS provided NSAG priority of the relevant NSAGs in RACH report.Proposal 3: Include RACH information related to features involving RA partitioning (SDT, slicing, msg3 repetition and Redcap) in RACH report. |

It can be seen that the contribution [5] provided a specific proposal, so it is suggested to discuss it.

**Q3: Do companies agree with P2 in [5]? Please provide your comments in the comment column if any.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | I believe with the agreement in the RAN2#119bis emeeting,Agree to add the following parameters into RACH report for RACH partitioning:- Feature or the combination of features that triggered the RACH- Used feature combinationRAN2 implicitly agreed to include NSAG ID. * No, for NAS provided NSAG priority of the relevant NSAGs. SON reports are AS report. We do not report NAS-provided information in the SON/MDT report.
 |
| Apple | No | How exactly that information would be used by gNB? |
| Xiaomi | Yes for NSAG IDNo for NSAG priority | Share the same view with QC that RAN2 implicitly agreed to include NSAG ID last meeting, but it can be confirmed explicitly online. As for the NSAG priority, we have not seen the motivation to indicate the NAS-provided parameter to gNB yet. |
| Ericsson | See comment | Not quite sure what is the benefit of logging the slice group identifier or NSAG. **We think it is better to log a richer information e.g., S-NSSAI**  |
| NEC | No | Agree with QC that the agreement has implicitly agreed to include NSAG ID. |
| Samsung | Yes | 1. NSAG ID is already agreed.2.UE selects RACH resources based on NAS provided priority and it can very for each UE, and also can be different for the same UE at different times. Thus NAS provided priority is an essential information on how to optimise the allocation of the RA resources across different NSAG. |
| Lenovo | No for P2. Yes for P3 |  |
| Huawei, HiSilicon | Yes | For the current featureCombination-r17, nsag id is defined, so we share the similar view as Qualcomm that RAN2 implicitly agreed to include NSAG ID.FeatureCombination-r17 ::= SEQUENCE { redCap-r17 ENUMERATED {true} OPTIONAL, -- Need R smallData-r17 ENUMERATED {true} OPTIONAL, -- Need R nsag-r17 NSAG-List-r17 OPTIONAL, -- Need R msg3-Repetitions-r17 ENUMERATED {true} OPTIONAL, -- Need R spare4 ENUMERATED {true} OPTIONAL, -- Need R spare3 ENUMERATED {true} OPTIONAL, -- Need R spare2 ENUMERATED {true} OPTIONAL, -- Need R spare1 ENUMERATED {true} OPTIONAL -- Need R}NSAG-List-r17 ::= SEQUENCE (SIZE (1.. maxSliceInfo-r17)) OF NSAG-ID-r17For NSAG priority, we are open, and the motivation seems unclear for now. |
| ZTE | Partially | For NSAG ID e agree with Qualcomm it is implicitly agreed since it is included as part of featureCombination. We are open to discus if priority is needed. |
| CATT | No | P2: We share the same view with QC that NSAG ID has been agreed to be reported in RACH reporting based on agreements in RAN2#119bis and NSAG priority which is provided by NAS should not be reported in SON/MDT report.P3: Same view to depriorize this. |
| vivo | Yes to discuss them | Enhancement of RACH report for other R17 features can be discussed after we conclude on the enhancement for RACH partitioning.The explicit info and usage shall be further clarified. |
| DOCOMO | Yes | Further discuss whether NSAG ID or NSSAI should be logged in RACH report.Not sure about the priority of NSAG priority. |
| CMCC | Yes | Share the same view with Samsung. |

### 2.1.4 Redcap

At RAN2#119b-e meeting, some proposals are related to Redcap, and here is a summary:

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| --- | --- |
| **Tdoc** | **Proposals** |
| [5], Samsung | Proposal 3: Include RACH information related to features involving RA partitioning (SDT, slicing, msg3 repetition and Redcap) in RACH report. |

It can be seen that the contribution [5] just mentioned the Redcap, but no specific proposals are provided. So it is suggested to collect companies’ views on possible enhancements.

**Q4: For enhancements of the RA report based on Redcap, what are the companies’ views on possible enhancements?**

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | RAN2 never discussed whether SON/MDT reports are supported for RedCap. Note that RedCap has memory restrictions, therefore, we are strong concern about supporting SON/MDT reports for RedCap UEs.  |
| Apple | We have only agreed to support RA partitioning related information, so in the context of that agreement Redcap should be supported. But not additional information, which we haven’t even discussed yet. |
| Xiaomi | RACH information other than RACH partitioning related parameters can be deprioritized in R18 SON/MDT enhancement. |
| Ericsson | No strong view |
| NEC | No strong view |
| Samsung | Fine to exclude any Redcap related enhancements except feature partitioning related information |
| Lenovo | No strong view.  |
| Huawei, HiSilicon | No strong view. |
| ZTE | No strong view. |
| CATT | We think no other enhancements are needed for Redcap. |
| vivo | The explicit info and usage shall be further clarified. |
| DOCOMO | No strong view. |
| CMCC | Fine to discuss it. |

### 2.1.5 SCG Activation/Deactivation

At RAN2#119b-e meeting, some proposals are related to SCG Activation/Deactivation, and here is a summary:

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| --- | --- |
| **Tdoc** | **Proposals** |
| [8], NEC | Proposal 3: RAN2 also considers to store and report RA related information with regarding the following RACH enhancement in Rel-17 SCG activation/deactivation |

It can be seen that the contribution [8] just mentioned the SCG Activation/Deactivation, but no specific proposals are provided. So it is suggested to collect companies’ views on possible enhancements.

**Q5: For enhancements of the RA report based on SCG Activation/Deactivation, what are the companies’ views on possible enhancements?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | SCG activation/deactivation is not part of rel-18 WI. We can deprioritize it for now. |
| Apple | Agree with QCOM |
| Xiaomi | Agree with QC. |
| Ericsson | Agree to de-priortise for this release |
| NEC | We support to discuss RA report enhancements for other Rel-17 features. And upon SCG activation, UE may or may not initiate RA procedure, and some enhancement can be made for RA-report. |
| Samsung | A new RA purpose can be considered for SCG activation. |
| Lenovo | Agree with QC |
| Huawei, HiSilicon | Under SCG deactivated, if SCG TAT is invalid, UE initiates RA to activate SCG otherwise UE can perform RACH-less SCG activation, and thus we think perhaps a new RA purpose can be considered for this use case. |
| ZTE | In one hand UE could be configured to initiate RACH for SCG activation, to include it as part of RA report can help NW’s decision, but on the other hand, it is indeed not part of the scope. Thus we can follow majority view. |
| CATT | Agree to de-priortise for this release. |
| vivo | The explicit info and usage shall be further clarified. |
| DOCOMO | Open to further discuss the details. |
| CMCC | We are fine to introduce one new RA purpose for SCG deactivation. Furthermore, the Mobility History Information could be enhanced to record the time of SCG Deactivation, since in existing report only the time spent in the PSCell is recorded and no information about SCG Deactivation. |

## 2.2 SgNB RACH report for MR-DC scenario

In the previous report [16], P7 and P8 were made.

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| **Summary proposal 7: For NE-DC, the UE collects SN RA report container (for LTE) and reports to the NR MN. Additionally, the UE also includes the PSCell identity for the stored SN RA report (FFS on the format).****Summary proposal 8: For EN-DC and NG-EN-DC, there are the following options:**1. **the NR SN fetching the list of NR RA reports via SRB3 can be considered for the SN RACH report in the (NG) EN-DC scenario**
2. **the UE collects SN RA report container (for NR) and reports to the LTE MN, and additionally the UE also includes the PSCell identity for the stored SN RA report (FFS on the format).**
 |

In addition, RAN3 agreed on the LS [17], which is likely to be treated at RAN2#120. In the LS, RAN3 mentions the following (while other content is about RACH report retrieval):

* *RAN3 has supported SN RA Report for EN-DC, (NG)EN-DC, and NR-DC scenarios in Rel-17. No further work will be triggered in RAN3.*
* *RAN3 believes that if RAN2 decides to support SN RA Report for EN-DC and (NG)EN-DC, the UE should report the PSCell identity outside the RACH report to help an eNB forward the report to the correct node without the need to decode the RACH report.*

It is the rapporteur’s understanding that the LS [17] can be considered here.

**Q6: Do companies agree with P7 in [16]? Please provide your comments in the comment column if any.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | RAN3 is not considering enhancements for NE-DC. Enhancements required for NE-DC can be deprioritized.  |
| Apple | No | Agree with QCOM |
| Xiaomi | No | Agree with QC. Currently, the SN RACH report in NE-DC scenario is not supported by RAN3 as the RACH report in LTE format not allowed to be exchanged over Xn interface. As such, RAN2 can deprioritize the SN RACH report in NE-DC scenario in R18. |
| Ericsson | No | Agree to de-priortise NE-DC scenario based on RAN3 LS |
| NEC | No | Agree with QCOM. |
| Samsung | No | Agree with QCOM. |
| Lenovo | No | Agree with QC |
| Huawei, HiSilicon | No | We can follow the RAN3 LS, and de-prioritize NE-DC for now. |
| ZTE | No | Agree to follow RAN3 decision. |
| CATT | No | RAN3 LS has clearly indicated that the NE-DC scenario is not supported for SN RA Report. |
| vivo | No | Agree with QC |
| DOCOMO | No | Agree with QC’s view. |
| CMCC | No |  |

**Q7: Do companies agree with P8 in [16]? Please provide your comments in the comment column if any.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No – 8(i)Modify – 8(ii) | RA report is sent using UEInformationrequest and repose. There is no need for reporting over SRB3. Regarding 8(ii), the NR RA report is a list containing up to 8 entries. As the eNB cannot open the NR RA report, it cannot forward individual entries to the corresponding nodes. Therefore, In EN-DC and (NG)EN-DC, once the eNB retrieves the NR container from the UE, it just needs to send it to the serving SN. SN can open the container and send individual entries to the corresponding nodes. Also, note that when UE sends the RA report, UE sends all entries, therefore, UE will forward the complete list (both MN and SN RA) to MN upon request. Therefore, this is sufficient:**In the case of EN-DC and (NG)EN-DC, UE reports the LTE RA report (including the NR RA Report container) to MN and MN forwards the NR RA report container to the serving SN.**  |
| Xiaomi | OK with P8, and prefer option1 | From our view, both alternatives can work without further work triggered in RAN3. So we are fine to agree P8 now, and the further decision can be achieved based on the companies’contributions in the next meeting.For the two options, compared with option 2, option 1 only requires for the NR enhancement without the extra PScell identity report to eNB and extra Xn signaling for SN RACH report exchange. As such, to reduce the impacts on LTE, we perfer to consider option1 for the SN RACH report in the (NG) EN-DC and EN-DC scenarios. |
| Ericsson | Modify Option 2 | Agree with QC, but it may not be needed to be a current SN and it can be any neighbouring gNB, capable of dispatching NR RA reports to the other gNB |
| NEC | Yes in general | We see benefits in both options which will work well. Considering that this enhancement is motivated from SN point of view, the option 1 looks more useful for the SN.  We can go with majority which option (or even both) is selected.  |
| Samsung | Option 2 | 1.We think there is no need for fetching the list via SRB3. 2.For 8(2), we are in general ok and are open to consider QC’s modified proposal |
| Lenovo | Option 2 | Option 2 is aligned with RAN3’s agreement which is also mentioned in LS [17] “*RAN3 believes that if RAN2 decides to support SN RA Report for EN-DC and (NG)EN-DC, the UE should report the PSCell identity outside the RACH report to help an eNB forward the report to the correct node without the need to decode the RACH report*”. |
| Huawei, HiSilicon | Option 2 | For Qualcomm’s suggested wording, we think the PSCell identity is also needed based on the RAN3 LS. |
| ZTE | Option 2 | As indicated in RAN3’s LS there will not be further work on this thus we shall go for solutions that follow RAN3’s design. |
| CATT | Option 2 | The solution provided in RAN3 LS is the Option (2), and since UE may not always be connected to a SN node, to report NR RA report container to the serving SN may not always be feasible, the solution is also provided in the RAN3 LS that “*the UE should report the PSCell identity outside the RACH report to help an eNB forward the report to the correct node without the need to decode the RACH report*”. |
| vivo | Option 2 |  |
| DOCOMO | Option2 | Fine with QC’s proposal. |
| CMCC | Option2 | The LS from RAN3 means Option 2.  |

# 3 Conclusion

[To be updated]

# 4 References (RAN2#119b-e Tdocs for AI 8.13.6 RACH enhancement)

[1] R2\_119bis-e\_Skeleton\_v2

[2] R2-2209567 Discussion on RACH report enhancement for RACH partitioning vivo discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

[3] R2-2209572 RACH enhancement for SON CATT discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

[4] R2-2209766 SON enhancements for RACH partitioning Apple discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

[5] R2-2209825 SON/MDT Enhancements for RACH Samsung R&D Institute India discussion

[6] R2-2209898 Discussion on RACH enhancement Huawei, HiSilicon discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

[7] R2-2209986 RACH report enhancements for RACH partition Spreadtrum Communications discussion Rel-18

[8] R2-2209999 Discussion on RACH enhancements NEC discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

[9] R2-2210030 Discussion on the SON/MDT enhancement for RACH report Beijing Xiaomi Software Tech discussion Rel-18

[10] R2-2210179 RACH report enhancements Ericsson discussion NR\_ENDC\_SON\_MDT\_enh2-Core

[11] R2-2210271 RACH report related enhancements Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

[12] R2-2210291 Consideration on RACH enhancements ZTE Corporation, Sanechips discussion Rel-18

[13] R2-2210511 SONMDT enhancement for RACH Enhancement. CMCC discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

[14] R2-2210574 Discussion on RACH partitioning China Telecom Corporation Ltd. discussion

[15] RAN2-119-e-SONMDT-HU \_2022-10-19 0535 UTC

[16] R2-2210793, Pre-meeting summary of 8.13.6 (Huawei), Huawei (Summary rapporteur)

[17] R3-226053, Reply LS on SN RACH report status in R17, Source: RAN3, To: RAN2