**3GPP TSG-RAN RAN2 #121 R2-23xxxxx**

**Athens, Greece, 27th Feb – 3rd Mar, 2023**

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

**Source: Huawei (email rapporteur)**

**Title:** **Report of [Pre120][XXX][R18 SON/MDT] RACH enhancement (Huawei)**

**Document for: Discussion and Decision**

# 1 Introduction

This is the email report of pre-meeting summary for 8.13.6 RACH enhancement.

According to Skeleton v2, the relevant Tdocs are listed below:

[1] R2-2300296 RACH enhancement for SON CATT discussion

[2] R2-2300717 Remaining issues of SON enhancements for RACH Apple discussion

[3] R2-2300957 Enhancements for SN RACH report Lenovo discussion

[4] R2-2301147 Consideration on RACH enhancements ZTE Corporation, Sanechips discussion

[5] R2-2301214 SN RACH Report for EN-DC/NG-EN-DC Samsung discussion

[6] R2-2301278 RA report enhancement Ericsson discussion

[7] R2-2301424 On SgNB RACH report for MR-DC scenario Qualcomm Incorporated discussion

[8] R2-2301573 Discussion on RACH enhancement Huawei, HiSilicon discussion

[9] R2-2301582 Further Consideration on RACH Enhancement CMCC discussion

[10] R2-2301635 Discussion on the SON/MDT enhancement for RACH report Beijing Xiaomi Software Tech discussion

[11] R2-2301812 Discussion on RACH enhancements China Telecom discussion

For the agenda item 8.13.6, it mentions:

Only address “FFS on whether and which PSCell identity UE should report outside the RACH report.”

So section 2.1 is only to address the FFS, and only the relevant proposals are listed and then summarized.

# 2 Discussion

## 2.1 List of companies’ proposals

The companies’ views are listed in the table below:

|  |  |
| --- | --- |
| **Company** | **Views** |
| [1], CATT | *Observation 2: The solution of eNB requesting a gNB to decode and re-transmit the RACH information will introduce much RAN3 complexity.*  **Proposal 4: UE reports the SgNB information using the format of NR container together with the outer PSCell ID in LTE SgNB RACH report, and the PSCell ID indicates the PSCell in which the RACH occurred.**  **Proposal 5: If more than one entry is recorded, multiple containers of SgNB RACH information with respective PSCell ID should be included in LTE SgNB RACH report, and each container includes only one NR- format RACH information.** |
| [2], Apple | Proposals are irrelevant to “FFS on whether and which PSCell identity UE should report outside the RACH report.” |
| [3], Lenovo | **Observation: LTE node is not able to encode/decode a report in NR format.**  **Proposal: The UE reports the PSCell ID where the RACH procedure occurred outside of the SN RACH report container to indicate the MN about which node the SN RACH report container should be forwarded to.** |
| [4], ZTE | *Observation 1: RAN3 has explicitly indicated in their reply LS that PSCell identity shall be included outside the RACH report to help an eNB forward the report to the correct node, which already been captured in Xn interface.*  *Observation 2: Forcing RAN3 to define a new solution to support a function that can already be resolved with existing RAN3 signalling will impact the time slot assigned for R18 feature discussion which shall be prohibited.*  *Observation 3: To forward complete SN RACH report container to serving SN might not always feasible since RA report can be fetched afterwards. It can also leads to unnecessary decoding and more forwarding between NW nodes, which is inefficient.*  **Proposal 1: For EN-DC and NG-EN-DC, a list of PSCell identities is included outside SN RACH report container.** |
| [5], Samsung | **Proposal 1: UE should report PSCell identity outside the SN RACH report send towards eNB, as requested by RAN3.**  **Proposal 2: UE includes the list of PSCell identities in LTE ASN.1 format in the SN RA report.**  **Proposal 3: UE includes the NR RA report using one of the below options in the SN RA Report**   1. **UE associates an individual PSCell identity to a NR RA report container containing the list of RACH reports for the same cell.** 2. **UE includes whole NR RA report (NR variable VarRA-Report) as a container, and includes PSCell identity list.** |
| [6], Ericsson | Proposal 1 UE includes a list of spCellID outside the list of NR RA report containers, in the LTE UE Information Response message, when reporting NR RA reports to the LTE eNB.  Proposal 2 Enhance the LTE UE information Request procedure with NR RA-Report request flag to fetch the NR RA-Report in LTE. |
| [7], Qualcomm | **Observation 1: In the RAN2#108 meeting [3], RAN2 agreed that the network cannot retrieve only parts of the stored list of the RACH report, i.e. no processing for individual entry is required at the UE.**  **Observation 2: From section 9.1.3.25 in TS 38.423 [4], we can observe that the entire RA-ReportList is included in the RACH report container. Therefore, RAN3 does not require UE to process each entry of the RA-ReportList and put them in separate containers.**  **Proposal 1: For SgNB RACH reporting for EN-DC and (NG)EN-DC, UE is not required to create separate containers for each entry. UE reports NR *RA-ReportList* in a container to the LTE MN.**  **Observation 3: LTE MN cannot open the RA-ReportList and obtain the individual entries, as the container contains the RACH report list instead of individual RACH entries.**  **Proposal 2: For SgNB RACH reporting for EN-DC and (NG)EN-DC, the UE is not required to put cell IDs of each RACH entry outside the container, as LTE MN cannot forward the individual entries to the corresponding NR cell.**  **Observation 4: Whether UE needs to include any cell ID outside the container depends on whether cross-RAT reporting of the RACH report in the standalone scenario is allowed.**  **Proposal 3: RAN2 should discuss which scenario for the sgNB RACH report is valid**  **In our understanding there exist mainly two scenarios,**   * **NR RA-ReportList is sent to the LTE cell only when UE is in EN-DC or (NG)EN-DC.** * **NR RA-ReportList is sent to the LTE cell together with the LTE RACH report (if available), whenever the LTE cell requests the RACH report.** |
| [8], Huawei | **Observation 1: From DC to SA and DC to DC, we could observe that alternative 1 has its restrictions and drawbacks. Especially for DC to SA, the forwarding of SN RA report is unfeasible.**  **Proposal 1: RAN2 to agree that UE can report PSCell ID outside RA report container to enable MN of identifying corresponding SN node.**  **Proposal 2: In addition to PSCell ID, UE can report PCell ID outside RA report container to enable the corresponding MN as a transfer node of delivering SN RA report to the corresponding SN.**  **Observation 2: Alt.2 causes unnecessary forwarding of irrelevant SN RA reports, while Alt.1 and Al.3 could possibly forward the relevant RA report to each corresponding SN.**  **Proposal 3: RAN2 to discuss which alternative for realization of NR container:**  **Alt.1: the single SN RA report entry as a NR container**  **Alt.2: the list of SN RA report entries as a NR container**  **Alt.3: the list of SN report entries associated to same PSCell ID as a NR container**  **Proposal 4: If the single SN RA report entry as a NR container is agreed in Proposal 3, option 1b (the consecutive same PSCell/PCell ID is only indicated once and the absence of PSCell ID indicates the reuse of the latest occurred PSCell ID) is used for indication of PSCell plus PCell ID for mapping between each RA report to associated PSCell ID and PCell ID.**  **Proposal 5: If the list of SN RA report entries as a NR container is agreed in Proposal 3, the solution to only indicate the involved PSCell ID and its associated PCell ID is sufficient for the forwarding requirement.**  **Proposal 6: If the list of SN report entries associated to same PSCell ID as a NR container is agreed in Proposal 3, the solution to only indicate the PSCell ID associated to each NR container and its associated PCell IDs enables the forwarding of relevant RA reports to each corresponding SN.** |
| [9], CMCC | **Proposal 1: To support SN RA Report for EN-DC and (NG)EN-DC, UE reports the PSCell identity outside the RACH report to help an eNB forward the report to the correct node.** |
| [10], Xiaomi | **Observation 1: There is similar Xn signalling overhead whether PScell identity is reported outsides SN RA report or not, while not reporting PScell is with no extra Uu signalling overhead.**  **Proposal 1: No need for UE to report the PScell identity information outside SN RA report in EN-DC and NGEN-DC scenarios.** |
| [11], China Telecom | **Proposal 1: to include PScell identity outside the RACH report for MR-DC** |

## 2.2 Summary

The email rapporteur observes that 8 companies support that UE reports the PSCell identity outside the SN RACH report, and 2 companies have concerns.

The main concern is:

* Whether UE needs to include any cell identity outside the container depends on whether cross-RAT reporting of the RACH report in the standalone scenario is allowed

And then one possible way is that:

* **NR RACH report is sent to the LTE cell only when UE is in EN-DC or (NG)EN-DC**

If the UE firstly logs NR RACH report in (NG)EN-DC and then the UE goes to LTE cell only, it is FFS whether the LTE cell needs to get the stored NR RACH report and how the LTE cell co-ordinates with other nodes. The email rapporteur think RAN2 can discuss this scenario first.

**Proposal 1: NR RACH report is sent to the LTE cell when UE is in EN-DC or (NG)EN-DC, and UE includes PSCell identity outside the NR RACH report.**

**Proposal 2: RAN2 to discuss whether the UE needs to report NR RACH Report to LTE cell when the UE is in standalone LTE.**

If proposal 1 is agreeable, the NR RACH report may include reports from more than one PSCell, and then there are some solutions on how to include PSCell identities.

* Alt 1: List of container for NR RACH report, and there is a respective PSCell identity for each container
* Alt 2: A list of PSCell identities is included, outside NR RACH report container
  + Alt 2a: List all PSCell identities that occur in *RA-ReportList*
  + Alt 2b: List unique PSCell identities, i.e. if a PSCell occurs more than once in *RA-ReportList*, it is recorded only once in the list of PSCell identities
  + *Note: for Alt 2a/2b, here is an example: if NR RACH report includes 3 reports (from PSCell-1, PSCell-1, PSCell-2), for Alt 2a, the list is “PSCell-1, PSCell-1, PSCell-2”; for Alt 2b, the list is “PSCell-1, PSCell-2”*
* Alt 3: UE associates an individual PSCell identity to a NR RACH report container containing the list of RACH reports for the same cell

The email rapporteur observes that Alt 2 has more supports than Alt 1 and 3, and some companies have concerns about Alt 1. Between Alt 2a and 2b, Alt 2b may be beneficial from Uu signalling point of view.

In addition, one company points out that the PSCell identity should use LTE ASN.1 format.

**Proposal 3: UE reports NR *RA-ReportList* in a container to LTE cell, and a list of PSCell identities is included (associated to NR cells in *RA-ReportList*). The PSCell identity uses LTE ASN.1 format.**

**Proposal 4: Regarding how UE sets the list of PSCell identities, RAN2 to discuss the following alternatives:**

* **Alt 2a: List all PSCell identities that occur in *RA-ReportList***
* **Alt 2b: List unique PSCell identities, i.e. if a PSCell occurs more than once in *RA-ReportList*, it is recorded only once in the list of PSCell identities**

For how the LTE requests the UE to send the NR RACH report, some companies provide their views, e.g.:

* **Re-use existing request flag (i.e. *rach-ReportReq-r9*):** NR RA-ReportList is sent to the LTE cell together with the LTE RACH report (if available), whenever the LTE cell requests the RACH report
* **Introduce new request flag:** Enhance the LTE UE information Request procedure with NR RA-Report request flag to fetch the NR RA-Report in LTE

**Proposal 5: RAN2 to discuss how the LTE requests the UE to send the NR RACH report:**

* **Re-use existing request flag (i.e. *rach-ReportReq-r9*)**
* **Introduce new request flag**

# 3 Conclusion

The summary proposals are listed as below:

**Proposal 1: NR RACH report is sent to the LTE cell when UE is in EN-DC or (NG)EN-DC, and UE includes PSCell identity outside the NR RACH report.**

**Proposal 2: RAN2 to discuss whether the UE needs to report NR RACH Report to LTE cell when the UE is in standalone LTE.**

**Proposal 3: UE reports NR *RA-ReportList* in a container to LTE cell, and a list of PSCell identities is included (associated to NR cells in *RA-ReportList*). The PSCell identity uses LTE ASN.1 format.**

**Proposal 4: Regarding how UE sets the list of PSCell identities, RAN2 to discuss the following alternatives:**

* **Alt 2a: List all PSCell identities that occur in *RA-ReportList***
* **Alt 2b: List unique PSCell identities, i.e. if a PSCell occurs more than once in *RA-ReportList*, it is recorded only once in the list of PSCell identities**

**Proposal 5: RAN2 to discuss how the LTE requests the UE to send the NR RACH report:**

* **Re-use existing request flag (i.e. *rach-ReportReq-r9*)**
* **Introduce new request flag**