3GPP TSG-RAN WG3 #120 [R3-2](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23113-e.exe/Meetings/RAN3%23113/chairnotes/Inbox/R3-214141.zip)33337

Incheon, Korea, 22nd May – 26th May 2023

Agenda Item: 10.2.3

Source: Qualcomm Incorporated (moderator)

Title: Summary of Offline Discussion on CB: # SONMDT3\_RACH

Document for: Approval

# Introduction

**CB: # SONMDT3\_RACH**

**- Discuss options for RACH report optimization**

**- Capture agreements and open issues, provide TPs if agreeable**

(moderator - QC)

Summary of offline disc [R3-233337](file:///C%3A%5CUsers%5Cz00274494%5CDownloads%5CInbox%5CR3-233337.zip)

# For the Chair’s Notes

Include the “PSCell list” optionally in addition to the “RACH Report Container” in ACCESS AND MOBILITY INDICATION over Xn

R3-233448 TP to 38.470 Support for RACH Indication (Huawei)

R3-233449 TP to 38.420 Support for RACH Indication (Huawei)

R3-233450 TP to 36.300 Correction on the naming of RA Report (Huawei)

R3-233451 TP to 36.423 for the support of RACH indication for EN-DC case (Huawei)

R3-233456 TP to 37.340 on RA Report retrieval (ZTE)

R3-23yyyy TP to 38.423 for including PSCell list in ACCESS AND MOBILITY INDICATION over Xn (Ericsson)

The following new assignments for BL CR are proposed after discussing with SON/MDT WI rapporteur

* Assign BL CR for 38.420 to Qualcomm Incorporated
* Assign BL CR for 38.470 to CMCC

Open issues for next meeting:

FFS whether and how to add the “PSCell list” optionally in addition to the “RACH Report Container” in ACCESS AND MOBILITY INDICATION over X2.

FFS whether ACCESS AND MOBILITY INDICATION over X2 should be extended to also enable forwarding SN RA Reports between eNBs

FFS whether and how to forward the RA Report in case the MN that retrieves the RA Report is not connected to any SN associated to the PSCells received with the RA Report.

# Phase-II Discussion

# Phase-I Discussion

## Potential enhancements to RA Report

Potential enhancements to RA Report have been discussed in the previous meetings RA report enhancements to handle the scenario where **RACH partitioning changes by the time RA Report is retrieved and how to associate the received RA Report with the “old” RACH partitioning configuration** and the following options have been captured in the Chair’s notes

**Option 1: Include the feature priority**

**Option 2: Include the RACH partition configuration related information (e.g., start preamble / number of preambles in the RA partition)**

**Option 3: Include the time between RACH access that led to the generation of a RA Report and reporting of the RA Report**

**Option 4: The network controls the UE to report RA information**

**Option5: Config Index information**

Regarding Option 1 and Option 2, the moderator makes the following observations from TS 38.331:

**Observation 1:** Feature Priorities is a cell-specific configuration and signaled in SIB1 and/or ServingCellConfigCommon

**Observation 2:** FeatureCombinationPreambles (that includes start preamble index and number of preambles in the partition) is also a cell-specific configuration and signaled via RACH-ConfigCommon

Option 5 is newly proposed in this meeting by two companies (by Qualcomm in [1] and ZTE in [6]) and a similar idea is also being discussed for retrieving UE context for SHR/SPR optimizations in CB #SONMDT1\_SHRSPR.

Being the proponent company, the moderator below provides some clarification on how Option 5 might work based on comments received online. An example scenario is shown below:



* gNB assigns a config index for the RACH partitioning configuration at a certain time (e.g., config index 1 at time t1, config index 2 at time t2 and config index 3 at time t3)
* gNB stores this mapping of config index with the RACH partitioning configuration
	+ Storing this cell specific RACH partitioning configuration should not be much of an overhead at gNB as the RACH partitions might not change so dynamically
* gNB signals this “Config Index” to UE(s) e.g., via cell specific signalling in SIB1
* When UE collects RA Report, it can simply include “Config Index” in RA Report
* If the RACH partitioning configuration changes (e.g., at time t2), gNB can update UE(s) via SI modification to indicate that it now uses config index 2 and UE will include the updated config index when collecting future RA Reports.
* How to encode this “Config Index” can be further discussed. But even if we have 8 bits for this “Config Index”, we can support up to 28 = 256 RACH partitioning configurations.

**Q1: Companies are requested to comment if they see any technical concern with the above proposed mechanism for Option 5 and whether Option 5 can be adopted?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No for option 5 | Comment |
| Huawei | NO. | We still think that option 1 and 2 are the easiest and most cost efficient way to go.For option 5, it is not applicable for RACH optimization as commented online.RA report is collected for each successful random access for each UE trying to access to the network. SHR and SPR also have the same issue. It is impossible for the network to enquiry internally for the network configuration used when the RA report is collected. The enquiring processing load is not on the same level as the network does for RLF report. For RLF case, only less 1% UEs will occur RLF and report the RLF report to the network.Second, today RACH algorithm is placed at gNB-DU which in most cases, is deployed closed to the user locally. There is no such memory for the gNB-DU to store each RACH configuration considering the RACH partitioning case. And it also introduce unacceptable processing load to the gNB-DU to lookup the RACH configuration used for each RA report received considering the data amount of the RA reports collected. |
| Lenovo |  | Check the discussion/decision made in CB #SONMDT1\_SHRSPR. We can try to have a unified solution for UE context retrieval.  |
| Samsung | Maybe not | As the RACH configuration is sent via SIB1, it is better to not add the complexity for SIB.Opt 1 and opt2 or opt3 are the most straightforward way. |
| Nokia | yes  | It sounds a good idea to support unified approach based on config index |

**Q2: If companies don’t agree with option 5, which of the following option is preferred? Also, companies are requested to clarify how this would be better than option 5 (w.r.t. Uu overhead that now every UE in the cell collecting RA Report would be required to report a cell-specific RACH configuration (e.g., feature priority or feature combination preambles) back to the gNB just because the cell has changed RACH partitions)?**

* **Option 1: Include the feature priority**
* **Option 2: Include the start preamble / number of preambles in the RA partition**
* **Option 3: Include the time between RACH access that led to the generation of a RA Report and reporting of the RA Report**
* **Option 4: The network controls the UE to report RA information**

|  |  |  |
| --- | --- | --- |
| Company | Option 1-4 | Comment |
| Huawei | 1 and 2 | 1 and 2 should be considered together. Clarifications, please see above. |
| Lenovo |  | See comments for Q1. |
| Samsung | 1+2 or 3 | Same comment as Q1. |
| Nokia |  | option 4 could be used together with option 5, e.g. a simple indication that the UE only needs to store and upload RA reports for the latest configuration |

##  Handling SN RA Report in case there is no Xn/X2 connectivity

The following was agreed online:

**Not consider the NG and S1 forwarding of RA report.**

We discussed the scenario on how to handle if the node retrieving the RA Report doesn’t have a X2/Xn connectivity with the PSCells indicated by the UE in RA Report and there seemed to be a compromised understanding achieved in the online session that there is no need to enhance RA Report with additional information (e.g., list of PCells associated with each PSCell). Since this was not explicitly captured in Chair’s notes, the moderator proposes the following to conclude the discussion:

**Moderator Proposal 1: There is no need to enhance RA Report with PCell related information (e.g., list of PCells associated with each PSCell) to address the scenario where the node retrieving the RA Report doesn’t have a X2/Xn connectivity with the PSCells indicated by the UE in RA Report**

But there was also a proposal online to include the list of PSCells (if reported by the UE) in addition with the “RACH Report Container” in ACCESS AND MOBILITY INDICATION so that the node retrieving the RA Report can forward this “list of PSCells” to another node to which it has X2/Xn connectivity, which can then forward it to the PSCells indicated in the RA Report. Stage-3 changes along the following lines would be needed for this proposal:

**ACCESS AND MOBILITY INDICATION**

This message is sent by NG-RAN node1 to transfer access and mobility related information to NG-RAN node2.

Direction: NG-RAN node1  NG-RAN node2.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE type and reference** | **Semantics description** | **Criticality** | **Assigned Criticality** |
| Message Type | M |   | 9.2.3.1 |   | YES | ignore |
| **RACH Report List** |   | *0..1* |   |   | YES | ignore |
| **>RACH Report List Item** |   | *1 .. <maxnoofRACHReports>* |   |   | EACH | ignore |
| >>RACH Report Container | M |   | OCTET STRING | Includes the *RA-ReportList* IE as defined in subclause 6.2.2 in TS 38.331 [10]. | YES | ignore |
| >>UE Assistant Identifier | O |   | NG-RAN node UE XnAP ID9.2.3.16 |  | YES | ignore |
| >> PSCell list | O |  |  |  |  |  |
| … |  |  |  |  |  |  |
| .. |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**Moderator Proposal 2:** Include the “PSCell list” optionally in addition to the “RACH Report Container” in ACCESS AND MOBILITY INDICATION over Xn/X2

**Q3: Do companies agree with Moderator Proposal 1 and Proposal 2?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | No | Question is how does the sending node know the receiving node have X2/XN connectivity with the node serving the PScells?And how many hops that the RA report together with the PScell IDs will be forwarded in the network?We prefer an accurate forwarding solution.  |
| Lenovo | Yes |  |
| Samsung | Maybe not | Same view as HW. |
| Nokia | Yes | Reply to question from Huawei: neighbour’s neighbour info (X2AP: *NR Neighbour Information* IE, XnAP: *Neighbour Information NR* IE) should be sufficient to inform about X2/Xn connectivity towards NR cell in the most important scenarios. So supporting these scenarios come nearly for free, while extending to all possible scenarios either required fully meshed X2/Xn or signalling via CN which would represent too heavy impact. |

Summary:

**FFS whether and how to forward the RA Report in case the MN that retrieves the RA Report is not connected to any SN associated to the PSCells received with the RA Report.**

**Agree “Include the “PSCell list” optionally in addition to the “RACH Report Container” in ACCESS AND MOBILITY INDICATION over Xn/X2”**

## Stage-2 and editorial TPs

Several stage-2 TPs have been proposed in [4] and [7] and copied below for your reference:

|  |  |
| --- | --- |
| a) 38.420 | 5.2.X RACH indication functionThis function enables the S-NG-RAN node to inform the M-NG-RAN node of the successful random access procedures occurring in the S-NG-RAN node over the Xn interface.6.2.X RACH indication procedureThe RACH indication procedure is used by the S-NG-RAN node to indicate the occurrence of random access procedure at the S-NG-RAN node:- RACH Indication |
| a) 38.470 | 5.2.X RACH indication functionThis function enables the gNB-DU to inform the gNB-CU of successful random access procedures occurring in the gNB-DU. 6.1.X RACH indication procedureThe RACH indication procedures are list below.- RACH Indication |
| b) 36.300 | 22.4.3.2.2 NR cell in EN-DC caseThe solution applies to an en-gNB supporting EN-DC operation. RACH optimisation is supported by UE reported information (RA report, see TS 38.300 [79]) made available at the eNB and further forwarded to the en-gNB, and by PRACH parameters exchanged (see TS 38.300 [79]) between en-gNBs and eNBs. |
| c) 36.423 | ***[4], Proposal 4: To agree on the TP for TS 36.423 BL CR in section 6 for the support of RACH indication on X2 for EN-DC case.*** |
| d) 37.340 | 10.18.Y RA Report retrievalWhen a UE performs successful random access attempts which are only known by the SN (e.g., beam failure recovery*,* UL synchronization issue*,* scheduling request failure, no PUCCH resource available), the SN may inform the MN about the occurrences of successful random access procedures in the SN via a RACH indication. The MN may then retrieve the RA Report from the UE(s) based on the RACH indication received via XnAP signalling from the SN. |
| e)38.423/38.473 | Rename the UE ID in RACH INDICATION over Xn and F1 as mentioned in [7]M-NG-RAN UE Assistant Identifier 🡪 RA Report Retrieval UE ID gNB-CU UE F1AP ID 🡪 RA Report Retrieval UE ID  |

**Summary:**

**a) Agree TP to TS 38.420 and TS 38.470 to add “RACH Indication” in the dedicated section for SON**

**b) Agree TP to TS 36.300 on renaming “RA Report”**

**d) Agree TP to TS 37.340 on RA Report Retrieval. Remove “via XnAP signaling”**

**To be checked:**

**c) TP to 36.423 on adding RACH INDICATION.**

**No consensus on e)**

**Q4: Do companies agree with the following TPs?**

1. **TPs to TS 38.420 and TS 38.470 BL CR for the functional description of RACH indication procedure**
2. **TPs to TS 36.300 BL CR for the naming of RA report**
3. **TP to TS 36.423 BL CR for the support of RACH indication on X2 for EN-DC case**
4. **TP to TS 37.340 about stage 2 description for RA report retrieval for MR-DC**
5. **TP to TS 38.423 and TS 38.473 to rename the** **UE associated ID in RACH INDICATION over Xn and F1 to “RA Report Retrieval UE ID”**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No for a)-e) | Comment |
| Huawei | Yes for all | For d, it should be a TP towards 38.300 rather than 37.340. |
| Lenovo | Yes for a)-d) | For e, no strong opinion. |
| Samsung | OK for a) to d)  | No strong view for e). |
| Nokia |  | a): better to enhance 6.2.9 Data exchange for self-optimisation procedure (38.420). (Didn’t check 38.470, maybe same situation).b) okc) need to come back (ran out of time…)d) oke) no, the UE AP ID (F1/Xn) is the one that is used, it shouldn’t be given additional names. |

# Conclusion, Recommendations

If needed

# References

|  |  |  |
| --- | --- | --- |
|  |  |  |
| [1] | [R3-232846](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_120%5CDocs%5CR3-232846.zip) | RACH optimization enhancements (Qualcomm Incorporated) |
| [2] | [R3-232587](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_120%5CDocs%5CR3-232587.zip) | (TP for SON BL CR to TS 38.473) Further discussion on RACH optimisation (Nokia, Nokia Shanghai Bell) |
| [3] | [R3-232805](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_120%5CDocs%5CR3-232805.zip) | Discussion on SON for RACH (Samsung) |
| [4] | [R3-232820](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_120%5CDocs%5CR3-232820.zip) | (TPs for SON BLCR for TS 38.470, TS 38.420, TS 36.423 and TS 36.000) Remaining issues for RACH optimisation (Huawei) |
| [5] | [R3-232894](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_120%5CDocs%5CR3-232894.zip) | Discussion on RACH enhancement (CATT) |
| [6] | [R3-233093](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_120%5CDocs%5CR3-233093.zip) | RACH Optimization enhancement (Ericsson) |
| [7] | [R3-233189](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_120%5CDocs%5CR3-233189.zip) | (TPs for SON BLCRs for TS 38.423 TS 38.473 TS 37.340)RACH enhancements (ZTE) |