3GPP TSG RAN WG2#115-e                                             R2-210xxxx

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Title: [Pre115-e][802][SON/MDT] Summary on agenda item 8.13.2.2 2-step RA related SON aspects

Document for: Discussion and Decision

# Introduction

In this document, summary of all the contributions submitted to 8.13.2.2 agenda item (2-step RA related SON aspects) of RAN2#115e meeting will be presented [1-11]. Taking the company proposals into account, the 3rd section provides sets of proposals for easy agreement, as well as for further discussions.

# Discussion

## RA type indication in RA Report

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 1: We propose to use explicit indication of the RACH Type in the RACH Report (2-step or 4-step RACH).  Proposal 3: RACH Type in the RACH report is indicated according to the RACH Type that initiated the RACH procedure (2-step versus 4-step RACH attempt). |
| R2-2107718 | vivo | Proposal 1: With the inclusion of 2-step RA specific parameters, RA type ‎per RA procedure is known ‎implicitly by NW in RA report. |
| R2-2107822 | CATT | Proposal 1: RA type ‎per RA procedure is known ‎implicitly by NW. |
| R2-2108354 | ZTE | Proposal 4: Explicit RA type indication is included in RA report once to indicate the RA type selected during initialization part. |
| R2-2108542 | CMCC | Proposal 1: UE reports the RA types configured by network, e.g. 2-step RA, 4-step RA, or even 2-step CBRA, 2-step CFRA, 4-step CBRA, 4-step CFRA, in the RA-Report. |
| R2-2107392 | OPPO | Observation 1: RACH type indication is not needed in the RACH report, since the RACH type for each RACH attempt could be easily inferred by checking whether or not the 2-step RACH frequency related information being included in the RACH report and comparing the RACH attempt order with the msgA-TransMax. |

**Rapporteur Summary:**

Explicit indication of the RA Type is proposed to be used by a number of companies including Nokia, ZTE and CMCC. Among them, CMCC further address the need to report the contention type related information. On the other hand, vivo, CATT, and OPPO suggest that the RACH type information could be implicitly inferred by the NW when receiving the RACH Report from the UE.

In the post RAN2 #113e meeting email discussion [12], it can be found 8 among 13 companies think the RA type can be inferred by the network according to the previously agreed 2-step RA specific information, e.g.,

**1. At least following RACH frequency related information should be included in RACH report for optimization of 2-step RACH:**

** msgA-FrequencyStart-r17**

** msgA-FrequencyStartCFRA-r17**

** msgA-SubcarrierSpacing-r17**

** msgA-SubcarrierSpacingCFRA-r17**

** msgA-FDM-r17**

** msgA-FDMCFRA-r17**

**2. UE includes the measured RSRP of DL pathloss reference obtained just before performing RACH procedure in 2step RA report. FFS how to reduce the report overhead.**

Aa a result, Rapporteur suggests that RA type is not need to be included in the RA report, since the network could already infer such information from other 2-step RA specific information included in the RACH report

**Proposal 1: RAN2 to agree that the RACH type is not needed to be included in the RACH report, since it could be easily inferred from other 2-step RACH specific information included in the RACH report.**

## Switching information in 2-step RA report

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107640 | vivo | Proposal 2: Switch indication is not needed for 2-step RA report as network impliclty knows whether ‎switching from 2-step RA to 4-step ‎RA is performed based on the coexistence of 4-step and 2-step frequency-related parameters and the explicit indication for fallback. |
| R2-2107718 | OPPO | Proposal 1: RAN2 to agree that down selection should be made from two below approaches for the network to know the boundary switching the 2-step RA towards 4-step RA:   *  Including msgA-TransMaX parameter in each RA report *  Indicating ‘RA type switching’ flag in the first RA attempt after the RA type is switched |
| R2-2107822 | CATT | Proposal 2: The switching information, i.e. configured maximum MSGA transmission number, should be explicitly included in RA report. |
| R2-2108354 | ZTE | Proposal 5: MsgA-Transmax, if configured, is explicitly included in RA report. |
| R2-2108418 | Ericsson | Proposal 1 Introduce a new field in the RA-InformationCommon, to aid the network to distinguish the 2-step RA attempts from the 4-step RA attempts in the perRAInfoList  Proposal 2 RAN2 to discuss whether this field should be:  a. a “switch” flag, indicating the last entry of the RA attempt in perRAInfoList before the switch, or  b. an indication of the maximum number of configured msgA attempts, i.e. msgA-TransMax, from which the network can infer the last entry of the RA attempt in perRAInfoList before the switch. |
| R2-2108642 | Samsung | Proposal 1: In the case of switching from 2SRA to 4SRA, a new explicit indicator is introduced to indicate if it’s the switched 4SRA or not. How to indicate it is studied, e.g.  1) Option 1: Info related to 2SRA (failed) and 4SRA is included in separate PerRAInfo  2) Option 2: type indicator for each IE perRASSBInfo or IE PerRAAttemptInfo |
| R2-2108542 | CMCC | Proposal 2: UE reports the information that can distinguish 2-step RA from 4-step RA in the granularity of per-RA procedure. |
| R2-2108780 | Sharp | Proposal 1: the configured maximum number of msgA transmission is not needed in the 2-step RA report.  Proposal 2: an explicit indication is used to inform the switch of 2-step to 4-step if network cannot derive the switching from the RA report signalling structure. |

**Rapporteur Summary:**

Among eight companies, six (OPPO, CATT, ZTE, Ericsson, Samsung, CMCC) obviously agree that an explicit indication should be used to notify the network of the switching RA attempt from 2-step RACH to 4-step RACH during a specific RACH procedure. From the contributions, it could be found that there are two main options for flagging the switch:

* Option 1: including an explicit switch indication in the IE related to the last/first RA attempt before/after the 2-step to 4-step RA switch.
* Option 2: including the parameter *MsgA-Transmax* in each PerRAInfo IE.

According to CATT [5], if the network would like to know exactly from which RACH attempt the RA type is switched, when explicit switching indication is used, it should be in the granularity of per RA attempt. In such cases, if 200 RA attempts are experienced, 200 bits are needed for the explicit switch indication to be included in RACH report. On the other hand, when the Option 2 is employed, since the parameter *MsgA-Transmax* is set per RA procedure, just 8 bits are needed regardless the number of RA attempts experienced in one RACH procedure.

**Proposal 2: RAN2 to discuss which option should be made for RACH type switch indication in the RACH report:**

* **Option 1: including an explicit switch indication in the IE related to the last/first RA attempt before/after the 2-step to 4-step RA switch.**
* **Option 2: including the parameter MsgA-Transmax in each PerRAInfo IE.**

## 2.3 How to reduce the reporting overhead of the measured RSRP of DL pathloss reference obtained prior to 2-step RACH procedure

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 2: We support to indicate in the RACH Report only whether DL beam quality is above or below the msgA-RSRP-Threshold-r16 (per RA ‎procedure)‎ in order to limit the amount of logging into the RACH Report. |
| R2-2107640 | Apple | Proposal 2: the only RSRP related information reported per RA attempt (in addition to the RSRP reported per RA report) is an indication of whether the DL beam quality is above or below the msgA-RSRP-ThresholdSSB; the dlRSRPAboveThreshold-r16 IE can be re-used for that. |

A FFS is left in the last RAN2 meeting regarding how to reduce the report overhead regarding ‘including the measured RSRP of DL pathloss reference obtained just before performing RACH procedure in 2step RACH report’. Both contributions support to have the indication per RACH procedure for reducing the overhead. As the RAN2 has only agreed that the measurement RSRP of DL pathloss reference before performing RACH procedure (one-shot) should be logged, no change is foreseen to the previous agreement.

**Proposal 3: RAN2 to agree that the measured RSRP of DL pathloss reference obtained just before performing RACH procedure to be logged in 2-step RACH report is of per RACH procedure granularity**

## MSGA PUSCH related information

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 6: Include in the UE RACH Report the payload size transmitted in MSGA for a 2-step RACH attempt. Additionally, the group type of a preamble (group A or group B) for the 2-step RACH attempt can be logged in the RACH Report. |
| R2-2108354 | ZTE | Proposal 1: MsgA PUSCH related information is included in 2step RA report.  Proposal 2: Include following PUSCH configuration used in 2step RA report:   * the MCS index , * the number of PRB per PO of of the PUSCH resource, * the combination of start symbol and length and PUSCH mapping type, * PUSCH group information, * Offset of lowest PUSCH occasion in frequency domain with respect to PRB 0 * The number of msgA PUSCH occasions FDMed in one time instance   Proposal 3: Include the padding size of the transmitted PUSCH payload in 2step RA report. |
| R2-2108418 | Ericsson | Proposal 3: Include information to allow the network to retrieve the preamble group used by the UE.  Proposal 4: RAN2 to consider including indication of whether the payload size is above or below the ra-MsgA-SizeGroupA threshold, and indication of whether the pathloss is above or below the pathloss threshold for group A/B selection.  Proposal 5: Include in the PerRAAttemptInfo IE an indication of the MsgA PUSCH resource the UE used in a 2-step RACH attempt (e.g., by specifying an indexing rule for MsgA PUSCH resources), thereby enabling the network to additionally derive the preamble index, preamble group and PRACH occasion the UE used. |
| R2-2108542 | CMCC | Proposal 3: Include the PUSCH resource allocated for msgA in the RA-Report. |

**Rapporteur Summary:**

Totally, four companies suggest including MSGA PUSCH resource related information in the RACH Report. The advantages of including such information are indicated as follows in their contributions:

* Optimization of ra-MsgASizeGroupA parameter
* Optimization of configuration of preambles and preamble groups A and B
* Optimization of configuration of physical layer parameters for PUSCH size of msgA,
* Adjusting the PO configuration

In the first step, RAN2 needs to discuss the need of including MSGA PUSCH resource related information in the RACH report. Subsequently, when the need is confirmed, further details of contents to be included in the RACH report could be discussed. As a result, rapporteur proposes RAN2 to discuss the necessity of including the MSGA PUSCH resource related information in 2-step RACH report.

**Proposal 4: RAN2 discusses the necessity of including the MSGA PUSCH resource related information in 2-step RA Report. FFS further details of the contents to be included in the RACH report.**

## Other aspects

***Logging of the switching information between contention-free RA and contention-based RA:***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 4: Log in the RACH Report every time there is a change in the RACH type and contention method (2-step CBRA to 4-step CBRA, 2-step CFRA to 2-step CBRA, 4-step CFRA to 4-step CBRA) to a different one. Include the reason for the change (e.g., switching after N attempts, fall back, no suitable beam found) for the RACH attempt when the change happens. |

***Optimization of the allocation of contention-free resources:***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 5: UE logs in the RACH Report the events of using CBRA RACH resources whenever CFRA resources were configured (but not used). |

***Logging preamble ID used in RACH transmission:***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 7: Log the preamble ID used in the RACH transmission in the RACH Report. |

***Detection and Resolving interference problem:***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 8: UE logs the type of scrambling identity (PCI or msgA-dataScramblingIndex) per MSGA PUSCH transmission in the RACH Report. In case msgA-dataScramblingIndex is configured, the UE can further include the index in the RACH Report. |

***RACH prioritization:***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 10: Consider RACH prioritization information logging in the RACH Report. |

***Report retrieval in MR-DC***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2107507 | Nokia | Proposal 9: We propose that UE reports the SN related RACH Report to the MN and the MN forwards it to the corresponding SN. |

***Logging additional DL beam RSRP:***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2108431 | Huawei | Proposal 1: In addition to the initial RSRP, the measured DL beam RSRP at the time of success is recorded in cases 1, 2, 4, 5, 6, 8.  Proposal 2: In addition to the initial RSRP, the best measured DL beam RSRP during the RA procedure is recorded in cases 3, 7. |

***Logging the Contention type information of the RACH:***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2108542 | CMCC | Proposal 1: To help network side understand the RA type that UE initiates, UE reports the RA types configured by network, e.g. 2-step RA, 4-step RA, or even 2-step CBRA, 2-step CFRA, 4-step CBRA, 4-step CFRA, in the RA-Report. |

***Resoloving RO collision issue:***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2108542 | CMCC | Proposal 5: Include the indication whether the RO is shared in the RA-Report. |

***The reason of fallback to 4-step RA***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2108542 | CMCC | Proposal 4: For the scenario that both 2-step RA and 4-step RA are configured, include the reason of fallback in the RA-Report, e.g. receiving the fallback indication from the gNB, maximum number of MSGA has been transmitted. |

***Fallback indicator granularity***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2108642 | Samsung | Proposal 2: RAN2 to discuss if the new fallback indicator is introduced in the PerRAAttemptInfo, perRAInfo or RA-InformationCommon. |

***Whether or not the MsgA was transmitted during RA attempt***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2108642 | Samsung | Proposal 3: an indicator can be introduced to indicate whether MsgA PUSCH was transmitted or not during this RA attempt |

***UE Power Limits in MR-DC***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2108642 | Samsung | Proposal 4: The UE indicates whether the UE could not transmit a PRACH due to the power limitation arising from the power allocation related to MR-DC (e.g., EN-DC, NE-DC, or NR-DC). The UE indicates whether the UE had to reduce its PRACH transmission power due to the power limitation arising from the power allocation related to MR-DC. |

**Rapporteur Summary:**

These issues are all raised by one company only, respectively. Rapporteur think that an email discussion might be needed to collect other companies’ view on all above proposals before online discussion, and therefore propose to postpone the discussion on these proposals

**Proposal 5: RAN2 to postpone the discussion on other candidate proposals for RA report enhancement, since only one company raise them, respectively, and it would be better to schedule an email discussion collecting companies views on them.**

# Conclusion

Based on summary of [1-11], we have the following proposals, and the following categorization has been used.

* **Cat-a-Proposal:** a potential easy agreement, e.g. Proposals where consensus exists, that seem straightforward to agree.
* **Cat-b-Proposal:** need further discussion. These should be tagged with e.g. [FFS] so they are clearly visible, and should indicate what the primary controversy is.
* **Cat-c-Proposal:** a candidate for immediate postpone, e.g. issues that may require other WG discussions or is contentious such that it is unlikely to converge at e-Meeting.

**Proposal 1 (Cat-b-Proposal): RAN2 to agree that the RACH type is not needed to be included in the RACH report, since it could be easily inferred from other 2-step RACH specific information included in the RACH report.**

**Proposal 2(Cat-a-Proposal): RAN2 to discuss which option should be made for RACH type switch indication in the RACH report:**

* **Option 1: including an explicit switch indication in the IE related to the last/first RA attempt before/after the 2-step to 4-step RA switch.**
* **Option 2: including the parameter MsgA-Transmax in each PerRAInfo IE.**

**Proposal 3 (Cat-a-Proposal): RAN2 to agree that the measured RSRP of DL pathloss reference obtained just before performing RACH procedure to be logged in 2-step RACH report is of per RACH procedure granularity**

**Proposal 4 (Cat-b-Proposal): RAN2 discusses the necessity of including the MSGA PUSCH resource related information in 2-step RA Report. FFS further details of the contents to be included in the RACH report.**

**Proposal 5 (Cat-c-Proposal): RAN2 to postpone the discussion on other candidate proposals for RA report enhancement, since only one company raise them, respectively, and it would be better to schedule an email discussion collecting companies views on them.**

# Reference

1. R2-2107392, Discussion on 2-step RACH reporting, OPPO
2. R2-2107507, Remaining Issues and New Aspects in 2-step NR UE RACH Report, Nokia
3. R2-2107640, On 2-step RACH SON, Apple
4. R2-2107718, Discussion on remaining issues of 2-step RACH report, vivo
5. R2-2107822, The remaining Issues of RACH Report for 2-step RACH, CATT
6. R2-2108354, 2-step RA related enhancements, ZTE
7. R2-2108418, 2-step RA information for SON purposes, Ericsson
8. R2-2108431, Discussion on 2 step RA related SON aspects, Huawei
9. R2-2108542, SON Enhancement for 2-step RA, CMCC
10. R2-2108642, SON Enhancements for 2SRA, Sumsung
11. R2-2108780, RA report for 2-step RA, Sharp
12. R2-2103093, Report of [Post113-e][852][NR17 SON/MDT] 2 step RA and other SON changes, CATT