3GPP TSG RAN WG2#114-e                                             R2-210xxxx

Electronic meeting, 19th April – 27th April, 2021

Agenda Item: 8.13.2.2

Source: CATT

Title: [Pre114-e][802][SON/MDT] Summary on agenda item 8.13.2.2 2-step RA related SON aspects

Document for: Discussion and Decision

# Introduction

This document provides the summary of the contributions submitted to agenda item 8.13.2.2 of #114-e meeting [1-10]. Taking the company proposals into account, section 3 provides sets of proposals for easy agreement, as well as for further discussions.

# Discussion

## Signalling model and RA report structure

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| **TDoc** | **Company name** | **Proposals** |
| R2-2104931 | CATT | Proposal 1: Enhance *ra-InformationCommon-r16* to include the 2-step RA related information. |
| R2-2105334 | Vivo | Proposal 3: RAN2 to choose one of the following options as the signalling model of 2-step RA report:   1. enhance the legacy field ra-InformationCommon to include 2-step RA related frequency parameters; 2. adopt a new field ra-InformationCommon-2step to include all 2-step specific information. |
| R2-2105466 | Oppo | Proposal 1: RAN2 to discuss which option shall be selected to introduce 2-step RACH related information in RACH report for SON purpose.   * Option1: A new field, quoted as ra-InformationCommnon-2step, is defined dedicatedly for 2-step RACH * Option2: 2-step RA related information is included in ra-InformationCommon-r16 |
| R2-2105839 | ZTE | Proposal 4: It is proposed to use one RA entry for one RA procedure, and the same IE (RA-InformationCommon) in the RA entry to include both 2step RA and 4step RA information of the same RA procedure. |
| R2-2106026 | Ericsson | Proposal 1 A dedicated twostepRAReport IE for 2-step RA attempts is introduced in the RA-Report (Option 1). |
| R2-2106185 | Samsung | Proposal 1: RAN2 discusses ASN.1 structure of RA Report before introducing new indicators.  Proposal 2: RAN2 discusses if information on only single type of RA can be included in a RA Report entry or not. |

**Rapporteur Summary:**

This issue is mainly about the case when switching from 2-step RA to 4-step RA due to reaching a maximum transmission times occurs. In this case there are different views regarding whether the information for 2-step RA and 4-step RA should be put in one RA report entry or different entries.

Five companies have proposals for RA report structure based on one RA Report entry, one company pointed out this issue without clear preference.

Based on majority’s preference we could try to agree on the following proposal.

**Proposal 1 If a RA procedure switching from 2-step RA to 4-step RA occurs, one RA report entry is used to convey RA information for 2-step RA and 4-step RA attempts.**

From the contributions, there are three options to include 2-step RA related information in *RA-Report-r16*:

* Option 1: introduce a new field, e.g. ra-InformationCommon2step, to include all 2-step RA specific information;
* Option 2: enhance the legacy field ra-InformationCommon to include 2-step RA related information;
* Option 3: introduce a new field, e.g. twostepRAReport, using the legacy IE RA-InformationCommon, and extend the IE RA-InformationCommon to include 2-step RA related information.

Two companies prefer option 2, one company proposes option3, and two companies propose RAN2 to discuss the option 1 and option 2. One company proposes to discuss the ASN.1 structure of RA Report before introducing new indicators.

It seems more discussions are needed on the options.

**Proposal 2 RAN2 discusses which option should be selected to introduce 2-step RACH related information in RACH report**

* **Option 1: introduce a new field, e.g. ra-InformationCommon2step, to include all 2-step RA specific information;**
* **Option 2: enhance the legacy field ra-InformationCommon to include 2-step RA related information;**
* **Option 3: introduce a new field, e.g. twostepRAReport, using the legacy IE of RA-InformationCommon, and extend the IE RA-InformationCommon to include 2-step RA related information.**

## RA type indication in RA Report

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| **TDoc** | **Company name** | **Proposals** |
| R2-2104931 | CATT | Proposal 2: RA type ‎per RA procedure is known ‎implicitly by NW. |
| R2-2105334 | 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. |
| R2-2105477 | 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). |
| R2-2105839 | ZTE | Proposal 2: Explicit RA type indication is included in RA report once to indicate the RA type selected during initialization part. |
| R2-2106185 | Samsung | Proposal 3: Based on the agreeable ASN.1 structure, RAN2 discusses the following indicators:  - how to indicate the random access type, i.e. 2SRA or 4SRA,  - whether to indicate if switching to 4SRA happened during random access procedure |
| R2-2106236 | 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. |

**Rapporteur Summary:**

Three companies propose to use explicit indication of the RA Type in the RACH Report, one company further propose to report the contention type related information. Two companies propose that RA type can be known implicitly by NW. One company suggests the RA type indication can be decided based on ASN.1 structure.

There have been extensive discussions on this matter from the last meeting [11], and it is observed that majority of companies think the RA type can be known by 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.

A few companies still prefer explicit indication.

To progress on this, Rapporteur suggests a 2-step discussion to confirm companies’ common understanding.

**Proposal 3 RAN2 confirms that network is able to know the RA type based on the 2-step RA specific information in RA report (as per previously agreed RA report information), e.g. 2-step RA frequency related information and measured RSRP of DL pathloss reference.**

**Proposal 4 RAN2 further discuss whether the RA type should be indicated explicitly in RA report.**

## Switching information in 2-step RA report

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| **TDoc** | **Company name** | **Proposals** |
| R2-2105334 | 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 by UE due to ‎reaching a configured MSGA ‎transmission times. |
| R2-2105466 | Oppo | Proposal 2: Introduce a type switching indication in 2-step RA report. The indication can be implicit by introducing a sperate IE to record 2-step RA related information. |
| R2-2105839 | ZTE | Proposal 3: UE includes MsgA-Transmax if configured explicitly in RA report to assist NW to derive the RA type switch information. |
| R2-2106026 | Ericsson | Proposal 2 If RAN2 agrees to include in the same perRAInfoList both 2-step RA and 4-step RA attempts (Option 2), a new field is introduced, e.g. in the RA-InformationCommon or perRAInfoList, to aid the network to distinguish the 2-step RA attempts in the perRAInfoList. |
| R2-2106133 | 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. |
| R2-2106185 | Samsung | Proposal 3: Based on the agreeable ASN.1 structure, RAN2 discusses the following indicators:  - how to indicate the random access type, i.e. 2SRA or 4SRA,  - whether to indicate if switching to 4SRA happened during random access procedure |
| R2-2106236 | CMCC | Proposal 2: UE reports the information that can distinguish 2-step RA from 4-step RA in the granularity of per-RA procedure. |

**Rapporteur Summary:**

From the contributions, there are three options provided for network to know whether ‎switching from 2-step RA to 4-step ‎RA is performed by UE due to ‎reaching a configured MSGA ‎transmission times:

* Option 1: network knows implicitly whether ‎switching from 2-step RA to 4-step ‎RA is performed by UE
* by the introduced separate IE to record 2-step RA related information, if any; or
* the NW could itself maintain the i.e. value of MsgA-Transmax
* Option 2: including an explicit switching indication in 2-step RA report
* Option 3: including MsgA-Transmax in 2-step RA report

There are two companies support option 1, one company supports option 2 if network cannot derive the switching from the RA report signalling structure, one company proposes option 3 to assist NW to derive the RA type switch information, and one company is ok for option 2 or option 3 if both 2-step RA and 4-step RA attempts is included in the same perRAInfoList.

According the section 2.1, there are three options for RA report structure, the details of switching information can be decided based on RA report structure. Given these, rapporteur suggests postponing this discussion until there is some progress on signalling model and RA report structure.

**Proposal 5 RAN2 discusses switching information based on the progress of signalling model and RA report structure.**

## MSGA PUSCH related information

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| **TDoc** | **Company name** | **Proposals** |
| R2-2105477 | 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.  Proposal 7: Log the preamble ID used in the RACH transmission in the RACH Report.  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. |
| R2-2105839 | ZTE | Proposal 1-1: MsgA PUSCH related information can be considered in 2step RA report to assist optimizing 2step RA configuration.  Proposal 1-2: It is proposed to include the following PUSCH configuration of the PUSCH resource 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, * the padding size of the transmitted PUSCH payload * Offset of lowest PUSCH occasion in frequency domain with respect to PRB 0 * The number of msgA PUSCH occasions FDMed in one time instance |
| R2-2106026 | Ericsson | [Proposal 3 Include information to allow the network to retrieve the preamble group used by the UE.](#_Toc71571423)  [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.](#_Toc71571424)  [Proposal 5 Include information in the PerRAAttemptInfo IE which allows the network to identify at least the MsgA PUSCH resource the UE used in a 2-step RA attempt.](#_Toc71571425)  [Proposal 6 Include in the PerRAAttemptInfo IE an indication of the MsgA PUSCH resource the UE used in a 2-step RA 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.](#_Toc71571426) |
| R2-2106236 | CMCC | Proposal 3: Include the PUSCH resource allocated for msgA in the RA-Report. |

**Rapporteur Summary:**

Four companies propose to include MSGA PUSCH resource related information in RA Report. Two companies propose to report the preamble group related information to optimize the preamble group A/B configuration, one company further propose to include the preamble ID used by the UE.

Since the preamble group or other information not related MSGA PUSCH payload are not the 2-step RA specific information, the rapporteur proposes RAN2 to discuss whether the MSGA PUSCH resource related information should be included in 2-step RA Report.

**Proposal 6 RAN2 discusses whether to introduce the MSGA PUSCH resource related information in 2-step RA Report. If yes, FFS which MSGA PUSCH resource related information to include.**

## Other aspects

***The reason of RA attempt failure for 2-step RA and 4-step RA***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2104931 | CATT | Proposal 3: Including the reason of RA attempt failure for 2-step RA and 4-step RA in RA report. |

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

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| **TDoc** | **Company name** | **Proposals** |
| R2-2106236 | 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.  Proposal 5: Include the indication whether the RO is shared in the RA-Report. |

***2-step and 4-step CFRA, 2-step and 4-step CBRA***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2105477 | 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.  Proposal 5: UE logs in the RACH Report the events of using CBRA RACH resources whenever CFRA resources were configured (but not used). |

***DL beam quality***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2105863 | 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. |
| R2-2105477 | 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. |

***RACH prioritization***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2105477 | Nokia | Proposal 10: Consider RACH prioritization information logging in the RACH Report. |

***SgNB RA report***

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| **TDoc** | **Company name** | **Proposals** |
| R2-2105477 | 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. |
| R2-2105839 | ZTE | Proposal 5: For NR-DC, SgNB RA report is submitted to MN in UEInformationResponse, i.e., no need to update the specs.  Proposal 6: For (NG)EN-DC, UE report SgNB RA report to MN using UEInformationResponse information as defined in TS 36.331, by including SgNB RA report in NR container. |
| R2-2106026 | Ericsson | Proposal 7 The sgNB RA-Report are transmitted in SRB1 (via the MN) or SRB3 to the SN, i.e. the UEInformationResponse/Request are transferred within the UL/DLInformationTransferMRDC.  Proposal 8 The UE includes the PCell in the RA report in case the RA occurred in an SCell. |

**Rapporteur Summary:**

Since the above topics are proposed by only few company, and it is unclear what is the majority view for them. Meanwhile, the discussion on sgNB RA report is not in the scope of AI 8.13.2.2. Therefore, Rapporteur proposes to postpone these to further discussions.

**Proposal 7 FFS on other potential content in RA Report.**

# Conclusion

Based on summary of [1]-[10], we have the following proposals. The proposals are highlighted as such

* potentially easy agreement
* for discussion and potential agreement in this meeting, and
* for further discussions

‎*Signalling model and RA report structure*

**Proposal 1(**potentially easy agreement**) If a RA procedure switching from 2-step RA to 4-step RA occurs, one RA report entry is used to convey RA information for 2-step RA and 4-step RA attempts.**

**Proposal 2(**for discussion and potential agreement in this meeting**) RAN2 discusses which option should be selected to introduce 2-step RACH related information in RACH report**

* **Option 1: introduce a new field, e.g. ra-InformationCommon2step, to include all 2-step RA specific information;**
* **Option 2: enhance the legacy field ra-InformationCommon to include 2-step RA related information;**
* **Option 3: introduce a new field, e.g. twostepRAReport, using the legacy IE of RA-InformationCommon, and extend the IE RA-InformationCommon to include 2-step RA related information.**

*RA type indication in RA Report*

**Proposal 3(**potentially easy agreement**) RAN2 confirms that network is able to know the RA type based on the 2-step RA specific information in RA report (as per previously agreed RA report information), e.g. 2-step RA frequency related information and measured RSRP of DL pathloss reference.**

**Proposal 4(**for discussion and potential agreement in this meeting**) RAN2 further discuss whether the RA type should be indicated explicitly in RA report.**

*Switching information in RA Report*

**Proposal 5(**for discussion and potential agreement in this meeting**) RAN2 discusses switching information based on the progress of signalling model and RA report structure.**

*MSGA PUSCH related information*

**Proposal 6(**for discussion and potential agreement in this meeting**) RAN2 discusses whether to introduce the MSGA PUSCH resource related information in 2-step RA Report. If yes, FFS which MSGA PUSCH resource related information to include.**

‎*Other aspects*

**Proposal 7(**for further discussions**) FFS on other potential content in RA Report.**

# Reference

1. R2-2104931 Further Discussion on RACH Report for 2-step RACH CATT discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core
2. R2-2105334 Discussion on signalling and content of 2-stepRA report vivo discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core
3. R2-2105466 Discussion on 2-step RACH reporting in SON OPPO discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core
4. R2-2105477 Remaining Issues and New Aspects in 2-step NR UE Report Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core
5. R2-2105839 Remaining issues on RA related enhancements ZTE Corporation, Sanechips discussion Rel-17
6. R2-2105863 Discussion on 2 step RA related SON aspects Huawei, HiSilicon discussion Rel-17
7. R2-2106026 2-Step RA information for SON purposes Ericsson discussion NR\_ENDC\_SON\_MDT\_enh-Core
8. R2-2106133 Discussion on RA information for 2-step RA SHARP discussion NR\_ENDC\_SON\_MDT\_enh-Core R2-2104057
9. R2-2106236 SON Enhancement for 2-step RA CMCC discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core
10. R2-2106185 SON Enhancements for 2SRA, Successful HO Report and Others Samsung discussion NR\_ENDC\_SON\_MDT\_enh-Core
11. R2-2103093 Report of [Post113-e][852][NR17 SON/MDT] 2 step RA and other SON changes (CATT) CATT discussion Rel-17 NR\_ENDC\_SON\_MDT\_enh-Core