**3GPP TSG-RAN RAN2 #121 R2-2304196**

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

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

**Source: Apple (rapporteur)**

**Title:** **Summary of 7.13.6 RACH enhancement**

**Document for: Discussion and Decision**

# 1 Introduction

This report summarizes the proposals from the contributions submitted to agenda item 7.13.6.

The summarized proposals (for discussion online) are provided in section 3.

The input papers are listed in section 4.

# 2 Discussion

## 2.1 Proposals as submitted to the meeting

|  |  |
| --- | --- |
| **Company** | **Proposals** |
| R2-2302614, CATT | Proposal 1: UE reports both the MN and the SN RACH information to the MN node by network requesting message in EN-DC and NG-EN-DC scenarios, and it is not necessary to introduce available indicator for NR SN RACH report.  Proposal 2: Additional capability may be needed for NR RACH Report enhancement in LTE for EN-DC and NG-EN-DC scenarios.  Proposal 3: Define a flag to indicate whether RA-SDT procedure is successful or not.  Proposal 4: RAN2 to down select one of the options to associate SDT and the new flag to indicate whether RA-SDT procedure is successful or not:  - Associating with feature or feature combination triggering the RACH and or used for RACH;  - Defining one new RA purpose for RA-SDT.  Proposal 5: The UE reports the RACH resource configuration for feature/feature combination for SON.  Proposal 6: The UE indicates the featurePriorities information for feature /feature combination for SON. |
| R2-2302856, Nokia | Proposal 1: RAN2 specifies UE-based solution for RA report retrieval in Rel-18.  Proposal 2: Rel-18 supports RA Report retrieval based on a separate availability bit for RA-report. |
| R2-2303145, ZTE | Proposal 1: Other than the existing RA resource information included in RA report, UE also includes below parameters in RA report if configured for the corresponding RA partition associated to this RA procedure:   * The starting preamble index associated to this RA partition * The total number of preambles associated to this RA partition   Proposal 2: UE includes RSRP of downlink pathloss reference for 4-step RA.  Proposal 3: Include Msg3 repetition number configured and applied for the RA procedure. |
| R2-2303368, Apple | Proposal 1: there is no need to introduce a new signaling to indicate to the network whether msg3 repetition has been applied and if so, the number of repetitions, as the network already has this information.  Proposal 2: signalling of the NSAG priority (or “NSAG information” besides NSAG ID) which is only known to UE and AMF (but not to NG-RAN) is not needed. |
| R2-2303454, E/// | Proposal 1 Include information in the RA report on whether the random-access procedure was executed towards an MCG cell or an SCG cell.  Proposal 2 Enhance the LTE UE information Request procedure with NR RA-Report request flag to fetch the NR RA-Report in LTE.  Proposal 3 UE include the following info in the RA report  a. start preamble index  b. the number of preambles in the partition.  Proposal 4 UE include slice information, i.e., S-NSSAI(s) that triggered the RACH through a given partition in the RA report.  Proposal 5 UE reports the data volume at the time of attempting for SDT operation, if the data volume is less than a data volume reporting threshold, as part of the RA Report.  Proposal 6 RAN2 discuss whether the data volume reporting threshold should be configurable or determined based on the sdt-DataVolumeThreshold. |
| R2-2303670, Samsung | Proposal 1: The list of NSAGs that triggered feature specific RACH can be one of the below   1. The NSAGs which are associated with the S-NSSAI(s) that triggered the random access attempt. 2. The NSAGs associated with the S-NSSAI(s) triggering the access attempt and that are included in SIB1 (i.e., in FeatureCombination and in RA-PrioritizationSliceInfo).   Proposal 2: RAN2 to confirm option b in P2 for the NSAGs that triggered feature specific RACH.  Proposal 3: UE logs and reports the NAS provided NSAG priority for the NSAGs that triggered random access.  Proposal 4: If MSG3 repetition has failed, UE reports the number of MSG3 repetitons performed and the used MCS.  Proposal 5: UE logs and reports the applicable features in the feature combination in the priority order in the RA Report.  Proposal 6: Feature specific RACH information is included in RA-InformationCommon and is also included for RLF report and CEF report. |
| R2-2303783, CT | Proposal 1: No need to support UE-based solutions for CU-DU split scenarios  Proposal 2: To include the indication of whether the RSRP is above rsrp-ThresholdMsg3 in RACH report.  Proposal 3: To include the number of Msg3 repetition in RACH report. |
| R2-2303798, CMCC | Proposal 1: No UE based solution is introduced for CU-DU split scenarios.  Proposal 2: RAN2 confirms that for slicing, NSAG-ID(s) reported by UE at least includes the applied NSAG-ID(s) and not applied NSAG-ID(s) which has higher priority than applied NSAG-ID(s) in the random access procedure.  Proposal 3: UE reports the information of NSAG priority (e.g. the exact priority value or the order of NSAG ID based on priority) in the RACH report. |
| R2-2303806, Xiaomi | Proposal 1: RAN2 agrees to include the feature priority into the RACH report.  Proposal 2: RAN2 considers to include the NSAG priority into the RACH report when the applicable feature is slicing.  Proposal 3: RAN2 considers to enable the addition in the RACH Report of RACH partition configuration information.  Proposal 4: RAN2 agrees the approach of enabling the addition of RACH partition configuration information in 2), i.e. UE includes the start preamble index and the number of preambles in the partition for which the RACH Report was generated into the RA report. |
| R2-2303829, Sharp | Proposal 1: include Msg3 repetition number configured and applied for the RA procedure in RA report.  Proposal 2: NAS provided NSAG priority is not included in RA report.  Proposal 3: UE includes RA and SDT information in RA report when RA procedure failure in SDT initial transmission phase.  Proposal 4: introduce a new RA purpose for SCG activation/deactivation, and other enhancements can be discussed in later release. |
| R2-2303957, Huawei | Proposal 1: It is proposed RAN2 to agree on including the feature priorities assigned to UE in RA report.  Proposal 2: It is proposed to enhance the RA report by including the selected feature(s) to enable the network to have sufficient information for RACH optimization. |

## 2.2 Issues, views, and moderator’s suggestions

### 2.2.1 RA report availability indication

R2-2302614, CATT:

Proposal 1: UE reports both the MN and the SN RACH information to the MN node by network requesting message in EN-DC and NG-EN-DC scenarios, and it is not necessary to introduce available indicator for NR SN RACH report.

R2-2302856, Nokia:

Proposal 1: RAN2 specifies UE-based solution for RA report retrieval in Rel-18.

Proposal 2: Rel-18 supports RA Report retrieval based on a separate availability bit for RA-repor

Moderator’s comments:the majority prefers not to introduce a UE-based solution; furthermore, as was pointed out in the email discussion, RAN3 have already agreed to introduce a network-based solution. One company still think a UE-based solution is needed, hence the proposal::

**Proposal 1: to discuss whether to introduce availability indicator for RA-report.**

### 2.2.2 msg3 repetition

R2-2303145, ZTE:

Proposal 3: Include Msg3 repetition number configured and applied for the RA procedure.

R2-2303368, Apple:

Proposal 1: there is no need to introduce a new signaling to indicate to the network whether msg3 repetition has been applied and if so, the number of repetitions, as the network already has this information.

R2-2303670, Samsung

Proposal 4: If MSG3 repetition has failed, UE reports the number of MSG3 repetitons performed and the used MCS.

R2-2303783, CT

Proposal 3: To include the number of Msg3 repetition in RACH report.

R2-2303829, Sharp

Proposal 1: include Msg3 repetition number configured and applied for the RA procedure in RA report.

Moderator’s comments: 4 out of 5 companies support inclusion of the number of msg3 repetitions in RA report:

**Proposal 2: to include the number of msg3 repetitions in RA report.**

### 2.2.3 Slicing

R2-2303368, Apple

Proposal 2: signalling of the NSAG priority (or “NSAG information” besides NSAG ID) which is only known to UE and AMF (but not to NG-RAN) is not needed.

R2-2303454, E///

Proposal 4 UE include slice information, i.e., S-NSSAI(s) that triggered the RACH through a given partition in the RA report.

R2-2303670, Samsung

Proposal 1: The list of NSAGs that triggered feature specific RACH can be one of the below

1. The NSAGs which are associated with the S-NSSAI(s) that triggered the random access attempt.
2. The NSAGs associated with the S-NSSAI(s) triggering the access attempt and that are included in SIB1 (i.e., in FeatureCombination and in RA-PrioritizationSliceInfo).

Proposal 2: RAN2 to confirm option b in P2 for the NSAGs that triggered feature specific RACH.

Proposal 3: UE logs and reports the NAS provided NSAG priority for the NSAGs that triggered random access.

R2-2303798, CMCC

Proposal 2: RAN2 confirms that for slicing, NSAG-ID(s) reported by UE at least includes the applied NSAG-ID(s) and not applied NSAG-ID(s) which has higher priority than applied NSAG-ID(s) in the random access procedure.

Proposal 3: UE reports the information of NSAG priority (e.g. the exact priority value or the order of NSAG ID based on priority) in the RACH report.

R2-2303806, Xiaomi

Proposal 2: RAN2 considers to include the NSAG priority into the RACH report when the applicable feature is slicing.

R2-2303829, Sharp

Proposal 2: NAS provided NSAG priority is not included in RA report.

Moderator’s comments:

* On NSAG priority, 3 out 5 companies would like to include it, whereas 2 companies believe it is not needed. Therefore, the proposal is to discuss this inline.
* On NSAG IDs, there are different views on how to interpret the agreement to include NSAG ID. In 03670 Samsung list two options:

1. The NSAGs which are associated with the S-NSSAI(s) that triggered the random access attempt.
2. The NSAGs associated with the S-NSSAI(s) triggering the access attempt and that are included in SIB1 (i.e., in FeatureCombination and in RA-PrioritizationSliceInfo).

* Samsung prefer option b, whereas CMCC in 03798 prefer a. Therefore the proposal is to discuss which NSAG IDs signalling option to adopt.
* Furthermore, E/// in 03454 propose to also include S-NSSAI(s).

**Proposal 3a: to discuss whether to include NSAG priority in RA report.**

**Proposal 3b: to discuss whether UE reports NSAG IDs which are associated with the S-NSSAI(s) that triggered the random access attempt or NSAG IDs which associated with the S-NSSAI(s) triggering the access attempt and that are included in SIB1.**

**Proposal 3c: to discuss whether to include S-NSSAI(s) in RA report.**

### 2.2.4 RACH resource configuration

R2-2302614, CATT

Proposal 5: The UE reports the RACH resource configuration for feature/feature combination for SON.

R2-2303145, ZTE

Proposal 1: Other than the existing RA resource information included in RA report, UE also includes below parameters in RA report if configured for the corresponding RA partition associated to this RA procedure:

* The starting preamble index associated to this RA partition
* The total number of preambles associated to this RA partition

R2-2303454, E///

Proposal 3 UE include the following info in the RA report

a. start preamble index

b. the number of preambles in the partition.

R2-2303806, Xiaomi

Proposal 3: RAN2 considers to enable the addition in the RACH Report of RACH partition configuration information.

Proposal 4: RAN2 agrees the approach of enabling the addition of RACH partition configuration information in 2), i.e. UE includes the start preamble index and the number of preambles in the partition for which the RACH Report was generated into the RA report.

Moderator’s comments: 4 companies propose to include RA resource information in RA report. Some companies provide more detailed proposals, specifically to include the starting preamble index and the number of preambles

**Proposal 4: to include in the RA report the following RA resource information: start preamble index, number of preambles in the partition.**

### 2.2.5 SDT

R2-2302614, CATT

Proposal 3: Define a flag to indicate whether RA-SDT procedure is successful or not.

Proposal 4: RAN2 to down select one of the options to associate SDT and the new flag to indicate whether RA-SDT procedure is successful or not:

- Associating with feature or feature combination triggering the RACH and or used for RACH;

- Defining one new RA purpose for RA-SDT.

R2-2303454, E///

Proposal 5 UE reports the data volume at the time of attempting for SDT operation, if the data volume is less than a data volume reporting threshold, as part of the RA Report.

Proposal 6 RAN2 discuss whether the data volume reporting threshold should be configurable or determined based on the sdt-DataVolumeThreshold

R2-2303829, Sharp

Proposal 3: UE includes RA and SDT information in RA report when RA procedure failure in SDT initial transmission phase.

Moderator’s comments:

* Regarding the proposals in 02614, the moderator’s interpretation of the essence of the proposals is to allow reporting of SDT failure simultaneously with other feature combinations that triggered RA.
* Data volume reporting in 03454 is a separate proposal.
* In 03829 it is proposed to clarify what is considered an SDT failure.

**Proposal 5a : to discuss whether to allow reporting of SDT failure simultaneously with other feature combinations that triggered RA.**

**Proposal 5b: UE reports the data volume at the time of attempting for SDT operation, if the data volume is less than a data volume reporting threshold, as part of the RA Report.**

**Proposal 5c: failure in the SDT initial transmission phase is considered for the purpose of RA report.**

### 2.2.6 Feature priorities

R2-2302614, CATT

Proposal 6: The UE indicates the featurePriorities information for feature /feature combination for SON.

R2-2303806, Xiaomi

Proposal 1: RAN2 agrees to include the feature priority into the RACH report.

R2-2303957, Huawei

Proposal 1: It is proposed RAN2 to agree on including the feature priorities assigned to UE in RA report.

Proposal 2: It is proposed to enhance the RA report by including the selected feature(s) to enable the network to have sufficient information for RACH optimization.

R2-2303670, Samsung

Proposal 5: UE logs and reports the applicable features in the feature combination in the priority order in the RA Report.

Moderator’s comments: 4 companies propose to include feature priorities in RA report. Furthermore, 2 companies propose to include applicable features.

**Proposal 6: to include in the RA report the applicable features and feature priorities.**

### 2.2.7 CU-DU split scenarios

Note: this section is voided, and P7 is merged into P1 (section 2.2.1)

### 2.2.8 RSRP

R2-2303145, ZTE

Proposal 2: UE includes RSRP of downlink pathloss reference for 4-step RA.

R2-2303783, CT

Proposal 2: To include the indication of whether the RSRP is above rsrp-ThresholdMsg3 in RACH report.

Moderator’s comments: both companies that submitted papers agree, hence the proposal is.

**Proposal 8: UE includes RSRP of downlink pathloss reference for 4-step RA.**

### 2.2.9 Other miscellaneous proposals

R2-2302614, CATT

Proposal 2: Additional capability may be needed for NR RACH Report enhancement in LTE for EN-DC and NG-EN-DC scenarios.

R2-2303454, E///

Proposal 1 Include information in the RA report on whether the random-access procedure was executed towards an MCG cell or an SCG cell.

Proposal 2 Enhance the LTE UE information Request procedure with NR RA-Report request flag to fetch the NR RA-Report in LTE.

R2-2303670, Samsung

Proposal 6: Feature specific RACH information is included in RA-InformationCommon and is also included for RLF report and CEF report.

R2-2303829, Sharp

Proposal 4: introduce a new RA purpose for SCG activation/deactivation, and other enhancements can be discussed in later release.

Moderator’s comments: these proposals appear only in one contribution, therefore the moderator’s suggestion is to discuss them online.

**Proposal 9a: Additional capability may be needed for NR RACH Report enhancement in LTE for EN-DC and NG-EN-DC scenarios.**

**Proposal 9b:** **Include information in the RA report on whether the random-access procedure was executed towards an MCG cell or an SCG cell.**

**Proposal 9c: Enhance the LTE UE information Request procedure with NR RA-Report request flag to fetch the NR RA-Report in LTE.**

**Proposal 9d: Feature specific RACH information is included in RA-InformationCommon and is also included for RLF report and CEF report.**

**Proposal 9e: introduce a new RA purpose for SCG activation/deactivation, and other enhancements can be discussed in later release.**

# 3 Conclusion

RA report availability indication

**Proposal 1: to discuss whether to introduce availability indicator for RA-report.**

msg3 repetition

**Proposal 2: to include the number of msg3 repetitions in RA report.**

Slicing

**Proposal 3a: to discuss whether to include NSAG priority in RA report.**

**Proposal 3b: to discuss whether UE reports NSAG IDs which are associated with the S-NSSAI(s) that triggered the random access attempt or NSAG IDs which associated with the S-NSSAI(s) triggering the access attempt and that are included in SIB1.**

**Proposal 3c: to discuss whether to include S-NSSAI(s) in RA report.**

RACH resource configuration

**Proposal 4: to include in the RA report the following RA resource information: start preamble index, number of preambles in the partition.**

SDT

**Proposal 5a: to discuss whether to allow reporting of SDT failure simultaneously with other feature combinations that triggered RA.**

**Proposal 5b: UE reports the data volume at the time of attempting for SDT operation, if the data volume is less than a data volume reporting threshold, as part of the RA Report.**

**Proposal 5c: failure in the SDT initial transmission phase is considered for the purpose of RA report.**

Feature priorities

**Proposal 6: to include in the RA report the applicable features and feature priorities.**

RSRP

**Proposal 8: UE includes RSRP of downlink pathloss reference for 4-step RA.**

Other miscellaneous proposals

**Proposal 9a: Additional capability may be needed for NR RACH Report enhancement in LTE for EN-DC and NG-EN-DC scenarios.**

**Proposal 9b:** **Include information in the RA report on whether the random-access procedure was executed towards an MCG cell or an SCG cell.**

**Proposal 9c: Enhance the LTE UE information Request procedure with NR RA-Report request flag to fetch the NR RA-Report in LTE.**

**Proposal 9d: Feature specific RACH information is included in RA-InformationCommon and is also included for RLF report and CEF report.**

**Proposal 9e: introduce a new RA purpose for SCG activation/deactivation, and other enhancements can be discussed in later release.**

# 3 References

R2-2302614 RACH enhancement for SON CATT discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

R2-2302856 RA report retrieval Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

R2-2303145 Consideration on RACH enhancements ZTE Corporation, Sanechips discussion Rel-18

R2-2303368 Remaining issues of SON enhancements for RACH Apple discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

R2-2303454 RA report enhancement Ericsson discussion NR\_ENDC\_SON\_MDT\_enh2-Core

R2-2303670 SON/MDT enhancements for RACH Samsung R&D Institute India discussion

R2-2303783 Discussion on RACH enhancement for SON China Telecom discussion

R2-2303798 Further considerations on RACH Enhancement CMCC discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

R2-2303806 Consideration on the SON enhancements for RACH report Beijing Xiaomi Software Tech discussion Rel-18

R2-2303829 SON enhancement for RA report Sharp discussion

R2-2303957 Discussion on RACH enhancement Huawei, HiSilicon discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

# 4 Agreements from previous meetings (for information)

## 4.1 RAN2#121

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

Agreements:

1: To have “a list of SN RA report entries as a single NR container (i.e. NR RA-ReportList)”.

=> It is not supported in R18 that UE reports NR RACH Report to LTE cell when the UE is in standalone LTE.

=> RAN2 assumes that the following two alternatives are feasible and would like to check RAN3’s views:

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

- Alt 2c: Includes the last PSCell identity (in NR RA-ReportList)

## 4.2 RAN2#120

Agreements:

1 For RACH report for RACH partitioning, RAN2 to agree to include NSAG ID when the applicable feature is slicing.

2 RACH report enhancements required for NE-DC are de-prioritized.

3 For EN-DC and NG-EN-DC, the UE collects SN RA report container (for NR) and reports to the LTE MN. FFS on whether and which PSCell identity UE should report outside the RACH report.

4 UE includes RA and SDT information in RA report when an SDT operation fails.

FFS: Include Msg3 repetition number configured and applied for the RA procedure.

FFS: For RACH report for RACH partitioning, RAN2 to discuss whether to include NAS provided NSAG priority (or ifnormation) when the applicable feature is slicing.

## 4.3 RAN2#119bis

Agreements:

For RACH report about RACH partitioning information

1 Agree to add the following parameters into RACH report for RACH partitioning:

- Feature or the combination of features that triggered the RACH

- Used feature combination