**3GPP TSG RAN WG2 Meeting #117-e**   **R2-220xxxx**

**E-Meeting, 21st February – 3rd March 2022**

**Agenda Item:** **8.18.2**

**Source:**  **Intel Corporation**

**Title:** **Report of [AT117-e][506]** **[RA Part] UP additional open issues (Intel)**

**Document for:** **Discussion/Decision**

# Introduction

This document aims to summarize all the papers that have been submitted to agenda item 8.18.2 of RAN2#117-e and handle the offline discussion below:

* [AT117-e][506][RA Part] UP additional open issues (Intel)

Remaining UP open issues

Deadline: W1 Thursday Feb 24 1200 UTC

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# Identification of additional issues

The following table identified the additional issues that are not covered by the open issue list

|  |  |  |
| --- | --- | --- |
| Tdoc number | Proposals | Rapporteur’s view |
| R2-2203206  (Sony) [3] | **Observation 1:** If a separate search space for each RACH resource partition is allowed, there will be as many search spaces as the number of partitions, and therefore the search spaces will overlap, and this overlap may cause RNTI collisions as well as making difficult for the gNB to achieve scheduling flexibility. Hence, RAN1 must be consulted.  **Observation 2:** If a configurable offset is allowed for each RACH resource partition, it can be easily added in the PRACH configuration parameters and there is no RAN1 impact (i.e., only RAN2 can decide it).  **Proposal 1: Simply introduce RRC configurable offsets for the symbol index (*s\_id*) and the slot index (*t\_id*) in the legacy RNTI equation as a part of PRACH resource configuration for each separate partition. The legacy PRACH resource configuration should assume an offset = 0 for *s\_id* and *t\_id*.** | P1 is discussed in OI Z011 [Post116bis-e][514] (Proposal 11) |
| R2-2203459  (Interdigital) [8] | **Proposal 1**:        Carrier selection happens before RACH partition/resource selection, as in legacy.  **Proposal 2**:        If the agreement on having an SDT specific carrier threshold is kept:   * RRC can indicate to UE MAC whether SDT is involved in the initiated RACH prior to carrier selection * MAC applies the SDT specific carrier selection threshold if RRC indicates that SDT is involved. * MAC selects the carrier according to the measured RSRP and the selected threshold, per legacy   **Proposal 3**:        BWP selection precedes PRACH partition selection, as in legacy.  **Proposal 4**:        the UE does not fallback to 4-step common RACH after selecting 2-step RA on a certain PRACH partition.  **Proposal 5**:        Legacy fallback from 2-step to 4-step RA are triggered (e.g. based on reception of a RAR or after N 2-step attempts) is performed in the same feature partition.  **Proposal 6**:        Network can optionally configure an RA-RNTI offset associated with a PRACH configuration. If configured, the offset is added in the formula for RA-RNTI/MsgB-RNTI for a preamble selected from that PRACH configuration. | P1 is being discussed in Z002 [Post116bis-e][514] (Proposal 1)  P2 is also related and discussed in Z002 [Post116bis-e][514] (Proposal 2)  P3 is also related and discussed in Z002 [Post116bis-e][514] (Proposal 4)  Fallback mechanism issue  P6 is discussed in OI Z011 [Post116bis-e][514] (Proposal 11) |
| R2-2203340 (Huawei) [7] | **Proposal 1: UE can be configured to switch from 2-step feature (combination) specific RA to 4-step feature (combination) specific RA of the same feature (combination).**  **Proposal 2: Fallback from 2-step feature (combination) specific RACH to 4-step common RACH is not supported.**  **Proposal 3: RAN2 to discuss whether it is MAC layer or RRC layer to perform the feature/feature combination selection.**  **Proposal 4: To avoid that SDT procedure is initiated while the feature/feature combination does not include SDT, RAN2 should consider updating the SDT CRs according to one of the following options:**   * **Option 1: SDT is only initiated when the selected feature/feature combination includes SDT;** * **Option 2: MAC layer indicates to RRC layer that SDT procedure should be cancelled when the selected feature/feature combination does not include SDT.** | Fallback mechanism issue  P3 and P4 are related to Z002 [Post116bis-e][514] (Proposal 4) |
| R2-2203283 [4]  (Nokia) | **Observation 1: Network can provide RACH partition for certain features and/or feature combinations in a cell but not necessarily all.**  **Observation 2: The UE may need to select between RACH partitions that don’t match for the feature combination that triggered the service request/RA procedure but matches to subset of the features.**  **Proposal 1: NW signals priority order of the features with RACH partition configured in SIB.**  **Proposal 2: UE selects the RACH partition based on the highest priority feature of the feature set used for current RA procedure and available and available in a certain RACH partition.**  **Observation 3: The number of required RACH partitions in the cell is preferably minimized.**  **Proposal 3: SDT can be configured to use common RACH resources in which case Msg3 is used to indicate the SDT procedure to the network.**  **Proposal 4: When one RO provides preambles for multiple RACH partitions, it shall be possible to selectively apply backoff for specific RACH partition(s).** | P1 and P2 are discussed in OI10 [Post116bis-e][515] (Proposal 8 and 9)  P3 SDT indication issue  P4: Backoff issue |
| R2-2202976 [2]  (Oppo) | **Propsosal1: fall back from 2-step partition specific RACH to 4-step common RACH procedure is not allowed for feature combination including either CE or Redcap or SDT**  **Proposal1a: fall back from 2-step partition specific RACH to 4-step common RACH is allowed for Slicing**  **Proposal2: To introduce new RACH variable to record feature combination to enable above cases.** | Fallback mechanism issue |
| R2-2202694 [1]  (CATT) | **Proposal: As legacy, the UE can be configured the fallback from 2-step feature/feature combination specific RACH to 4-step feature/ feature combination specific RACH except for CE.** | Fallback mechanism issue |

Based on the above analysis, the following issues will be discussed here (as remaining are covered by [Post116bis-e][514] and [515]):

* Issue#1: Fallback mechanism from 2-step RACH to Msg1 of 4-step RACH
* Issue#2: Selective Backoff in RO shared by multiple RACH partition
* Issue#3: Msg3 indication for SDT

The other issues are related to the open issues already being discussed in [6] and [9].

# Issue#1: Fallback from 2-step RACH to 4-step RACH

The proposals are listed below:

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| --- | --- |
| Tdoc number | Proposals |
| R2-2203459  (Interdigital) [8] | **Proposal 4**:        the UE does not fallback to 4-step common RACH after selecting 2-step RA on a certain PRACH partition.  **Proposal 5**:        Legacy fallback from 2-step to 4-step RA are triggered (e.g. based on reception of a RAR or after N 2-step attempts) is performed in the same feature partition |
| R2-2203340 (Huawei) [7] | **Proposal 1: UE can be configured to switch from 2-step feature (combination) specific RA to 4-step feature (combination) specific RA of the same feature (combination).**  **Proposal 2: Fallback from 2-step feature (combination) specific RACH to 4-step common RACH is not supported.** |
| R2-2202976 [2]  (Oppo) | **Propsosal1: fall back from 2-step partition specific RACH to 4-step common RACH procedure is not allowed for feature combination including either CE or Redcap or SDT**  **Proposal1a: fall back from 2-step partition specific RACH to 4-step common RACH is allowed for Slicing**  **Proposal2: To introduce new RACH variable to record feature combination to enable above cases.** |
| R2-2202694 [1]  (CATT) | **Proposal: As legacy, the UE can be configured the fallback from 2-step feature/feature combination specific RACH to 4-step feature/ feature combination specific RACH except for CE.** |

As mentioned in the contributions, it is agreed in common RACH that in general all RACH retransmissions shall be performed over the same RACH resources and the same carrier as the one selected for initial RACH resource until RACH failure happens.

|  |
| --- |
| 6. As a baseline, the RA procedure design for Rel-17 should adhere to the following general principles:  c: As a general rule, all RACH retransmissions (if any are needed, until RACH failure happens) shall be performed over the same RACH resources (and same carrier – NUL/SUL) as the one selected for initial RACH resource. However, we can discuss fallback on a case by case basis if there is a strong motivation and discuss them together in this AI. |

However, there are still FFS on whether to support fallback from 2-step slice specific RACH to 4-step common RACH, if 4-step slice specific RACH is not configured. Even though the FFS is on slicing, it is more a general case whether this is to be supported.

For slicing, unified partitioning framework should take priority

FFS for next meeting – whether RAN2 confirms the following agreements/assumption made in the Slicing WI regarding fallback for slice-specific 2-step RACH

=> The agreement 9 needs to be aligned to common framework where the UE falls back (switching) to the same RA type it has initially selected and we will update the wording next meeting

6  For RACH type selection, UE first selects between slice-specific and common RACH, then selects between 2-step and 4-step.

**9  The following fallback case is supported?:**

**–** **Fallback case 2: Fallback from 2-step slice specific RACH to 4-step common RACH, if 4-step slice specific RACH is not configured.**

10 The following fallback cases are not supported in this release:

– Fallback case 1: Fallback from 4-step slice specific RACH to 4-step common RACH

– Fallback case 3: Fallback from 2-step slice specific RACH to 2-step common RACH, if neither 4-step slice specific RACH nor 4-step common RACH is configured

Based on the proposals in the contribution, the following proposal seem to be common among the contributions:

**Proposal 1: UE can be configured to switch from 2-step feature (combination) specific RA to 4-step feature (combination) specific RA (if configured) of the same feature (combination) after N 2-step feature (combination) specific RA attempts (like in legacy fallback from common 2-step RACH to common 4-step RACH after** *msgA-TransMax* **common 2-step RACH attempts).**

**4-1. Do companies agree to the above proposal?**

|  |  |  |
| --- | --- | --- |
| **Companies** | **Yes/No** | **Comments** |
| Intel | Yes | It is already implied by the baseline:  6. As a baseline, the RA procedure design for Rel-17 should adhere to the following general principles:  c: As a general rule, all RACH retransmissions (if any are needed, until RACH failure happens) shall be performed over the same RACH resources (and same carrier – NUL/SUL) as the one selected for initial RACH resource. However, we can discuss fallback on a case by case basis if there is a strong motivation and discuss them together in this AI. |
| Qualcomm | Yes | It helps keep UE behavior simple and is not hard for network to configure. |
| OPPO | Yes |  |
| Sony | Yes |  |
| Xiaomi | Yes |  |
| ZTE | Yes | Since there is no RACH partition change in this case, there is no issue with this switching. No changes needed to running CR as pointed out by others. |
| Nokia | Yes | The legacy behaviour should already allow this. |
| LGE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| InterDigital | Yes |  |
| CATT | Yes |  |
| NEC | Yes |  |
| Ericsson | Yes |  |
| Vivo | Yes |  |

*Rapporteur’s summary:*

*All companies (14/14) agreed to the proposal. Companies also think that there is no spec impact with this proposal, but rapporteur suggests to let the CR rapporteur check whether any update is needed for the proposal during CR implementation. Rapporteur suggests to agree to the proposal:*

***Proposal A [14/14]: [To agree]*** *UE can be configured to switch from 2-step feature (combination) specific RA to 4-step feature (combination) specific RA (if configured) of the same feature (combination) after N 2-step feature (combination) specific RA attempts (like in legacy fallback from common 2-step RACH to common 4-step RACH after msgA-TransMax common 2-step RACH attempts).*

As on whether to support fallback from 2-step feature (combination) specific RACH to common 4-step RACH after N 2-step attempts, if 4-step feature (combination) specific RACH is not configured, [7] and [8] think that it should not be supported, while [2] generally think so except for slicing. The reason for not supporting it is that it does not conform to what we agreed in common session and it may not work for some features such as SDT due to TB rebuilding, RedCap and CE. Unless such fallback is only allowed for slicing on its own, it would be good to follow an uniform approach as with the proposal below:

**Proposal 2: Fallback from 2-step feature (combination) specific RA to 4-step common RA (I.e. if 4-step feature (combination) specific RA of the same feature (combination) is not configured) after N 2-step feature (combination) specific attempts (like in legacy fallback from common 2-step RACH to common 4-step RACH after** *msgA-TransMax* **common 2-step RACH attempts) is not supported.**

**4-2. Do companies agree to the above proposal?**

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| --- | --- | --- |
| **Companies** | **Yes/No** | **Comments** |
| Intel | Yes |  |
| Qualcomm | Yes |  |
| OPPO | No | The main intention to differentiate slice group via msg1 or msgA is for access control. In case 2-step RACH is triggered but failed and it is not allowed to fallback to common 4-step RACH, it means the RACH will stop immediately. If this associated slice will be originally accommodated by network it means UE loss the chance from beginning. |
| Sony | Yes |  |
| Xiaomi | Yes |  |
| ZTE | Yes | i.e. this should NOT be supported (just highlighted NOT above to avoid confusion). |
| Nokia | Yes |  |
| LGE | Yes | We prefer to have a unified framework, rather than allowing feature-specific operation. |
| Huawei, HiSilicon | Yes | This was only agreed for Slicing, but it will be complex to implement, so we prefer not to make any exceptions. |
| InterDigital | Yes | Prefer to have a unified behaviour for all features. |
| CATT | Yes | We think one unified procedure is simple. And it is up to the network configuration to guarantee the proper RA configuration. |
| NEC | Yes |  |
| Ericsson | Yes |  |
| vivo | Yes |  |

*Rapporteur’s summary:*

*Majority companies (13/14) agreed to the proposal. However, one company think such fallback should be allowed for slicing as slicing is for access control and not just identification and think that if UE is not allowed to fallback, the RACH will stop immediately. From rapporteur’s understanding, the 2-step RACH will continue until the max preamble attempts and N attempt is a smaller value for the fallback. Also if the slicing is for critical slice, network can configure the feature combination specific 4-step RACH as in Proposal A. Hence, rapporteur suggests going with the majority:*

***Proposal B [13/14]: [To Agree]*** *Fallback from 2-step feature (combination) specific RA to 4-step common RA (I.e. if 4-step feature (combination) specific RA of the same feature (combination) is not configured) after N 2-step feature (combination) specific attempts (like in legacy fallback from common 2-step RACH to common 4-step RACH after msgA-TransMax common 2-step RACH attempts) is* ***NOT*** *supported.*

# Issue#2: Selective Backoff in RO shared by multiple RACH partition

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| R2-2203283 [4]  (Nokia) | **Proposal 4: When one RO provides preambles for multiple RACH partitions, it shall be possible to selectively apply backoff for specific RACH partition(s).** |

[4] think that multiple RACH partitions sharing the same RO may encounter congestion, but there is no means for the network to selectively indicate the RACH partition to perform the backoff.

**5-1. Companies are invited to provide their views whether the proposal should be addressed in Rel-17? If so, please provide the reason.**

|  |  |  |
| --- | --- | --- |
| **Companies** | **Yes/No** | **Comments** |
| Intel | No | This seems like an optimisation and would require more discussion as it requires changes to the MAC specification to provide such indication. |
| Qualcomm | No | As far as we can see, the only obvious use case for such differentiated backoff is slicing. But slicing already has prioritization enhancements which allows network to apply different backoff for slicing groups with different priorities. So we don’t think any additional enhancement is necessary at level of RACH partitions. |
| OPPO | No |  |
| Sony | No |  |
| Xiaomi | No |  |
| ZTE | No |  |
| Nokia | Yes | Otherwise, backoff feature cannot really be used or the RO sharing is useless. |
| LGE | No |  |
| Huawei, HiSilicon | No | We agree with the comments from QCM. We already have Slicing specific RA prioritization parameters and this does not seem to be needed on top of that. |
| InterDigital | No | Agree with Intel and QC. |
| CATT | No | We don’t see the necessity of optimization. |
| NEC | No |  |
| Ericsson | No | Back off solves the problem of RO congestion although features sharing the RO with low congestion are affected. |
| vivo | No | From the performance point of view, as long as the overload is detected, the NW should shuffle the UEs, regardless of feature partitioning (similarly to the UEs there is a lot of legacy UEs using the preambles in the same RO). We are not sure whether the proposal could bring obvious gain. |

*Rapporteur’s summary:*

*Majority companies (13/14) do not agree to the proposal as it is seen to be an optimisation which requires further changes to MAC and also that ra-prioritisation can be used to provide such backoff differentiation for each RACH partition. 1 company, however, thinks that backoff feature is useless in a RO sharing scenario without this. In view of the majority, rapporteur suggests:*

***Proposal C [13/14]: [To agree]*** *No further mechanism is introduced to selectively apply backoff for specific RACH partition(s) in this release.*

# Issue#3: Msg3 indication for SDT

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| R2-2203283 [4]  (Nokia) | **Proposal 3: SDT can be configured to use common RACH resources in which case Msg3 is used to indicate the SDT procedure to the network.** |

[4] thinks that the number of required RACH partitions in the cell is preferably minimized. One way to do it is to allow an alternative way to indicate SDT (i.e. SDT indication is in Msg3) instead of indicating via RACH partition. From the rapporteur’s point of view, this should have been discussed in SDT whether this is a possibility.

**6-1. Companies are invited to provide their views whether the proposal 3 above on SDT should be addressed in Rel-17? If so, please provide the reason.**

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| **Companies** | **Yes/No** | **Comments** |
| Intel | No (see comments) | RAN2 already discussed and agreed the following:  RAN2 continues to progress the work based the separate RACH resources for SDT (i.e. explicit mechanisms to support common resources won’t be pursued unless there is sufficient support for this. However, use of common RACH resources will not be precluded if possible via implementation  So we don’t think providing any additional indication in msg 3 should be discussed again. However, the specs should not preclude the use of common RACH resources for SDT. |
| Qualcomm | See comment | We think this proposal is best discussed in the SDT session instead of in common RACH session, because it has no impact on any procedural or configuration aspects of common RACH. |
| OPPO | No | We are fine to conclude like this. Otherwise it should be left to SDT session. |
| Sony | No | It must be discussed in SDT session. |
| Xiaomi | No | As RAN1 has agreed in 106-e meeting to support RA-SDT by configuring separate RO or separate preamble in shared RO between SDT and non-SDT, we think there is no need to discuss this proposal. |
| ZTE | No | No, we think even if network wants to use msg3 based indication, it can just mark all partitions then as SDT partitions (and use larger msg3 size for all RACH attempts) nothing breaks in this case. So, no need for further optimisation. |
| Nokia | Yes |  |
| LGE | No | In addition, there is no need to discuss further in SDT session. |
| Huawei, HiSilicon |  | We think this can be achieved by network implementation with no further indication in msg3. |
| InterDigital |  | This can be discussed in the SDT session. We recognize the benefit of this, as in some cases the regular msg3 can be sufficient to also carry small data and BSR, depending on the cell deployment and type. This should be achieved by implementation and configuration. |
| CATT | No | This should be in SDT. And in SDT, there is no enhancement is pursued for SDT indication in Msg3. |
| NEC | No | This is SDT specific issue |
| Ericsson | No | Discuss details in SDT |
| vivo | No | It has been discussed in SDT session before:   * RAN2 continues to progress the work based the separate RACH resources for SDT (i.e. explicit mechanisms to support common resources won’t be pursued unless there is sufficient support for this. However, use of common RACH resources will not be precluded if possible via implementation. |

*Rapporteur’s summary:*

*Majority companies (10/14) do not agree to the proposal as they either think the need of additional Msg3 indication should be discussed in the SDT or is an optimisation or has been discussed in SDT session. 1 company also think it should not be discussed in common session since it does not impact procedural or configuration aspects, while 2 companies think that this can already be done by implementation without the need for further Msg3 indication for SDT. Only 1 company supports it. In view of the comments, rapporteur suggests:*

***Proposal D [11/14]: [To agree]*** *Explicit mechanisms to support common resources for SDT will not be discussed further in common RACH session.*

# Issues carried forward from [Post116bis-e][514][RA Part] [6]

## Proposals where technical discussion is not really needed

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| Proposal [6] |
| Proposal 3: The CE/non-CE selection threshold can then be configured per BWP (as agreed in the CE session) |
| Proposal 5: BWP selection is handled in REDCAP CR. |
| Proposal 7: RSRP threshold for SSB selection for CE be configured differently in different RACH partitions (note this is conditional IE configured only in rach partitions that support CE) |
| Proposal 8: RACH partitioning can be applicable also in connected mode |
| Proposal 10: For the REDCAP BWP, network configures a RACH partition which is applicable to REDCAP (i.e. without combination with other features), similar to “legacy” RACH partition in non-Redcap initial BWP |

**7-1 Only comments if you have a strong concern on any of the above proposals. Otherwise, they will be considered as agreeable.**

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| --- | --- |
| **Companies** | **Comments** |
| Qualcomm | We do not support Proposal 3. We think CE selection threshold should be per partition. First, it is already agreed that CE is a feature. And depend on which feature(s) it is jointly configured with, CE selection threshold may be different. For example, it is desirable to have higher CE thresholds when configured in a partition for RedCap. Or network may want to configure different CE thresholds for different slices, depend on the different reliability/coverage requirements of the slides.  ZTE: Unfortunately, this would require CE to be not treated as a feature but as something like RACH type. Seems very hard to convince companies to go this way. |
| OPPO | For proposal 8: we need make it clear which feature(s) is applicable. Following the discussion, it seems SDT and slicing is not relevant, CE is applicable while it is not so clear for Redcap.  ZTE: Agree with the above, but do we need to do this exercise of clarifying which features CFRA is applicable to (since it will not result in any spec changes anyway). The only spec change is from question in 7.2.2 below. So, we can just focus on that.  The rest proposals are fine.  As for the comment from QC, I think per partition configuration is complicated for UE since it has to select among potential partitions based on configured threshold. For Redcap we think the threshold could be different, but Redcap UE usually access a Redcap specific BWP which resolve the issue implicitly. For the rest we don’t think it is necessary to differentiate among features. |
| Xiaomi | We agree with all proposals including proposal 3. And for the comment from QC, we have not seen any strong motivation that the threshold can be different for different partitions and depend on which feature is jointed with CE.  However, based on propsoal3, where to put the BWP-specific selection threshold can be discussed further, i.e. CE/non-CE selection threshold is configured in *BWP-UplinkCommon or RACH-ConfigCommon* (just like legacy RSRP threshold) or other position. |
| ZTE | We support all proposals. Please see more comments above. |
| Huawei, HiSilicon | We were not in favor of treating CE within feature combination selection as this leads to no possibility to use carrier specific CE vs. non-CE threshold. But since the majority wanted to go this way, we think P3 is the only way.  The rest of the proposals are also OK to us. |
| CATT | We support all the proposals above. |
| Ericsson | Ok with the above. |
| vivo | We are fine with the proposals as well. |

*Rapporteur’s summary:*

*Looking at the above comments, it seems like companies do not have a strong concern for all the proposals except that one company still has concerned on Proposal 3 as it wants the CE/non-CE selection is per RACH partition. One company has responded to the concern that it will mean treating the CE/Non-CE like a RA Type selection which companies do not agree. Rapporteur suggests trying another time whether there is strong concern with the following proposal since only 1 company has concerned:*

***Proposal E [To agree? one company has concerned on Proposal 3]:*** *To agree the following proposals:*

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| --- |
| Proposal |
| Proposal 3: The CE/non-CE selection threshold can then be configured per BWP (as agreed in the CE session) |
| Proposal 5: BWP selection is handled in REDCAP CR. |
| Proposal 7: RSRP threshold for SSB selection for CE be configured differently in different RACH partitions (note this is conditional IE configured only in rach partitions that support CE) |
| Proposal 8: RACH partitioning can be applicable also in connected mode |
| Proposal 10: For the REDCAP BWP, network configures a RACH partition which is applicable to REDCAP (i.e. without combination with other features), similar to “legacy” RACH partition in non-Redcap initial BWP |

## Proposals where technical discussion is needed

### Overall MAC procedure

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| --- |
| Proposal [6] |
| Proposal 4: For overall MAC procedure (order of steps is as below):   1. RRC will indicate to MAC whether SDT, REDCAP, SliceX is applicable for any RACH 2. [FFS wait for SDT session outcome] If SDT is applicable, MAC would have checked already that the correct RACH partition is available (this is also discussed as part of SDT) 3. If carrier is not indicated by RRC, MAC will select the carrier (this is same as legacy) 4. MAC will perform BWP selection (this is also legacy behaviour) 5. MAC will determine CE applicability after BWP is selected 6. Finally, MAC will select the RACH partition |

**7.2.1 Apart from the FFS part, companies are invited to provide their view whether the rest of the overall MAC procedure is agreeable.**

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| --- | --- | --- |
| **Companies** | **Yes/No** | **Comments** |
| Qualcomm | No | SDT, CE, RedCap are features and hence should be considered during, instead of before, the selection procedure of RACH partitions. UE determines which feature to consider first based on the priority provided by network, as already agreed. |
| OPPO | Yes |  |
| Xiaomi | No |  |
| ZTE | Yes | @Xiaomi, did you mean to say yes or is there some specific concern? |
| Nokia | Comments | What is a use case for RRC to indicate carrier?  BWP selection is discussed in different WIDs whether it should be based on available partitions. |
| LGE | No | We think the current SDT agreement to configure separated RSRP threshold should be reverted (i.e., use legacy RSRP threshold to select UL carrier in SDT procedure), in order to have the consistency on the carrier selection in SDT procedure.  With this, the first part of 3 is not needed, i.e.,  3. ~~If carrier is not indicated by RRC~~, MAC will select the carrier (this is same as legacy) |
| Huawei, HiSilicon | Not entirely | 1. We do not think there is a need for carrier indication by RRC. The carrier for RACH can be selected directly within MAC for all feature combinations (we do not apply SDT specific carrier selection threshold for RA-SDT in this case). What LGE suggests is OK.  2. Just for clarity, we think it would be good to capture step 0, i.e. “RRC checks whether the conditions to trigger specific features are met (SDT, Redcap, SliceGroup)”. |
| InterDigital |  | The SDT-specific carrier threshold is not really necessary, but we’re fine with it if that’s the majority view. Discussion on this threshold was left for this AI.  The overall procedure looks good, but carrier selection should be done in MAC as usual.  If the agreement on having an SDT specific carrier threshold is kept: RRC can indicate to UE MAC whether SDT is involved in the initiated RACH prior to carrier selection. MAC applies the SDT specific carrier selection threshold if RRC indicates that SDT is involved. MAC selects the carrier according to the measured RSRP and the selected threshold, per legacy |
| CATT | Yes | In SDT, the agreement defining one separate RSRP threshold for SUL selection is not changed based on the current meeting progress. Besides, CG-SDT selection is performed based on the selected carrier and before RA-SDT. Hence, we think there is no need to change the SDT procedure for carrier selection. |
| NEC | See comment | It is still not clear what RRC indicates to MAC? #3 implies, in some case, RRC indicates a carrier to be used explicitly, but not sure “in which case” and based on what? We guess #1 should be rephrased a bit to be pair with #3. E.g., RRC will indicate a carrier (to be used) to MAC. Then, what is taken into account for this carrier? All possible features supported by the UE, or some already triggered feature (e.g. RedCap, SliceX, SDT)?  We expect that if RRC indicates a carrier to MAC, the simplest way is to indicate available feature/feature combinations in each carrier. Then, MAC select carrier based on those information as well. |
| Ericsson | Yes, comment | We think carrier selection will be performed in MAC, and then it is more about the modelling. To have a consistent behaviour across features we are open to discuss e.g. the SDT threshold although this (and other Wis) needs to be usable to steer UE to or from a partition/use of feature. |
| vivo | Comments | We also think carrier selection will be done in MAC. Meanwhile, at least for Redcap, we think there is no need to require RRC to indicate whether it is applicable. |

*Rapporteur’s summary:*

*Looking at the comments from 13 companies, the main comment (from 7 companies) is in Step 3 where ‘If carrier is not indicated by RRC’. Rapporteur’s understanding is that this is also discussed in SDT offline discussion. 1 company saying ‘No’ has the same concern on Step 3 and think that MAC should select the carrier. 2 other companies that also say no: 1 company didn’t give any reason while the other think that feature applicability should all be done during RACH partitioning selection. Taking the majority view, rapporteur suggests the following:*

***Proposal F [To Agree?]:*** *To agree to the following:*

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| Proposal [6] |
| Proposal 4: For overall MAC procedure (order of steps is as below):   1. RRC will indicate to MAC whether SDT, REDCAP, SliceX is applicable for any RACH 2. [FFS wait for SDT session outcome] If SDT is applicable, MAC would have checked already that the correct RACH partition is available (this is also discussed as part of SDT) 3. MAC will select the carrier (this is same as legacy). [FFS for SDT – to be decided in SDT session if carrier is indicated by RRC] 4. MAC will perform BWP selection (this is also legacy behaviour) 5. MAC will determine CE applicability after BWP is selected 6. Finally, MAC will select the RACH partition |

### CFRA

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| Proposal [6] |
| Proposal 9: In case of CFRA, in order to initialize the RACH parameters such as rsrp-ThresholdSSB etc and for CBRA fallback:  Option 1: Network signals an explicit RACH partition to be used  Option 2: UE performs RACH partition selection up front  In case of option 2 it is not clear if network and UE will have the same understanding of the parameters to be used. |

**7.2.2 Companies are invited to provide their view on the options.**

|  |  |  |
| --- | --- | --- |
| **Companies** | **Option 1 or 2** | **Comments** |
| Qualcomm | Option 1 | It is CFRA. Let network tell UE what to do |
| OPPO | Option 1 |  |
| Sony | Option 1 |  |
| Xiaomi | Option 1 |  |
| ZTE | Option 1 | Agree with Qualcomm comment. |
| Nokia | None | There is no possibility for NW to always indicate CBRA partition, e.g., with PDCCH order. Hence, we need to anyway specify UE behaviour in case this is not indicated.  Simplest is the UE uses common RACH in this case, no need for additional specification effort. CFRA is anyway only for HO, BFR, and PDCCH order. |
| LGE | None | Agree with Nokia. When a UE fallbacks from CFRA to CBRA, the RA parameters of common RACH resource (i.e., legacy RA parameter) can be used. There is no need to consider RACH partitions. |
| Huawei, HiSilicon | Option 2 | We can just reuse RACH partition selection procedure. We are OK with option 1 as well with an understanding that this will be indicated within dedicated RACH configuration in RRC signalling. |
| InterDigital | None | Agree with Nokia |
| CATT | None | We agree to use common RACH resource. |
| NEC | Option 1, if needed | but tend to agree with Nokia for fallback from CFRA. |
| Ericsson | None | Are there new cases for CFRA? As Nokia notes it is only for connected mode in legacy. It is not supported for SDT, also not for other features (e.g. RedCap) Legacy would be sufficient. |
| vivo | None | The CFRA can only be performed on the legacy RO or Redcap-specific BWP. |

*Rapporteur’s summary:*

*13 companies responded. 6 companies opted for Option 1. 1 company opted for Option 2 (but is also ok with Option 1) while 6 companies propose to use common RACH configuration to initialize the RACH parameters (such as rsrp-ThresholdSSB etc) and for CBRA fallback since it will not be possible to indicate the RACH partition in PDCCH order. It seems like the following 2 options have more support:*

*Option 1: Network signals an explicit RACH partition to be used*

*Option 3: UE uses RA parameters of common RACH resource*

*Based on the comments, rapporteur suggests to discuss:*

***Proposal G [To discuss]:*** *In case of CFRA, in order to initialize the RACH parameters (such as rsrp-ThresholdSSB etc) and for CBRA fallback:*

*Option 1: Network signals an explicit RACH partition to be used (6/13)*

*Option 3: UE uses RA parameters of common RACH resource (6/13)*

### RNTI collision issue

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| Proposal [6] |
| Proposal 11: The network may configure a separate search space for RAR/MSGB per RACH partition (to be captured in RRC CR if agreed). No other mechanism is pursued apart from this for handling the RNTI collision problem. |

Agreeing to the above Proposal means that the configuration of the separate search space will be specified in the common RACH CR.

**7.2.2 Companies are invited to provide their view whether the proposal is agreeable for handling the RNTI collision problem.**

|  |  |  |
| --- | --- | --- |
| **Companies** | **Yes/No** | **Comments** |
| Intel | Yes |  |
| Qualcomm | No | We don’t think Proposal 11 is an effective/scalable way to solve the RNTI collision problem. That is because network has to ensure none of the RA search spaces has overlapping monitoring occasions. That limits the maximum number of partitions that can be configured. If companies still think having separate RA search spaces is the right approach, then we think a more sensible granularity would be separate search space per PRACH configuration.  Moreover, whether different partitions need to have separate search space is a different issue. Some feature(s) may do, e.g. SDT, but we think that should be discussed separately on a case by case basis. |
| OPPO | No | We think network should control not to configure too much RACH partitions in the cell since the differentiation among features during RACH procedure is not a must. And network should also take RNTI collision into account. If more search spaces are configured in order to avoid RNTI collision, this feature is too “heavy” to have since both uplink and downlink signalling overhead is increased. |
| Sony | No | This solution of separate search space for RAR/MSGB per RACH partition does not solve the problem because it allows as many search spaces as the number of partitions which may be impractical due to limited CORESET0 resource/space, and the search spaces will overlap, and this overlap causes RNTI collisions as well as making difficult for the gNB to achieve scheduling flexibility. So before agreeing this solution, RAN1 must be consulted to check if it is visible.  However, there is another solution, that just provides configurable offset(s) to either *s\_id* or *t\_id* or both, and it can easily be added in the PRACH configuration parameters, hence this solution does not need a separate search space for each partition. The specification is also in RAN2 area and RAN1 does not need to be involved. RAN2 should consider this option in this Rel-17 before it is too late. |
| Xiaomi | Yes |  |
| ZTE | Yes | Or we can simply do nothing if there is no consensus |
| Nokia | No | It seems the search space proposal would need to be asked firstly from RAN1. |
| LGE | No | Agree with Qualcomm. In addition, it should be consulted with RAN1 first before determining the separated search space for RAR/MsgB. Since we don’t think this as an essential issue, we prefer to leave as network implementation for Rel-17 considering the remaining time. |
| Huawei. HiSilicon | Yes | As mentioned on several occasions before, we think it is really important to have a solution for this issue and having separate search spaces is the simplest one. Configuring an offset can in practice be as hard as trying to avoid collisions by implementation. We think the proposal from QCM is reasonable, i.e. to have search space configured per RACH configuration, not per RACH partition. This reduces the overhead of search space signalling and the collisions happen among different RACH configurations anyway. Also this can be an optional parameter and the current search space can be always a default one.  We think we can agree this in RAN2 and request RAN1 to confirm. |
| InterDigital | No | This seems to involve RAN1. If this issue is essential, we prefer to address it by RA-RNTI partitioning/offsets. |
| CATT | No | We agree that this should be consulted with RAN1. |
| NEC | Yes | same view as ZTE. This option (separate SS) or do nothing. |
| Ericsson |  | Agree that separate SS is one solution and should then be tied to different configurations. In any case, RAN1 needs to be consulted. |
| vivo | Comments | We Agree with this for SDT only. Furtehr RAN1 input is needed for other feature. |

*Rapporteur’s summary:*

*14 companies responded. 5 companies agree to proposal. On the other hand, 7 companies do not agree the proposal as it requires RAN1 involvement. 1 company think that if we go this way then the search space should be per RACH configuration rather than per RACH partition. 1 company think that it should only be for SDT. 3 companies also suggest doing nothing and leave it to network implementation to resolve the RNTI collision issue (e.g. limiting the number of RACH partition). In view of the split in opinion, rapporteur suggests:*

***Proposal H [Yes 5/14, No. 7/14]:*** *No further mechanism is introduced for handling RNTI collision problem in this release*

# Conclusion

*Proposal A [14/14]: [To agree] UE can be configured to switch from 2-step feature (combination) specific RA to 4-step feature (combination) specific RA (if configured) of the same feature (combination) after N 2-step feature (combination) specific RA attempts (like in legacy fallback from common 2-step RACH to common 4-step RACH after msgA-TransMax common 2-step RACH attempts).*

*Proposal B [13/14]: [To Agree] Fallback from 2-step feature (combination) specific RA to 4-step common RA (I.e. if 4-step feature (combination) specific RA of the same feature (combination) is not configured) after N 2-step feature (combination) specific attempts (like in legacy fallback from common 2-step RACH to common 4-step RACH after msgA-TransMax common 2-step RACH attempts) is* ***NOT*** *supported.*

*Proposal C [13/14]: [To agree] No further mechanism is introduced to selectively apply backoff for specific RACH partition(s) in this release.*

*Proposal D [11/14]: [To agree] Explicit mechanisms to support common resources for SDT will not be discussed further in common RACH session.*

***Proposal E [To agree? one company has concerned on Proposal 3]:*** *To agree the following proposals:*

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| Proposal |
| Proposal 3: The CE/non-CE selection threshold can then be configured per BWP (as agreed in the CE session) |
| Proposal 5: BWP selection is handled in REDCAP CR. |
| Proposal 7: RSRP threshold for SSB selection for CE be configured differently in different RACH partitions (note this is conditional IE configured only in rach partitions that support CE) |
| Proposal 8: RACH partitioning can be applicable also in connected mode |
| Proposal 10: For the REDCAP BWP, network configures a RACH partition which is applicable to REDCAP (i.e. without combination with other features), similar to “legacy” RACH partition in non-Redcap initial BWP |

***Proposal F [To Agree?]:*** *To agree to the following:*

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| --- |
| Proposal [6] |
| Proposal 4: For overall MAC procedure (order of steps is as below):   1. RRC will indicate to MAC whether SDT, REDCAP, SliceX is applicable for any RACH 2. [FFS wait for SDT session outcome] If SDT is applicable, MAC would have checked already that the correct RACH partition is available (this is also discussed as part of SDT) 3. MAC will select the carrier (this is same as legacy). [FFS for SDT – to be decided in SDT session if carrier is indicated by RRC] 4. MAC will perform BWP selection (this is also legacy behaviour) 5. MAC will determine CE applicability after BWP is selected 6. Finally, MAC will select the RACH partition |

***Proposal G [To discuss]:*** *In case of CFRA, in order to initialize the RACH parameters (such as rsrp-ThresholdSSB etc) and for CBRA fallback:*

*Option 1: Network signals an explicit RACH partition to be used (6/13)*

*Option 3: UE uses RA parameters of common RACH resource (6/13)*

***Proposal H [Yes 5/14, No. 7/14]:*** *No further mechanism is introduced for handling RNTI collision problem in this release*

# References

[1] R2-2202694 Remaining issues for common aspects of RACH procedure CATT discussion Rel-17 NR\_cov\_enh-Core, NR\_slice-Core, NR\_SmallData\_INACTIVE-Core, NR\_redcap-Core

[2] R2-2202976 Discussion on RACH partition UP open issues OPPO discussion Rel-17 NR\_SmallData\_INACTIVE-Core, NR\_cov\_enh-Core, NR\_redcap-Core, NR\_slice-Core

[3] R2-2203206 RNTI collision issue for different features in NR Sony discussion Rel-17 NR\_SmallData\_INACTIVE-Core R2-2200917

[4] R2-2203283 Common aspects for RACH partitioning Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_SmallData\_INACTIVE-Core

[5] R2-2203307 Introduction of common RACH partitioning aspects in MAC ZTE Corporation (rapporteur) CR Rel-17 38.321 16.7.0 1214 - B NR\_SmallData\_INACTIVE-Core, NR\_cov\_enh-Core, NR\_redcap-Core, NR\_slice-Core Late

[6] R2-2203309 [POST116bis-e][514][RA Part] - Open issue list summary ZTE Corporation (rapporteur) report Rel-17 Late

[7] R2-2203340 Further details of RACH procedure with RACH partitioning Huawei, HiSilicon discussion Rel-17 NR\_SmallData\_INACTIVE-Core, NR\_slice-Core, NR\_redcap-Core, NR\_cov\_enh-Core Late

[8] R2-2203459 Remaining issues for RACH partitioning InterDigital discussion Rel-17 NR\_SmallData\_INACTIVE-Core, NR\_cov\_enh-Core, NR\_redcap-Core, NR\_slice-Core

[9] R2-2203357 Report of [POST116bis-e][515][RA Part] CP open issues Ericsson report Rel-17 NR\_redcap-Core, NR\_slice-Core, NR\_cov\_enh2-Core, NR\_SmallData\_INACTIVE-Core Late