3GPP TSG-RAN2#117-e Tdoc R2-22xxxx

Electronic meeting, 2022-xx - 2022-yy

Agenda Item: x.xx RACH indication and partitioning

Source: Ericsson

Title: Open issue list for 38.331 for RIP

Document for: Discussion, Decision

# 1 Introduction

This document relates to this offline discussion:

 **[POST116bis-e][515][RA Part] CP open issues (Ericsson)**

Scope:

- List of critical open issues to be resolved for WI completion

- Updated CR 38.331 for information and review

NOTE: NO contributions on these critical open issues are expected

Deadline:

- Open issues list Jan. 28th

- Company inputs 23:59 UTC Feb. 14th

This document captures a list of remaining open issues for TS 38.331 for RIP.

Note: The draft running CR attempts to capture agreements and a baseline framework for continued updates as a result of when RACH specific agreements are made in WI-specific discussions (e.g. RedCap, CE, Slicing etc).

The following delegates participated in the discussion:

|  |  |
| --- | --- |
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# 2 Open issue list to current running CR

Below is a list of open issues which does not fit under WI-specific Open Issues and are RIP specific.

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| --- | --- | --- | --- | --- |
| **OI Number** | **Slogan** | **Open issue description** | **Criticality** | **Remark** |
| **01** | **FFS if we remove the FeatureCombination from RACH common config and only keep 2)** | 1. If the indication in *RACH-ConfigCommon* allows to associate an additional whole RACH resource to a specific feature combination. This feature combination may then be considered the default one associated to all ROs of an additional RACH configuration,
 | Should be addressed early | Construct with or without will work but overall structure needs changes and thus this benefits from early decision🡪 Current version of the running CR has this top level removed. Compare with previous version for changes |
| **02** | **WI Specific parameters** | * Signaling and parameters to be implemented from WI-specific discussions
 | Noncritical | Expected to be added as part of output from WI-specific agreements/progress.Currently only place holder is captured which needs WI input. |
| **03** | **Mapping between 2-step RA preambles and PUSCH resources for MsgA** | * It is unclear if the legacy mapping mechanism between 2-step preambles to MsgA PUSCH resources can be used as it is.
 | Should be addressed | RAN2 needs to make sure the mapping is clear. To be handled in CR/ASN.1 design |
| **04** | **L1 parameters**  | * Remaining, yet to be implemented after WI Specific discussions
 | TBD |  |
|  |  |  |  |  |
| **05** | **FFS if CE indication is configured, then the RACH partition is only applicable to the RACH procedure where CE is required. Otherwise, if CE indication is not configured, then the RACH partition is applicable to the RACH procedure where CE is not required. (if CE is considered as part of feature combination)** | * COND construct or similar - to be confirmed
 | TBD |  |
| **06** | **Maximum number of additional RACH configurations** | * Define constraints in multiplicity (6.4)
 | Noncritical | maxAdditionalRACH-r17 INTEGER ::= TBD -- Maximum number of additional RACH configurationsComment: Depends on the number of SliceGroups from Slicing WI |
| **07** | **Multiple bit use for Slicing.**  | * To determine if one or multiple bits use for Slicing.
 | TBD | To be defined once we have the meaning and use of multiple bits from Slicing WISlicing WI should define how many slices there might be in total. Then the indication may just reflect this number. Up to Slicing WI to define the mapping between slice ID and PLMN or priority or other. Update: Currently implemented in updated running CR v00 as a slice specific IE “SliceGroupList” that can be populated independently in Slicing WI discussions with e.g. as currently exemplified with a list of SliceGroupID etc.Editor’s note added to capture that the details are to be defined in Slicing WI |
| **08** | **Use of extension marker or spare fields** | * For extensibility in future releases
 | TBD | To be discussed together with the CR/ASN.1 design.**Rapporteur Initial comment:** Defining speres need decision on how many spares to add in this release and thus the limitation and overhead that number brings.By using the extension marker, only in future this would give additional overhead, however, legacy UEs will not be able to read anything after the extension mark (‘…’) and may incorrectly use a RACH partition that may come with additional future limitations. |
| **09** | **Mapping relationship of SSB and RO, and the mapping relationship of SSB and preamble** | * In Current running CR, featureCombinationPreambles-r17 IE reuses the mapping relationship of SSB and RO, and the mapping relationship of SSB and preamble
* Whether the legacy mapping between RO and SSB, and the mapping between preamble and SSB should be used for R17 should be discussed
 | TBD | To be discussed as part of the CR/ASN.1 discussion.The current CR handles this mapping as in legacy. Some companies are proposing to do this differently, but it is not clear what benefit this renders into. Invite motivation for discussion.From Rapporteurs p.o.v the SSB mapping is done like this in legacy for a reason. In case many ROs are mapped to 1 SSB at a certain time only 1 SSB is used in all frequencies to ensure that analogue beamforming can be used. We can of course be more flexible with many ROs to 1 SSB mapping, but it seems we are then rediscussing an already established solution. |

Please provide input below:

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| Company, Issue Number | Comments  | Rapporteur comment |
| LGE | The extensible format of the feature indication (i.e., FeatureComination IE) should be discussed as an open issue (e.g. whether to use extension marker ',,,‘ or introduce a spare field for future releases), considering that Rel-17 UEs would not be able to interprete the extension fields defined in future releases.  | Added as open issue |
| Huawei 001 | Regarding to „Multiple bit use for Slicing.” – there is already an agreement made in Slicing WI, so there is no need to wait with implementing this:* In a cell, there may be multiple slice-specific RACH configurations.
* One or more of the slice groups are linked to a slice-specific RACH configuration.
* There may be slice groups that are not linked to a slice-specific RACH configuration (they use the common RACH configuration).
* All slices of a slice group use the slice-specific RACH configuration of the slice group.

Baed on the agreements it is clear that we need to have a possibility to configure RACH partition per slice group. | Implemented in updated running CR , see Rapporteur comment to OI #07 |
| Huawei 002 | Regarding **Mapping between 2-step RA preambles and PUSCH resources for MsgA**In the running CR, for separated preamble case, the MsgA PUSCH config for R17 still use the shared resource with legacy R16, however, this may not be suitable, i.e., the PUSCH payload for SDT and non-SDT is different. For separated RO case, the MsgA PUSCH config is per RACH configuration, however, in our understanding, each RACH configurtion corresponds to at least one RACH partition, and each RACH partition maps to one feature/feature combination. Considering that, e.g. each slice group may have different type of service which may lead to different PUSCH payload, so the MsgA PUSCH config should be per feature/feature combination. We agree this has to be addressed. | Open Issue #03 created |
| Huawei 003 | According to the current running CR, featureCombinationPreambles-r17 IE reuses the mapping relationship of SSB and RO, and the mapping relationship of SSB and preamble, i.e., the parameter ssb-perRACH-OccasionAndCB-PreamblesPerSSB. However, whether the legacy mapping between RO and SSB, and the mapping between preamble and SSB should be used for R17 should be discussed. We think that the mapping between SSB and preamble should be R17 feature/feature combination specific. | **Rapporteur Initial comment**: Apart from company view, an Open Issue #09 is captured for discussion. |
| OPPO | OI#1:We think the same IE within FeatureCombinationPreambles-r17 can already do the same job, so it can be removedOI#3:For shared Rel16 RO case, we think additional PUSCH resource for MsgA is needed because legacy PUSCH resource units are only for CBRA of legacy UE while any RACH partition introduced in Rel17 is taken as reserved preambles for legacy UE.OI#5:We think CE can be taken as a feature hence FFS can be removed.Oi#7:Yes we need wait input from Slicing WID, but common session can decide whether we need define RACH partition per slicing group or for all groups with additional rule. We prefer RACH partition per slicing group to make progress.OI#8:the issue itself is not very clear about extension of what. If it is for new feature in future, we think it is necessary to keep forward compatibilityOI#9:From running CR, RACH partition for one specific feature combination may consist of two part: 4-step RACH resource in *rach-ConfigCommon-r16/r17* and 2-step RACH resource in *rach-ConfigCommonTwoStepRA-r16/r17*. If there is no ROs defined within rach-ConfigCommonTwoStepRA-r16 or rach-ConfigCommonTwoStepRA-r17, it measn only 4-step RACH resource for RACH partition will be configured i.e. featureCombinationPreambles-r17 will not be there. Is it correct understanding? |  |
| Intel01 | It is unclear to us what the following new fields in the FeatureCombinationPreamble are equivalent to in legacy RACH operation:

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| ***featureCombinationRSRP-ThresholdHigh*** UE may used the preambles defined by this feature combination only if the RSRP is lower than this threshold. If absent, the value is infinity.  |
| ***featureCombinationRSRP-ThresholdLow*** UE may used the preambles defined by this feature combination only if the RSRP is higher than this threshold. If absent, the value is minus infinity.  |

 Are they supposed to be the equivalent fields to the following in legacy RACH ones?

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| ***rsrp-ThresholdSSB*** UE may select the SS block and corresponding PRACH resource for path-loss estimation and (re)transmission based on SS blocks that satisfy the threshold (see TS 38.213 [13]).  |
| ***rsrp-ThresholdSSB-SUL*** The UE selects SUL carrier to perform random access based on this threshold (see TS 38.321 [3], clause 5.1.1). The value applies to all the BWPs.  |

 If this understanding is correct, we suggest aligning their name and description.For IO#1: We support the rapporteur updates.For IO#5: We think similar discussion is made in the UP side. Our preference is to remove the FFS.For IO#7/8: We are fine with rapporteur’s suggestions. |  |
| Samsung01 | ***featureCombinationRSRP-ThresholdHigh*** and ***featureCombinationRSRP-ThresholdLow*** are unclear. What are these and when have we agreed to define these? |  |
| Samsung02 | ***nrofPreamblesForThisPartition:*** In our understanding this is equivalent to number of CB preambles per SSB in legacy. So suggest to rename it as ’nrofCB-PreamblesPerSSB‘ |  |
| Apple | **OI#011:** we prefer to keep FeatureCombination in RACH common config but not in FeatureCombinationPreambles. In this structure, one RACH common config is corresponding for each feature combination specific RACH partition for both shared RO and separate RO case, The unified structure for both shared and separate RO case would be simpler.  |  |
| Xiaomi 01 | For OI#1, we are fine with current change.For OI#5, we have agreed to consider CE as part of feature combination and for OI#7 we have agreed in Slicing WI to have RACH parititions configured per slice group, thus we prefer to remove them here. |  |
| Xiaomi 02 | We are also confused what ***featureCombinationRSRP-ThresholdHigh*** and ***featureCombinationRSRP-ThresholdLow***  means which seems never been discussed and agreed before. |  |
| LGE | OI#1: Since the feature combination indication (i.e., FeatureCombination) in 2) (i.e., FeatureCombinationPreambles) is sufficient, the feature combination indication can be removed from AdditionalRACH-ConfigCommon-r17, as in current Running CR.OI#3: In shared RO case, the associated MsgA PUSCH resource for SDT should be larger size. In addition, the associated MsgA PUSCH resource for RedCap should be configurable with narrower bandwidth.Therefore, in our view, the MsgA PUSCH resource configuration (i.e., MsgA-PUSCH-Resource-r16) should be configured for each partition, considering the combination cases for SDT and RedCap.OI#2/4: Fine with the rapporteur’s suggestion (i.e., to be implementated after WI specific discussion)OI#5: Same view as Intel. It seems as an UP issue, but we think that FFS can be removed since it is agree that CE is a part of feature combination.OI#7:In RAN slicing, three points are agreed as assumptions:* Slice-specific RACH configuration can be configured for a slice group
* There can be multiple (i.e., more than one) slice-specific RACH configurations
* One or more slice groups can be linked to one slice-specific RACH configuration.

Regarding the slice-specific RACH configuration, the common RACH session may decide in which level the slice group ID(s) can be configured:* Option 1: feature indication includes one or more slice group ID(s), e.g.,

FeatureCombination-r17 ::= SEQUENCE { redCap ENUMERATED {true} OPTIONAL, -- Need R smallData ENUMERATED {true} OPTIONAL, -- Need R slicing SEQUENCE (SIZE (1.. maxSliceInfo-r17)) OF sliceGroupID-r17 OPTIONAL, -- Need R  covEnh ENUMERATED {true} OPTIONAL, -- Need R ...}* Option 2: There is one bit indication for slicing, and the additional parameters can be configured to link one or more slice group ID(s), e.g.,

FeatureCombination-r17 ::= SEQUENCE { redCap ENUMERATED {true} OPTIONAL, -- Need R smallData ENUMERATED {true} OPTIONAL, -- Need R slicing ENUMERATED {true} OPTIONAL, -- Need R covEnh ENUMERATED {true} OPTIONAL, -- Need R ...}FeatureCombinationPreambles-r17 ::= SEQUENCE { featureCombination-r17 FeatureCombination-r17,\ SliceInformation-r17 SEQUENCE (SIZE (1.. maxSliceInfo-r17)) OF sliceGroupID-r17 OPTIONAL, -- Need R ...}Between the two options, we prefer Option 2 in order to defined the unified structure for feature combination indication (i.e., FeatureCombination)OI#8: Considering the forward compatibility, using only ‘…’ in the feature indication (i.e., FeatureCombinationIndication), as an extension mark may cause the misinterpretation by Rel-17 UEs, if new feature(s) are defined in future release, Specifically, since the indication after ‘…; is not readable for Rel-17 UEs, Rel-17 UEs may ignore the indication for potential feature and incorrectly use the RACH partitions for the potential feature. Therefore, the additional field or spare field(s) may be needed for the extension, in order to prevent the misunderstanding of the feature indication. For example,FeatureCombinationIndication ::= SEQUENCE { redCap ENUMERATED {true} OPTIONAL, smallData ENUMERATED {true} OPTIONAL, slicing ENUMERATED {true} OPTIONAL, covEnh ENUMERATED {true} OPTIONAL, **feature\_extension ENUMERATED {true}** **OPTIONAL,**  ... }OI#9: In our view, the current CR implies that the mapping relationship between ROs and SSBs are same as in the legacy. Considering the Rel-17 timeline, we prefer to keep the same mapping method as defined in the legacy design unless the benefit is identified. |  |
| ZTE 01 |  additionalRach-ConfigCommonToAddModList-r17 SEQUENCE (SIZE(1..maxAdditionalRACH-r17)) OF AdditionalRACH-ConfigCommon-r17 OPTIONAL, -- Cond SpCellOnly3 additionalRach-ConfigCommonToReleaseList-r17 SEQUENCE (SIZE(1..maxAdditionalRACH-r17)) OF AdditionalRACH-ConfigIndex-r17 OPTIONAL -- Cond SpCellOnly3Since “Any field with Need M or Need N in system information shall be interpreted as Need R.”, it seems sufficient to have one additionalRach-ConfigCommonToList-r17 with Need R instead of the addmod list and release list. |  |
| ZTE 02 | The following two IEs have not been agreed. Propose to removefeatureCombinationRSRP-ThresholdHigh-r17, featureCombinationRSRP-ThresholdLow-r17 |  |
| ZTE 03 | The search space specific to additional RACH partition is missing.Since we agree to support SDT specific search space, and search space is configured in DL BWP common, some kind of mapping is required to map the additional RACH resource to the additional search space. |  |
| ZTE 04 | For the procedure part, it seems RRC need to indicate the corresponding features of each triggered RACH procedure to MAC (at least for REDCAP, SDT, RAN slicing). For SDT, it has been captured in the current SDT CR, but it is not clear how to handle REDCAP, RAN slicing. Shall we capture it in the common CR or leave it to each individual CR? |  |
| CATT | IO #1:We support the current CR that removes the same IE in *RACH-ConfigCommon* IE. IO #3: We agree the mapping between 2-step RA preambles and PUSCH resources for MsgA should be different for R-17. As some feature may have the different PUSCH resource requirement. But how to design the signalling structure to capture the shared ROs and separate ROs needs to discuss.IO #5: This can be decided by the discussion on the RACH procedure. We prefer that CE can be seen as part of feature combination. IO #7: According to the agreements on slicing, one or more slice groups are linked to a slice-specific RACH configuration. So we think the multiple bits can be used for slicing indication.IO #8: We think it is more flexible and forward-compatible by using the extensible mark ”…”. IO #9: It is not clear that what benefit will be by using the new mapping. So we prefer to reuse the legacy mapping.We have the same concern with other companies. It is not clear to us the intention of introduce the new parameters: *featureCombinationRSRP-ThresholdHigh , featureCombinationRSRP-ThresholdLow* |  |

# 3. Other General Open Issues

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| **OI No** | **Slogan** | **Open issue description** | **Criticality** | **Remark** |
| **10** | **Priority rules between RACH partitions are configurable** | RAN2 agreement:3. If only a subset of features have a matching RACH partition, and the triggered RACH doesn’t fit with any of the configured RACH partitions then the UE behaviour will be specified. Details are TBD4. Priority rules are configurable (e.g. can be configured in SI) | Essential | Overall mechanism need to be implemented. **For agreement 3**, Rapporteur thinks this should be only present in case of some (odd) NW implementation and suggest a simple solution. For example, one solution is to consider that no partition is available, i.e the cell is barred for RACH corresponding to that (subset)feature/feature-comb. However, needs to be discussed.**For agreement 4:** See sub-item below w.r.t the definition of priority. Depends on the general direction above. |
| **11** | **Priority definition** | Whether the priority rule is defined for each feature or each partition. | Essential | Decision needed before implementation.**Rapporteur initial comment.** For some features, like RedCap it is essential to have the feature (indication) prioritized rather than selecting an access mechanism (feature) such as SDT without an RC indication. Needs discussion |
|  |  | UE behavior if decided:1. no priority is configured,
2. if specified for equal priority,
3. or alternatively relative priority is always explicitly given.
 | Essential | Rapporteur suggests that it is left for UE implementation for cases 1,2 if 3 is not decided.  |
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Please provide input below:

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| Company, Issue number | Comments | Rapporteur comment |
| LGE | In RAN2#116bis, it is agreed that the priority rules between the RACH partitions are configurable:3. If only a subset of features have a matching RACH partition, and the triggered RACH doesn’t fit with any of the configured RACH partitions then the UE behaviour will be specified. Details are TBD4. Priority rules are configurable (e.g. can be configured in SI)Regarding the configuration the details should be discussed as an open issue including:* Whether the priority rule is defined for each feature or each partition. Depending on the decision, the priority rule for following case would be different
	+ The RA is for F1+F2+F3. The network configures one partition is for F1 (with high priority) and another partition for F2+F3 (each of feature has low priority).
* On which level of ASN1 signaling the priority is configured.

After that, the configuration of priorty rule should be handled in RRC CR.  | Agree on issue; additions to open issues added.  |
| OPPO | OI#10/11:We think priority should be defined per feature instead of per RACH partition considering RACH partition will increase more quickly than features themselves. Once priority i.e. a priority value is configured for one feature, then the relative priority is also clear i.e. the lower value, the higher priority. Then RACH partition will be prioritized over another one if at least one feature is of higher priority. |  |
| Intel, IO#11 | On whether the priority rule is defined for each feature or each partition, we prefer that the priority rule can be defined for each feature combination/RACH partition. Our thinking is that the network can provide a priority value for each feature combination/RACH partition. The highest value RACH partition with subset feature combination will be selected by the UE. In this way, if REDCAP needs to be prioritised, the priority for the feature combination/RACH partition can be set higher value.  |  |
| Apple  |  |  |
| NEC, for OI10 | For the agreement 3:We do not think this is just “odd” NW implementation. The network may not want to configure some FCs to avoid resource fragmentation in some cases. For example, the network supports the SDT in a cell, while does not configure RACH partition for e.g. SDT+CE, considering this FC is not so attractive considering possible Msg3 repetitions. |  |
| NEC, for OI11 | We tend to agree with Rapporteur initial comment on RedCap. Unless there is strong need to include RedCap in priority configuration, the RedCap can be top priority without explicit signaling for it.  |  |
| Xiaomi | We share the same view with OPPO and prefer to configure priority per feature instead of per feature combination. And for the UE behaviour if the priority is not decided, we agree with rapporteur’s suggestion. |  |
| LGE | OI#10:Regarding the network configuration of RACH partition, if the network is not able to allocate RACH partitions for all combination of features, it would be difficult to determine which combination is useful to the UEs, since the UE would use RACH partition with only a subset of features. Therefore, the UE may include some information to indicate missing feature/feature combination in Msg3 or after the RA procedure, the network would allocate RACH resource more efficiently.OI#11:Regarding the configuration of priority rules, we think that the priority rule can be configrued per feature, in order to simplify the priority configuration.Within the priority configuration for each feature, UE only considers the first priority to select the RACH partition. For example, the RA procedure is for F1+F2+F3 but there is no RACH partition for F1+F2+F3, If the feature priortity is F1>F2>F3, * If there is a RACH partition with F1, the UE selects partition with F1. If there are muleiple partitions with F1 (e.g., F1+F2, F1+F3, and F1), the selection can be done by UE implementation (i.e., UE does not consider the 2nd priority).
* If there is no RACH partition with F1, the UE may check whether there is RACH partition with lower priority.

Regarding the case 1,2,3, we agree with the Rapporteur’s suggestion (i.e., If case 3 is not agreed, leave as UE implemtnation for case 1 and 2). |  |
| ZTE | For priority, we also think the priority should be defined per feature and UE is only allowed to select the RACH partition among the partitions which are available for the RACH procedure.Considering the RACH triggered for SDT has to select the RACH resource configured for SDT and only the RACH triggered by SDT is allowed to select the SDT specific RACH resource, it seems we only need to configure the priority for REDCAP, CE and RAN slicing. |  |
| CATT | We prefer that the priority rule is defined for each feature. For slicing, the priority should be defined for each slice group or slice group list. Considering the potential number of feature combination is lager than the number of feature. The priority rule defined for each feature is a better choice. |  |

# 4. Summary and Conclusion with Proposals

Based on the discussion in phase 2 consider the above open issues and comments a new document will provide the proposed conclusion.