3GPP TSG-RAN WG2 Meeting #117 electronic R2-22xxxxx

**Online, February 21 – March 3, 2022**

**Agenda item: 8.8.1**

**Source: Huawei (email rapporteur)**

**Title: List of open issues for RAN slicing WI**

**Document for: Discussion and Decision**

# Introduction

This is the report of the following email discussion.

* [AT117-e][245][Slicing] Updated CR for 38.331 (Huawei)

      Scope: Updated 38.331 and 36.331 based on online agreements. Can discuss also open issues related to RRC.

Intended outcome: Discussion report in [R2-2203783](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203783.zip). Agreeable RRC CR in [R2-2203784](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203784.zip).

Deadline: Deadline 5

This email discussion is based on the session minutes RAN2-117e LTE 71 GHz DCCA Multi-SIM and RAN slicing (Tero)\_2022-03-01-1650\_v2 because more agreements were made in the minutes. It is proposed to slightly modify the Deadline 5 in order to have more time for companies to check the updates of the RRC CR.

**Modified Deadline 5 (CR/LS approval via email):**

* **Comment deadline:** EOM, may continue to short post-meeting email (based on chair decision)

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# CR rapporteur handled issue

For this part, only bullet 3 and 4 related issues are listed.

* **Each open issue** should be associated with **suggested treatment/handling**.
  1. **Simple issues, Company input into Pre117-e-offline**
  2. Company tdocs invited.
  3. CR rapporteur handled issue (CR rapporteur will propose resolution as input to next meeting).
  4. Other, e.g. immature area, reference to dependency, unclear status etc.

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| **Issue** | **Relevant section in TS 38.331** | | **Suggested handling** |
| OI 1.4: FFS in which SIB to broadcast slice info for the purpose of inter-frequency reselection, SIB4 or new SIB. | 6.3.1 | | Immature stage 3 details can be left for later phase. |
| Q 1.6: *FFS what’s the maximum number for slice group* |  | Immature ASN.1 details can be left for later phase. | |
| OI 1.7: Whether an entry in RA-Prioritization (set of RA-prioritization parameters) configuration is per slice group ID or per slice groups (IDs); | 6.3.2 | Stage 3 issues | |
| OI 1.8: How many different RA-Prioritization parameters sets (backoff timer, power ramping step) can be configured? | 6.3.2 | Stage 3 issues | |

[Rapp] For the above issues, the rapporteur thinks:

* For OI 1.4, based on the contributions in this meeting, there are some supports on using legacy SIBs, and some supports on introducing a new SIB. The key point is about the potential overhead caused by slice related parameters. **It is suggested to go with a new SIB**
* For OI 1.6, in this meeting, some contributions provide specific numbers, e.g.:
  + **The maximum number of frequencies is 8**
  + **The maximum number of cells in one frequency is 16**
  + **The slice group ID is 16 bits and maxSliceInfo-r17 is 16. For maxSliceInfo-r17, RAN2 has agreed that “10. The maximum number of RA-prioritization configurations (i.e. maxSliceInfo-r17) is decided in the next meeting.”**
* For OI 1.7, **it is proposed that an entry is per slice group ID (the other alternative is more like singalling optimization)**
* For OI 1.8, based on the baseline RRC CR [R2-2203022](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203022.zip), RA-Prioritization parameters are configured per slice group and the maximum number is defined by maxSliceInfo-r17, since the value of the parameter will be decided in the next meeting, the issue is expected to be solved later

**Question 1: For OI 1.4, do companies agree with putting slice related parameters in a new SIB?**

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| **Company** | **Yes/No** | **Comments if any** |
| Xiaomi | No | Unless there is a strong concern to put these parameters in legacy SIB（i.e. SIB2, SIB4), legacy SIB is preferred and we can note it is also the majority view in the previous discussion. |
| Qualcomm | Yes | In previous discussion, we don’t think company carefully considered potential payload size of broadcasting slice group ID in SIB, especially by that time, the details of slice grouping were not clear and PCI list was not agreed to be introduced.  Let us take Rapporteur suggested values above for analysis:   * The maximum number of frequencies is 8. * The maximum number of cells in one frequency is 16. * The slice group ID is 16 bits and maxSliceInfo-r17 is 16   + Although no agreement, it seems to be majority view. And if per PLMN slice group is adopted by SA2, the required bit will be much larger.   Then, payload size could be as big as:   * If PCI info is absent, payload = 8 frequencies \*16 slice groups\*(16bits slice group ID) = 2048 bits * If PCI info is present, payload = 8 frequencies \*16 slice groups\*(16bits slice group ID + 16 cells \*10 bits PCI) = 22528 bits   However, the maximum size of one SI message is just 2976 bit. And legacy SIB3/4/5 don’t allow SIB segmentation. Therefore, we think it may cause issue if slice info is included in legacy SIBs. Furthermore, given detail of slice group is still pending on SA2 (note that per PLMN signalling is still preferred by most company in SA2 by now), we think a new SIB is safest choice to complete WI. |
| Samsung | See comment | In our view, if there is no restriction on SIB size, then we prefer to use legacy SIB. Otherwise, a NEW SIB is okay. |
| Huawei, HiSilicon | Yes | Share similar views as Qualcomm. |
| Nokia | No strong view | Normally SIB2/4 should contain all parameters related to reselection.  What QC indicates is true if we consider the maximum SIB size. However, such large usage will likely not happen in typical cases. |
| NEC | Yes | We did assessment in R2-2203235, and had the same conclusion that a new SIB is necessary considering the potential overhead |
| Lenovo | Yes | A new SIB can be used for future compatibility purpose since it is not very clear how popular slicing will be on field and therefore how many slices and slice groups will be in use.  For now, we do not think/ know that SliceGroupId is 16 bits long but think 4 bits to represent 16 Slice groups in a geographical area where the slice to slice group Id mapping is valid, is sufficient. Having said that we need to decide if the frequencies need to be signalled as ARFCN (1..262143) or as an indexing to frequencies listed in SIB4 can be used.  Even if a new SIB is used, effort must be made to keep the signalling to a minimum. |
| LGE | Yes | Share similar views as Qualcomm. |
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**Question 2: For OI 1.6, RAN2 agreed that the parameter maxSliceInfo-r17 will be decided in the next meeting. For other parameters (i.e. the maximum number of frequencies, the maximum number of cells in one frequency, the slice group id size), there may be the following options:**

* **Option 1: Decide on values in this meeting via RRC CR discussion**
* **Option 2: Decide on values in the next meeting (similar as for maxSliceInfo-r17)**

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| **Company** | **Preferred option** | **Comments if any** |
| Xiaomi | Option 2 |  |
| Qualcomm | See comments | For max # of frequency and max # of cell in one frequency, 8 and 16 are legacy number in RRC spec. Considering RAN4 will not be involved, we believe RAN2 can only copy existing value in 331.  For slice group id size, because it is related to per TA or per PLMN granularity which is still pending on SA2, we prefer to decide in next meeting. |
| Samsung | Option 2 | But no strong view |
| Huawei, HiSilicon | Option 2 | Agree that legacy design can be referenced, and decision can be made at the next RAN2 meeting. |
| Nokia | Option 1, See comments | Our view is that for the maximum number of frequency and the maximum number of cells the legacy values (8 and 16) should be used.  The size of the slice group identifiers strongly depends on the granularity of slice group identifiers. However, we think RAN2 should progress according to the assumption (scope of the slice group ID is per TA) to have an ASN.1 baseline. We think with this assumption 8 bits (enabling 256 SG per TA) can be a reasonable starting point:  sliceGroupID-r17 BIT STRING (SIZE (8)) -- The size is FFS, depends on slice group granularity  The RRC CR needs a value for maxSliceInfor that serves as a place-holder. We think we could just define it e.g. as  maxSliceInfo-r17 INTEGER ::= 8 -- FFS on the exact value  Then in next meeting we can determine whether this is the correct value, but the ASN.1 part of the CR will be complete. |
| NEC | Slightly prefer option1 | Our view as indicated in R2-2203235:  maxCellSlice-r17 is 16  The maximum number of frequencies is 8  maxSliceInfo-r17 is equal to 8 or 16  the size of slice group ID should be FFS as of now since it highly depends on the granularity, and it is better to leave to SA2 to decide |
| Lenovo | Option 1 | We must already strive to zero down to numbers. We can of course change it in the next meeting if new points emerge. |
| LGE | Option 2 | We think the value of maxSliceInfo-r17 can be the same as that of max. # of Freq for inter-frequency cell re-selection. But RAN2 decision can be made in the next meeting after SA2 make the final conclusion. |
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**Question 3: For OI 1.7, do companies agree that an entry in RA-Prioritization (set of RA-prioritization parameters) configuration is per slice group ID?**

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| **Company** | **Yes/No** | **Comments if any** |
| Xiaomi | Yes | And RA prioritization parameters can be configured with a **slice group list.** |
| Qualcomm | Yes |  |
| Samsung | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes, but | To achieve consistency with common session agreements, it should be confirmed that RA-prioritization can be signalled for a slice group List,   * In the slicing running CR RA-prioritization is signalled per slice group ID * In the RA partitioning CR, sliceGroupList is signalled first to determine applicability of the RACH configuration, for which RA-prioritization is configured.   if the latter (common framework) schema is followed, there is no need to scatter further the RA-prioritization per slice Group ID (as the same can be achieved with the List)  Thought, we have agreed to have RA partitioning and RA-prioritization working independently, it seems duplicated signalling for RA-prioritization may be unnecessarily introduced. For this reason, we would like to confirm: that RA-prioritization for a SliceGroupList should enable configuration for a slice Group ID and for slicing there is no need to support RA-prioritization for AI |
| NEC | Yes |  |
| Lenovo |  | It must be possible to signal that more than one slice group use the same prioritization parameters or RACH partitioned resources. |
| LGE | See comments | If the question is asking whether the RA prioritization can be configured with one slice ID, our answer is yes. However, if the question is asking whether the RA prioritization can only be configured with one slice ID (i.e., no mapping of one RA prioritization parameter set with multiple slice group IDs), our answer is No.  In common RACH CR, the RACH partition for slicing is configured for **one or more** slice group(s). Similarly, we think that one set of RA prioritization parameters can be associated with **one or more** slice group(s). For example, in one RA-PrioritizationSliceInfo-r17 IE, a **list** of slice groups can be configured.  Meanwhile, this should be handle in common RACH CR (see our answer in Q4). |
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| **Issue** | **Relevant section in TS 38.321** | **Suggested handling** |
| OI 2.2: The parameters should be aligned with RRC spec, e.g., *ra-PrioritizationForSlicing*, *ra-PrioritizationForSlicingTwoStep*, *enableRA-PrioritizationForSlicing*, *ra-Prioritization*, *RACH-ConfigCommon* and *RACH-ConfigCommonTwoStepRA* for Slicing. | 5.1.1a | To be updated by CR rapporteur to align with RRC CR. |
| OI 2.3: FFS on the impact of RA fallback from 2-step Slicing RA to 4-step Slicing RA or 4-step common RA. | 5.1.3a, 5.1.4a, 5.1.5 | To be updated later by CR rapporteur to align with common RACH decision. |
| OI 2.4: To be updated to align with common RACH decision and general MAC CR, if needed. |  | To be updated later by CR rapporteur to align with common RACH decision. |

[Rapp] For OI 2.2, they will be updated in the RRC CR. For OI 2.3 and OI 2.4, the RRC CR rapporteur will check the common RACH progress and handle both OIs in the RRC CR.

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| **Issue** | **Source or Relevant section in TS 38.304** | **Suggested handling** |
| OI 3.8: Slice specific cell reselection parameters. | 5.2.4.7.0 | CR rapporteurs to update aligned with RRC spec. |

[Rapp] For OI 3.8, details can be directly discussed in the RRC CR.

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| **Issue** | **Relevant section in TS 38.300** | **Suggested handling** |
| OI 4.1: Details of slice grouping and how it is provided to the UE are FFS, depends on SA2 | 16.3.3, 16.3.X | CR rapporteur to update based on further RAN2 agreements or SA2 further agreements. |

[Rapp] RAN2 has received one new LS from SA2, and see agreements and the rapporteur’s comments in section 3.

# Implementation of RAN2#117-e agreements in the RRC CR (based on RAN2-117e LTE 71 GHz DCCA Multi-SIM and RAN slicing (Tero)\_2022-03-01-1650\_v2)

The latest RAN2 agreements are listed as below, and the rapporteur’s comments are added (how to implement them in the RRC CR). Please companies check the comments and provide comments/suggestions if any.

[R2-2203650](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203650.zip) Report of [AT117-e][241][Slicing] Closing slice-specific reselection open issues (CMCC) CMCC discussion Rel-17 NR\_slice-Core Late

*Proposals for easy agreements:*

* 1: RAN2 confirm the working assumption on option A without formula.
* 2: The UE should determine the frequency priority order according to the following rules:

a) Considering the slice/slice group priority provided by NAS, the frequencies that support higher priority slice/slice group have higher slice based frequency priority than the frequencies that support lower priority slice/slice group;

b) Among the frequencies supporting a slice/slice group with the same priority, the UE should follow the slice specific frequency priority received in SIB or RRCRelease (if configured);

c) Among the frequencies supporting the same slice/slice group, the frequency not configured with slice specific reselection priority should be considered as lower priority than other frequencies configured with slice specific reselection priority;

d) The frequencies that support any slice/slice group have higher slice based frequency priority than the frequencies that support none of slice/slice group;

e) For the frequencies that do not support any slice/slice group, the UE should follow the legacy cell reselection priority received in SIB, FFS when only legacy priority received in RRCRelease;

* 5: RAN2 confirm that if the UE is configured with slice specific frequency priority via RRCRelease message, the UE shall ignore all the slice specific priorities provided in system information. FFS if we still apply the legacy cell reselection frequency priorities in SIB.

[Rapp] The above agreement 5 will be implemented in the RRC CR.

* 6: The legacy procedure (i.e., UE first enters any cell selection state and performs cell selection) should be reused when the UE cannot find a suitable cell using any cell reselection priorities (including slice-based and legacy (non-slice based) priorities) if the UE is configured with slice based dedicated priority.
* 7: Inter-RAT frequencies are not configured with slice specific frequency priority, but inter-RAT frequencies can be considered using legacy cell reselection frequency priority after all NR frequencies that support any slice/slice group.
* 8: The slice specific cell reselection information provided by the network in SIB is slice group specific.
* 10: Reuse the legacy T320 timer for slice specific frequency priority in RRCRelease.
* 11: RAN sharing can be supported for slice based cell reselection and RACH by network implementation (e.g. dedicated priorities in RRCRelease). We don't define PLMN-specific reselection priorities or RACH configuration. FFS if we need something extra in RACH (may not be critical to WI completion).

[Rapp] The above agreement 7, 8, 10, 11 will be implemented in the RRC CR.

* 3: FFS a frequency can be sorted multiple times (7/18) or only once (2/18) or it is up to UE implementation (5/18). Can discuss this further offline (244) (Lenovo) based on the consequences of each decision (including TPs).
* Discuss the TPs for each option in offline [244]
* 9: The slice group specific cell reselection information can be provided by the network in RRCRelease.

[Rapp] The above agreement 9 will be implemented in the RRC CR.

* 15: PCI list per slice group per frequency can be provided in system information.
* 15.1: Network can indicate whether the PCI list is block-list (“cells not supporting the corresponding slice group”) or allow-list (“cells supporting the corresponding slice group”).

[Rapp] The above agreement 15, 15.1 will be implemented in the RRC CR.

Agreeable proposals:

* 1. Not support the slice-based dedicated RACH resources and RACH prioritization parameters in the dedicated signalling.
* 2. RAN2 confirms that RA prioritization and RA partitioning work independently. Can discuss in the next meeting if this requires some configuration changes.
* 3. Deprioritize the RRC re-establishment triggered RACH in slice-based RACH design.
* 4. Reuse the same rule as the legacy in preamble group selection for slice-based RACH, i.e. if the preamble group has been selected during the RA procedure, the UE shall select the same preamble group for each RACH attempt (can be revisited in the common session if necessary).
* 6. Not to introduce the slice-specific max number of MsgA preamble transmissions for the slice-based RA fallback.
* 7. In one BWP, one slice group links to only one slice-specific RACH configuration.
* 11. The indication (i.e. whether slice override MCS, MPS or MPS override slice is common for all slice groups) is put under the IE BWP-UplinkCommon.

[Rapp] The above agreement 1, 2, 3, 4, 6, 7, 11 will be implemented in the RRC CR.

In principle, these agreements will be captured either in slice specific CRs or common RACH CRs, the rapporteur (and also companies) can double check the progresses from both sessions.

* 8. The UE AS is aware of the slice group ID (s) based on the information provided by the UE NAS.

[Rapp] Not sure whether the above agreement will be captured in the RRC CR, and companies can double check.

* 9. It is left to the network implementation on how to signal the order of slice-based RA-prioritization parameters.
* 10. The maximum number of RA-prioritization configurations (i.e. maxSliceInfo-r17) is decided in the next meeting.

[Rapp] ok to make it FFS in the RRC CR and we can decide on it in the next meeting.

* Working agreement: RAN2 assumes that the mapping of slice to the slice groups for cell reselection are per TA.
* Send LS to SA2 to indicate the RAN2 working agreement above.
* 13. A slice is not associated with multiple slice groups for the same purpose. A slice can be associated with one slice group for RACH and one slice group for reselection.

[Rapp] For the above working agreement and agreement 13, it will be good to collect companies’ views on potential impacts to the RRC CR, e.g. which of information will be needed as part of slice specific information in RRC Release message or SIB.

**Question 4: For the following assumption and agreement captured in the session minutes, what are the potential impacts to the RRC CR?**

RAN2 assumes (based on majority views in RAN2) that the mapping of slice to the slice groups for cell reselection are per TA.

13. A slice is not associated with multiple slice groups for the same purpose. A slice can be associated with one slice group for RACH and one slice group for reselection.

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| **Company** | **Comments if any** |
| Qualcomm | For “RAN2 assumes that the mapping of slice to the slice groups for cell reselection are per TA.”, we think one impact is: the slice group id size is still kept as FFS (as it is now). We can update after SA2 provides their feedback.  For “A slice is not associated with multiple slice groups for the same purpose. A slice can be associated with one slice group for RACH and one slice group for reselection”, we think no RRC impact is foreseen because it seems should be specified in NAS signaling, irrespective of whether per TA or per PLMN is adopted in SA2. |
| Samsung | About the first part ‘mapping of slice to the slice groups’, this may not be present at AS level if slice info for cell reselection is configured with slice group ID in SIB or RRCRelease.  For the second part, the configuration in RRC incorporating this agreement is done by NW implementation. This may be captured in corresponding fields descriptions e.g., slice group info for RACH, slice group info for cell reselection. |
| Nokia, Nokia Shanghai Bell | Note that this is a RAN2 assumption, it is no longer a working agreement but. The exact wording in the minutes is:   * RAN2 assumes (based on majority views in RAN2) that the mapping of slice to the slice groups for cell reselection are per TA.   The granularity has impact to the slice group id size, but RAN2 could assume TA granularity at this point (see our proposal at Q2). We see no other ASN.1 impact. |
| NEC | We do not see direct impact to RAN2 specification, except the granularity will impact the size of group ID in principle, which anyway better to be decided by other WG. |
| LGE | For ‘mapping of slice to the slice groups’, agree with Qualcomm that the size of slice group ID configuration can be affected. |
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As analysed above, the rapporteur has made some comments for some RAN2 agreements, and no RRC CR impacts are observed for others. Please companies check the comments and provide comments in the following table if any.

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| **Company** | **Comments if any** |
| LGE | According to RAN2#117e discussion, the chair clarifies that slice specific RACH would be captured in common RACH CR as follows:   * LGE is fine with P2 but would like to note that this needs to be discussed in common RACH session. Thinks FeatureCombination configuration may be problematic. wonders in which CR these are handled? **Chair indicates the RACH part will be in common RACH CR.** QC agrees.   On the other hand, in common RACH session, RACH resource configuration (including RACH prioritization parameter) should be captured in common RACH CR, in order to avoid the duplicated implementation:   * (Agreed in RAN2#115 meeting): A common RRC CR capturing the signalling framework for RACH resource configuration across all the WIs should be used and this CR should be maintained as part of the common RACH agenda item. Each WI is expected to provide the necessary parameters to include in the signalling. * (Agreed in RAN2#116bis meeting): RAN2 submits one RRC CR to plenary that captures the RA partitioning feature that covers all common aspects for RA partitioning. The RRC CRs for RedCap, SDT, Coverage enhancements, and Slicing should not have any overlap with this common RRC CR.   Since the RACH prioritization parameters are already considered in common RACH CR, in RAN slicing, configuration of RACH prioritization should be removed. In our understanding, the current agreement to independently configure RACH isolation and RACH prioritization will impact on common RACH CR. |
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# Conclusions

[To be added if some decisions are to be made]

# References