3GPP TSG-RAN WG2 Meeting #116bis-e R2-22XXXX

Electronic Meeting, 17 – 25 January 2022

**Agenda item: 8.8.1**

**Source: CMCC**

**Title: Report for [AT116bis-e][240][Slicing] Remaining details for slice groups (CMCC)**

**WID/SID: FS\_NR\_slice**

**Document for: Discussion and Decision**

# Introduction

This document aims at address the remaining details for slice groups

* [AT116bis-e][240][Slicing] Remaining details for slice groups (CMCC)

Scope: Discuss the slice group aspects: 1) discuss what should be the definition of slice group (based on latest RAN2 and SA2 agreements)? 2) how to resolve the TA boundary aspects? 3) does UE select different slice group if no cell supporting that slice group is available?

Intended outcome: Discussion summary in R2-2201708.

Deadline: Deadline 3

Comment deadline: Thursday W1, 1600 UTC (for collecting views)

Rapporteur proposals: Friday W1, 0900 UTC (proposed resolution of issues)

Document deadline: Monday W2, 1200 UTC (report or agreed CRs)

**Contact List**

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| Company | Name | Email |
| Qualcomm | Peng Cheng | chengp@qti.qualcomm.com |
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# Discussion

***Open issue 1: Definition of slice grouping***

Previous agreements in RAN2#116-e:

* A network slice can be associated to none or only one slice group.

Since SA2 hasn’t reached agreement on the definition of slice grouping, RAN2 can try to define one based our understanding. A candidate definition is shown below:

**Slice group: A group which is associated with one or multiple slices. And a slice is associated to none or only one slice group.**

**Q1.1: Do you agree with the above definition for slice group? Other suggestions are also welcome.**

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| **Company** | **Comments** |
| Qualcomm | Agree. |
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Regarding to the maximum number of slice groups, the contributions [19, 30, 47] suggested the maximum number of slice groups as at most 16 slice groups, or as less as possible (e.g. 3 slice groups representing for high/medium/low degree of importance). While, [5] suggested to postpone the decision on maximum number of slice grouping configured by Network after it is clear what dedicate configurations can be configured for one slice group.

**Q1.2: What is the maximum number of slice group?**

**Option 1: 16**

**Option 2: other numbers.**

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| Company | Which option do you prefer | comments |
| Qualcomm | See comments | We still see more than 1 companies are proposing to modify previous RAN2 WA on per-TA slice grouping to per-PLMN with some technique justifications. If it is per-PLMN, it is obviously up to 16 groups is not sufficient. That is why we think it seems still not a good time to determine the maximum number of slice group. We think RAN2 can agree max slice grouping number only after:   * The definition of slice grouping is finalized (including its definition and granularity) * What configuration (and its payload size) can be configured to one slice group |
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***Open Issue 2: TA boundary***

Previous agreements in RAN2#116-e

* 3: Working assumption: The granularities of the slice groups for cell reselection are per TA. FFS on the details (e.g. how to resolve TA boundaries).

A number of contributions [4, 16, 19, 25, 30, 49] see issues for TA boundary and suggested to resolve the issues, while the contributions [22, 48] thought that there is no issue and no spec impacts on TA boundary.

The first open issue is that, when UE is checking whether the highest ranked cell support the highest priority slice, how the UE is aware of the slice supported by the neighbouring cell belonging to other TA?

According to the contributions, there are several potential solutions for resolving the TA boundary issue.

**Q2.1: How UE can know the supported slice for neighbouring cell at TA boundary?**

**Option A: The gNBs exchange the supported slices (S-NSSAI/NSSAI) through Xn interface, then serving gNB can map the slices supported by neighbour cells to slice groups based on the slice group mapping relationship in current TA and broadcast it to the UEs. [19]**

**Option B: As assistance information, an optional PCI list is introduced to indicate the cells supporting one slice group in a new SIB. And if NW don’t provide such info on the best ranked cell, the UE may skip the checking on slice support in best ranked cell. [4]**

**Option C: Add the association of slice group IDs and their valid TACs in the slice-specific cell reselection info for inter-TA cell reselection. The UE can determine whether to camp on the highest ranked cell based on the TAC received in its SIB1.[30]**

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| Company | Which option do you prefer | comments |
| Qualcomm | Option B in RAN2 | We are proponent of Option B. It is also one solution to reduce signalling overhead of slice info in SIB. In this way, the UE behaviour is clearly specified, and no RAN3 and SA2 impacts are foreseen (i.e., it is up to source cell implementation how to provide the optional PCI list)  For Option A and C, it obviously has at least RAN3 impacts. And we don’t see they are mutual exclusive to Option B. Because they are not RAN2 expertise, we suggest proponents to propose these solution in RAN3 and SA2 first. |
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The contribution [19, 12] pointed out the case that the neighbour cell supports a slice which cannot be mapped into any current slice group and suggested to handle this issue. There are several potential solutions for this issue:

**Q2.2: How to handle the case if the gNB doesn’t support the slice group mapping for the slice of the neighbouring cell? Do we need to send LS to RAN3/SA2?**

**Option 1: The gNB can request CN to update the mapping to involve the new slice.[19]**

**Option 2: The gNB can request RAN OAM to update the mapping to involve the new slice.**

**Option 3: Restrict that one slice is mapped to only one slice group. [12]**

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| Company | Which option do you prefer | Send LS to RAN3/SA2? | comments |
| Qualcomm | See comments | No | As we replied in Q2.1, Option 1 and Option 2 are RAN3 expertise. We suggest proponents to propose these solutions in RAN3 first. We don’t think any issue to resolve in RAN2, and also we don’t think RAN2 should trigger such discussion to RAN3. |
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***Open issue 3: Consider low priority slice or not***

The contribution [8, 19] have proposed that low priority slice is considered with iteration but needs to some enhancements, for example, reuse the immediate past measurements, or set the maximum number of iterations, or set a timer for iteration, etc. Another contribution [30] proposed that RAN can indicate the UE whether to perform Step 7 or the limit times of iterations.

On the other hand, the contribution [35, 37] proposed new algorithm on frequency priority handling, in which the low priority slice is considered without iteration.

Some contributions [4, 16, 11, 33, 41] suggested to only consider the highest priority slice.

**Q3: Does UE select different slice if no cell supporting that slice is available, which option do the companies prefer?**

**Option A1: Low priority slice is considered with iteration. [8, 19, 44, 45]**

**Option A2: Low priority slice is considered, but without iteration. [35, 37]**

**Option B: Only highest priority slice considered. [4, 16, 11, 33, 41]**

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| Company | Which option do you prefer | Comments |
| Qualcomm | Option B with comments | We support a clearer Option B:  **Option B-1: Only highest priority slice considered, then legacy priorities considered. [4, 16, 11, 33, 41]**  For Option A1 and A2:   * We do not support them as we commented before that it will increase UE’s latency and power consumptions during cell reselection, especially if number of slice group is large. It is conflicted with the intention to introduce slice specific cell reselection. * At such late stage of Rel-17, we have to emphasize that RAN2 need to focus on how to close open issues in the remaining two meetings. In our understanding, there is even not a converged baseline solution on how to consider the low priority slice (e.g., how to converge Option A1 and Option A2?). And more and more enhancements are being proposed as Rapporteur mentioned (e.g., set the maximum number of iterations, or set a timer for iteration), which we are not sure whether they are on top of Option A1 or Option A2? We don’t think how RAN2 can make progress for these on-fly proposals in the remaining 2 meetings.   In all, although we understand Option B-1 has some performance restriction, we think it is a reasonable way forward to finalize Rel-17 RAN slicing enhancement, given the current situation. |
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# Summary

# References

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2. R2-2200044 Running 38.304 CR for RAN slicing Ericsson
3. R2-2200055 List of open issues for RAN slicing WI CMCC
4. R2-2200179 Remaining issues on slice specific cell reselection Qualcomm Incorporated
5. R2-2200180 Remaining issues on slice specific RACH Qualcomm Incorporated
6. R2-2200181 Further discussion on UE capability related to RAN slicing enhancement Qualcomm Incorporated
7. R2-2200406 Optimizations for signalling Slice Information Lenovo, Motorola Mobility
8. R2-2200407 RAN Slicing CR to 38.304 Lenovo, Motorola Mobility
9. R2-2200408 Triggers for initiating RAN slicing based cell reselections Lenovo, Motorola Mobility
10. R2-2200409 Principles of Slice based reselection Lenovo, Motorola Mobility
11. R2-2200416 Discussion on Slice based Cell Reselection CATT
12. R2-2200417 Analysis on issues of slice groups at TA boundaries CATT
13. R2-2200418 Analysis on UE capability for RAN slicing enhancement CATT
14. R2-2200510 Further considerations of slice based cell reselection Intel Corporation
15. R2-2200511 UE capability for Slicing enhancement Intel Corporation
16. R2-2200636 Consideration on slice based cell reselection Spreadtrum Communications
17. R2-2200697 Considerations on UE capability for RAN slicing Beijing Xiaomi Software Tech
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19. R2-2200845 Discussion on open issues for slice based cell reselection CMCC
20. R2-2200846 Discussion on open issues for slice based RACH configuration CMCC
21. R2-2200847 Discussion on UE capability for RAN slicing enhancement CMCC
22. R2-2200929 Consideration on slice-specific cell reselection OPPO
23. R2-2200930 Consideration on slice-specific RACH OPPO
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29. R2-2200973 Running NR RRC CR for RAN slicing Huawei, HiSilicon
30. R2-2200974 Discussion on slice based cell reselection under network control Huawei, HiSilicon
31. R2-2200975 Discussion on slice based RACH configuration Huawei, HiSilicon
32. R2-2200976 Discussion on UE capabilities for RAN slicing Huawei, HiSilicon
33. R2-2201005 Leftover issues in slice based cell reselection ZTE corporation, Sanechips
34. R2-2201050 Detailed RRC signalling for RACH prioritization configuration Nokia, Nokia Shanghai Bell
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38. R2-2201170 RACH for RAN slicing enhancement Ericsson
39. R2-2201171 UE Capabilities for Slice- based Cell re-selection Ericsson
40. R2-2201190 Slice-Info provision NEC Telecom MODUS Ltd.
41. R2-2201192 Slice-based cell re-selection TP for solution 4C NEC Telecom MODUS Ltd.
42. R2-2201200 Slice information provided by RRCRelease Sharp
43. R2-2201208 Discussion on signalling slice information LG Electronics UK
44. R2-2201209 Discussion on slice based cell reselection LG Electronics UK
45. R2-2201389 A couple of FFS for Cell Reselection Kyocera
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51. R2-2201422 On selection of Solution 4 Option A, B and C Samsung R&D Institute UK
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54. R2-2201536 38.321 running CR for RAN Slicing OPPO