**3GPP TSG-RAN WG2 Meeting #111 electronic R2-2008143**

**Online, August 17th - 28th, 2020**

**Agenda item: 8.8**

**Source: CMCC**

**Title: [AT111-e][213][RAN slicing] Use cases and deployment scenarios (CMCC)**

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

**Document for: Discussion and Decision**

# 1 Background

A Release 17 study item “Study on enhancement of RAN Slicing” was approved in RAN#86. The following are the objectives of this work item:

|  |
| --- |
| The study item aims to investigate enhancement on RAN support of network slicing. Detailed objectives of the study item are:   1. Study mechanisms to enable UE fast access to the cell supporting the intended slice, including [RAN2] 2. Slice based cell reselection under network control 3. Slice based RACH configuration or access barring   Note: whether the existing mechanism can meet this scenario or requirement can be studied.   1. Study necessity and mechanisms to support service continuity, including [RAN3] 2. For intra-RAT handover service interruption, e.g. target gNB doesn’t support the UE’s ongoing slice, study slice re-mapping, fallback, and data forwarding procedures. Coordination with SA2 is needed.   Note: This study item should take SA2 output on slicing enhancement into consideration if RAN impacts are identified.  Note: The use of RAN slicing in given cells shall not prevent from accessibility for Rel-15 and Rel-16 UEs. |

In RAN2#111-e meeting, the following agreements are achieved during the online session:

|  |
| --- |
| => RAN2 can discuss the scenarios and requirements from a RAN2 perspective and then inform SA2 and RAN3  => TA discussion will not take place in RAN2, we will wait for SA2 input   1. Scenarios for now to be studied by RAN2:  * Multiple and different slices can be supported on different frequencies * Multiple and different slices can be supported in the same frequency layer in different regions.   2 For each scenario we study both IDLE and INACTIVE and determine whether there is need for a solution and possible solutions. Connected mode will also be considered but with a lower priority.  3 RAN2 will study both cell selection and cell re-selection  => Identify the problem with existing mechanisms with dedicated priority and study if some enhancements are needed  => RAN2 will study slice-based RACH resources/configuration and RACH parameters prioritization *to enable UE’s fast access for the intended slice.*  => Get input during email discussion on valid use cases |

**Email content to be finalized and discussion kicked off only after the online session on Aug 24th, potential scope below.**

**[AT111-e][213][RAN slicing] Use cases and deployment scenarios (CMCC)**

Scope:

* + - Discuss use cases and deployment scenarios based on online decisions.
    - Capture agreements from this meeting in a TP to the TR

Intended outcome:

* + - Discussion summary in [R2-2008143](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2008143.zip) (by email rapporteur), including TP for the TR.

Deadline for providing comments, for rapporteur inputs, conclusions and CR finalization:

* + - Deadline for companies' feedback: Wednesday 2020-08-26 12:00 UTC
    - Deadline for rapporteur's summary (in [R2-2008143](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2008143.zip)): Thursday 2020-08-27 12:00 UTC

# 2 Discussion

## 2.1 Capture the RAN2 agreements into TP

### 2.1.1 About the use cases and deployment scenarios

For the scenario, RAN2 has made the following agreements, which need to be captured into the TR 38.832:

**Agreements*:***

1. Scenarios for now to be studied by RAN2:

* Multiple and different slices can be supported on different frequencies
* Multiple and different slices can be supported in the same frequency layer in different regions.

From the rapporteur’s point of view, the scenarios in the following contributions are aligned with the RAN2 agreements, so it is suggested to discuss on the scenario descriptions based on these contributions.

[R2-2007716](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007716.zip) Scenarios and requirements for RAN slicing SoftBank Corp. discussion Rel-17 FS\_NR\_slice

[R2-2007421](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007421.zip) Discussion on support of RAN slicing CMCC discussion Rel-17 FS\_NR\_slice

[R2-2006707](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2006707.zip) Considerations on slice aware cell selection KDDI Corporation discussion

[R2-2008071](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2008071.zip) Considerations scenarios on enhancing the RAN support of network slicing China Unicom discussion Rel-17 FS\_NR\_slice

Based on the above contributions from operators, the rapporteur is to implement the draft TP for the scenario as follows.

//Start of the TP//

5.1 Slice based cell reselection under network control

5.1.1 Scenario and issue description

*Editor Note: capture the description of scenario and issue.*



Figure 1. Scenario for slice deployment

**General description for the scenario:**

**• Multiple and different slices can be supported on different frequencies**

**• Multiple and different slices can be supported in the same frequency layer in different regions.**

As shown in figure 1, eMBB service (slice 1) is supported in both 2.6GHz and 4.9GHz everywhere, since the frequency resources are so valuable and the top requirement for all operators’ 5G network is to serve millions or billions of smart phone users. URLLC service (slice 2) is supported only in 4.9GHz in some area, e.g. factory or hospital.

Area 1 is deployed in the factory or hospital. In this area, 2.6GHz supporting eMBB, 4.9GHz supporting both eMBB and URLLC.

Area 2 is the public area. 2.6GHz and 4.9GHz all supporting eMBB for smart phone users, no URLLC is supported in area 2. And 4.9GHz is deployed as hotspot to provide wideband access.

Here, eMBB and URLLC slices are used only as an example of various slices. The deployment of any slice on any frequency band is up to network implementation.

//End of the TP//

**Question 1: For scenario descriptions, do you agree to capture the above TP into the draft TR 38.832?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| ZTE | Yes | This scenario has been identified and acknowledged when this SI is decided in RAN plenary.  Also, We observe that the existing mechanism cannot fully satisfy the requirements in this scenario and further enhancements should be considered. |
| Convida Wireless | Yes | Recommend changing the general description text to use “frequencies” or “frequency layer” terminology consistently.   * Multiple and different slices can be supported on different frequencies * Multiple and different slices can be supported ~~in~~ on the same frequency ~~layer~~ in different regions. |
| Qualcomm | See comments | We have two comments on above TP:   * The current scenario seems to be too specific to one deployment. We assume that the scenario of 3GPP TR is better to be general enough to cover all similar scenario. Thus, we suggest to remove specific frequency (e.g. 2.6GHz/4.9GHz) and slices (i.e. use F1/F2, Cell1/Cell2 and Slice1/Slice2 in the figure) to generalize the scenario. Of course, rapporteur can clarify that F1 could be 2.6GHz and Slice 1 could be eMBB as example in the text of TP.   We have agreed two scenarios online. It seems the Rapporteur only captures the 2nd scenario in Figure 1 (i.e. Multiple and different slices can be supported in the same frequency layer in different regions). We think it is fair to also capture 1st scenario (i.e. Multiple and different slices can be supported on different frequencies) in another figure. And similar to our first comment, the figure should be general enough. |
| CATT | Yes | It’s quite aligned with our online agreements on the scenario. |
| OPPO | Yes | We think two scenarios agreed on-line are already captured in the TP. In details, Area1 can be seen as scenario 1, and the comparison of Area1 and Area 2 can be seen as scenario 2. |
| BT | No | We agree with QC.  We can remove specific frequencies and traffic types from the picture to generalize the scenario.  In current figure, only 1 traffic type uses multiple frequencies. Then, first agreement is not captured |
| Lenovo, MotM | Yes but… | It depicts a general view of the scenario described by operators so far.  The “Area 2” does not pose any specific problem/ issue/ impact by itself and therefore can be removed. Also, we think that Public and Private (network) need not be separately discussed now.  We might rather want to address another “Area 3” where different slices are available on different (but overlapping) frequency layer, like URLLC on one frequency and eMBB on the other. |
| Spreadtrum | Yes | We agree on the above descriptions basically. And it may be more suitable if we describe the two scenarios more generally, as the above descriptions seem like a specific use case and consider only two slice types. |
| Xiaomi | Yes |  |
| SoftBank | Yes, but | Agree with Qualcomm and BT, it is better to remove specific frequencies and traffic types from the figure and update the description accordingly. |
| Nokia | Yes |  |
| Intel | See comments | We agree with Qualcomm that the description is too specific to the scenario. The agreements, though based on the figure, were not specific to the figure. Our suggestions are:   1. to capture the agreement scenarios as the starting point (rather than description of “the” scenario given in the figure), 2. Add editors note that additional scenarios can be discussed as follows:  |  | | --- | | **The following scenarios will be studied:**  **• Multiple and different slices can be supported on different frequencies**  **• Multiple and different slices can be supported in the same frequency layer in different regions.**  Editors Note: Additional scenarios can be discussed as part of the study |  1. The figure and description can be added after the agreements as an example, with the generalization similar to what Qualcomm mentioned. 2. Figure 1 title should be changed to “An example scenario for slice deployment” |
| Mediatek | Yes | The figure aligns with our agreements on scenarios, which can be considered as a specific example. For TR, it’s OK not to have figures which is not generalized enough as long as there is no important information missing. Maybe we can say the figure as ‘Figure 1. Example of Scenario for slice deployment’. We also agree with Convida’s revision. |
| KDDI |  | Agree with QC. We prefer to make the statements more generic instead of using specific frequencies |
| Ericsson | Yes, but. | We agree the proposed scenarios captures what has been claimed as an essential use case.  As commented by others, we can generalize the services and the frequencies.  If there are slices with services that are better suited to run on a specific frequency, a good deployment scenario might be that the slice is allowed on other frequencies, but when possible steered to that preferred frequency defined for the slice. With that deployment scenario, most UEs will be served on the preferred frequency, but RAN can serve the UE on another frequency if that is better, based on current QoS requirements, coverage situation and cell loads.  We propose that also this deployment scenario, where a slice is allowed on any frequency, but preferred on specific frequency, is included in the TP. |

### 2.1.2 About others

For RAN2 agreements other than the use cases and deployment scenario, we have the following considerations.

|  |  |
| --- | --- |
| **RAN2 agreements** | **The rapporteur’s considerations** |
| 1. RAN2 can discuss the scenarios and requirements from a RAN2 perspective and then inform SA2 and RAN3 | No need to capture it in the TR. |
| 1. TA discussion will not take place in RAN2, we will wait for SA2 input | No need to capture it in the TR. |
| 1. For each scenario we study both IDLE and INACTIVE and determine whether there is need for a solution and possible solutions. Connected mode will also be considered but with a lower priority. | Suggest to capture it in the TR. |
| 1. RAN2 will study both cell selection and cell re-selection | No need to capture it in the TR. |
| 1. Identify the problem with existing mechanisms with dedicated priority and study if some enhancements are needed | Suggest to capture it in the TR. |
| 1. RAN2 will study slice-based RACH resources/configuration and RACH parameters prioritization *to enable UE’s fast access for the intended slice.* | Suggest to capture it in the TR. |
| 1. Get input during email discussion on valid use cases | No need to capture it in the TR. |

**Question 2: For the above considerations from the rapporteur, what is your opinion?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | We also think it is good to capture some agreements in the TR. |
| ZTE | Yes | We agree to capture agreement (3) (5) (6) in the TR as initial description on what we would do in this SI. Maybe agreement (4) can be considered to capture in the TR as only cell reselection is mentioned in the objective part of the SID, we can make the scope clearer by mentioning both cell selection and reselection in the TR.  For the remaining agreement (1) (7), there seems to be no need to capture anything in the TR for the time being. We can wait for the outcome of the discussion on scenarios, requirements, and use cases and capture them afterwards.  For agreement (2), it is more related to SA2 and there is no progress so far, we also think there is no need to capture anything for the time being in our TR. |
| Convida Wireless | Yes | We are in general agreement with the rapporteur’s considerations. However, with regards to agreement (4), we suggest to capture it in the TR. |
| Qualcomm | Yes 1/3/4/5/6 | For 2), we tend to think maybe we can capture it in Editor’s notes, e.g.  *Editor’s Notes: RAN2 will wait SA2 input on TA discussion* |
| CATT | Yes | Basically, we’re fine with the rapporteur’s thinking, but also fine to capture agreement (4) into TR. |
| OPPO | Yes | Generally, we agree with rapporteur’s considerations. Regarding (4), we also think we it is needed to captured in the TP, since cell selection is not mentioned in current SID. |
| BT | Partially | Yes to 1,3,5,6,7.  It will be helpful to capture the agreements as suggested by Huawei.  For point 2), at this stage an Editor’s Notes may result helpful as suggested by QC.  We consider point 4 should be captured. |
| Lenovo, MotM |  | For (3), our opinion is that RRC Connected state should also be studied, until it is clear that network has up to date knowledge about UE’s slice/ service priorities at any point in time, with same focus as Idle/ Inactive from the beginning. We do not have much time to lose.  (4) may also be captured in the TR.  We may also add:  (8) Minimize impacts to legacy R15/16 UEs. |
| Spreadtrum | Yes | We agree on the rapporteur’s considerations in general. As for (4), we have similar views with ZTE, capture it into TR could make the scope of SID clearer. |
| Xiaomi | Partially | We agree with the rapporteur’s consideration on (1)(2)(3)(5)(7).  For agreement(4), we have the same opinion with above companies that it can be considered to capture in the TR.  For agreement(6), we think it can also be captured in the TR as “RACH parameters prioritization *to enable UE’s fast access for the intended slice”* is not mentioned in the objective of WID , we can make it clear in the TR. |
| SoftBank | Yes | For (4), we agree with other companies, it is good to capture it in TR. |
| Nokia | Yes | Our understanding is that (7) is about valid use-cases that requires slice-based RACH |
| Intel | Partly | Agreement 4 should be captured.  Also agree with Qualcomm that 2 can be captured as an editors note. |
| Mediatek | Yes | For (4), we can keep it open for the time being. The agreement is saying what RAN2 will do. It doesn't have concrete conclusion, which is not worthwhile to be captured in the TR. If the impacts on cell selection are identified later, the corresponding agreements will definitely be captured. |
| KDDI | Yes | Agree with CATT and OPPO, prefer to capture something with regard to (4) |
| Ericsson | Partially | We agree with the proposal by the Rapporteur, but on (3), we agree with other company comments above that study of what is possible according to existing specifications (in Connected) is essential when assessing if new mechanisms are needed.  On (2), we note that completely avoiding TA discussion is probably not possible in RAN2 when discussing existing mechanisms. So (2) should not be captured in the TR. |

## 2.2 Scope for the long-term email discussion

In the session minutes, a long-term email is also mentioned. From the rapporteur’s point of view, the email is needed as it can help a lot on RAN slicing discussions.

Post-meeting email discussion

* TBD if this is needed - Email content to be announced during the CB session on Friday, Aug 28th, potential scope below
* [Post111-e#xx][NR][RAN slicing] TBD: Progressing RAN slicing SI (CMCC)

Scope: Based on online agreements (TBD if needed)

Intended outcome: Email discussion summary + TP

Deadline: Long

The rapporteur suggests to discuss the scope of the long-term email in this email discussion. Based on the contributions on RAN slicing in this RAN2 meeting, the rapporteur has summarized the following important questions because they are mentioned in quite a lot of contributions. And then companies check these questions, e.g. whether a topic is suitable to be discussed in the long-term email.

* Q1: What is the issue that RAN2 needs to study in this SI for the agreed scenario?
* Q2: What are the candidate solutions to address the above issues?
* Q3: Whether the R15 dedicated priority mechanism can solve the above issues?
* Q4: What are the use cases or intentions for studying slice-based RACH configuration or RACH parameters prioritization?

**Question 3: For the above 4 questions, do you support to discuss them in the long term email discussion (i.e. from the end of this RAN2 meeting until the next RAN2 meeting)? If there is another question, please also indicate it below and it should be straightforward and reasonable.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Which question do you support to discuss?** | **Comments** |
| Huawei, HiSilicon | Q1, Q2, Q3, Q4 | For Q2, we think that some contributions have already mentioned candidate solutions in this RAN2 meeting. In order to have efficient email discussions, perhaps the rapporteur could summarize the solutions and use them for further comments. |
| ZTE | All the questions listed above | We share the same understanding with Huawei that companies have already come up with solutions this meeting and it would be nice if the rapporteur can summarize the solutions and start the discussion on that during the follow up email discussion considering that we have very limited time for this SI. |
| Convida Wireless | Q1, Q2, Q3, Q4 | The term “intended slice” is widely used, but it’s not clear if there is a common understanding of what is meant by an “intended slice”. Recommend also including a question to capture views on what is meant by an “intended slice” in order to formalize a definition that describes how this term relates to S-NSSAI, Allowed NSSAI and/or Requested NSSAI. We should also discuss whether there are times when only the UE knows the “intended slice (i.e. MO Traffic) and times when the UE does not know the “intended slice” (e.g. MT traffic). |
| Qualcomm | All | Same understanding as Huawei and ZTE.  We also echo Convida’s concern on the term of “intended slice”. Slightly different from Convida, we think the new question should be more general that whether the UE need to know “intended slice” for MO and/ MT traffic? |
| CATT | Q1, Q2, Q3, Q4 | As mentioned by above companies, it’s an efficient way to also summarize the potential solutions in the long email discussion. But we wants to emphasize that how to evaluate the potential solutions is also important. For instance, the requirement for Slice based cell reselection is to enable UE FAST access to the cell supporting the intended slice, so we think any potential solution should meet the requirement in principle. More addition, we also agree with Convida that the “intended slice” concept should be clarified and how UE can get it should be also considered. |
| OPPO | Q1, Q2, Q3, Q4 | We share the same understanding as Huawei and ZTE.  We also agree with Convida’s concern on the term of “intended slice”. One more question may be what is the meaning of intended slice and whether the intended slice can always be obtained by UE side? |
| BT | All | We agree with previous companies and as Convida pointed, it will be desirable to clarify the term “intended slice” |
| Lenovo, MotM | All but… | We would replace Q1 with the following Q1a and Q1b and changes the order a little:  Q1a) Are there concrete requirements/ operator observation or expectation on how fast/ quick the access to certain special slice need be? Are there multiple such quick-access-slices in any/ some/ special UEs?  Q1b) What’s the scope of the scenario w.r.t. RRC states: Connected, Idle as well as Inactive?  Q2) Whether the R15 dedicated priority mechanism can solve the above issues?  Q3): What are the candidate solutions to address the above issues?  Q4): What are the use cases or intentions for studying slice-based RACH configuration or RACH parameters prioritization?  Further, due to the longer break until next meeting, we suggest a phased email discussion:  1st phase: to identify and discuss further use-cases/scenarios/issues.  2nd phase: discuss candidate solutions for the identified use-cases/scenarios/issues. |
| Spreadtrum | Q1,Q2,Q3,Q4 | For Q2, We share the similar views with Huawei and ZTE.  And as a part of objectives of SID, the UAC solutions are not discussed due to time limit online. We could clarify it as well in the email discussion.  For the “intended slice”, we agree with Convida that we should figure out the specific definition of “intended slice”. For the cases where only the UE knows the “intended slices”, it could be un-appropriate to set cell reselection frequency priority by gNB.  Finally, we should also achieve common understandings of “fast access”, which could impact on the solutions selection. |
| Xiaomi | All | We have the same view with Huawei and ZTE.  For the term of “Intended slice”, we agree with Convida and CATT that the concept of it should have a common understanding and we should further discuss how and when UE can get it.  Besides, considering that UE may request multiple slices which are supported on different frequencies, we suggest to discuss whether slice priority need to be defined and it is decided by UE or by network.  For slice based access barring mentioned in the objective of SID, we suggest to discuss whether it need to be deprioritized. |
| SoftBank | Q1, Q2, Q3, Q4 | As mentioned from other companies, a definition of “intended slice” can be also discussed. |
| Nokia | Q2, Q3, Q4, but | Regarding to slice-based RACH (Q4) we should also investigate whether the use-cases can be solved with legacy mechanisms |
| Intel | All, see comments | Q3 should not just mention dedicated priorities but should be generalized to say “whether Rel-15 mechanisms such as dedicated priority”.  We think we can also discuss additional scenarios that should be considered. |
| Mediatek | All | Agree with HW and ZTE. |
| KDDI | Q1, Q2, Q3, Q4 | Share the view with other companies |
| Ericsson | All | We agree with Intel on clarifying Q3, and Nokia on Q4. |

# 3 Summary