**3GPP TSG-RAN WG2 Meeting #116 e R2-210xxxx**

**E-Meeting, Nov. 1 – 12, 2021**

**Source: Lenovo, Motorola Mobility**

**Title:****[Post115-e][244][Slicing] Resolving FFSs for solution 4 (Lenovo)**

**Document for:** **Discussion and Decision**

# **Introduction**

RAN2 has initiated the following long email discussion.

* [Post115-e][244][Slicing] Resolving FFSs for solution 4 (Lenovo)

Scope: Attempt to resolve solution 4 FFSs, including understanding if there are any impacts to RAN4 requirements. Can draft LS to RAN4 in case any potential impacts are identified.

Intended outcome: report + draft LS to RAN4 (if needed)

Deadline: Long

Following are the relevant agreements from the RAN2#115e:

Agreements

* 1: Solution Option 4 is selected for further work i.e., resolve the FFSs, send any required LSs and consequently start to draft specification CRs
* 2 Following is taken as the baseline for Solution Option 4:

The “slice info” (for a single slice or slice group) agreed to be provided to the UE in the last RAN2 meeting using both broadcast and dedicated signaling are provided for the serving as well as neighboring frequencies. The following steps are used for slice based cell (re)selection in AS:

Step 0: NAS layer at UE provides slice information to AS layer at UE, including slice priorities.

Step 1: AS sorts slices in priority order starting with highest priority slice.

Step 2: Select slices in priority order starting with the highest priority slice.

Step 3: For the selected slice assign priority to frequencies received from network.

Step 4: Starting with the highest priority frequency, perform measurements (same as legacy).

Step 5: If the highest ranked cell is suitable (as defined in 38.304) and supports the selected slice in step 2 then camp on the cell and exit this sequence of operation;

FFS: How the UE determines whether the highest ranked cell supports the selected slice.

Step 6: If there are remaining frequencies then go back to step 4.

Step 7: FFS: If the end of the slice list has not been reached go back to step 2.

Step 8: Perform legacy cell reselection.

Following are the relevant agreements from the RAN2#114e:

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| --- |
| * 1: Frequency priority mapping for each slice (slice -> frequency(ies) -> absolute priority of each of the frequency) is provided to a UE.

Note: Signaling optimizations are not excluded.Note: "slice may also mean "slice group"* 1b: Frequency priority mapping for each of the slice (slice -> frequency(ies) -> absolute priority of each of the frequency) is part of the “slice info” agreed to be provided to the UE using both broadcast and dedicated signaling.
* 3: RAN2 consider a scenario in its work for slice specific cell (re)selection where it is possible that (Suitable) cells on the same frequency belonging to different TAs support different Slice(s).
* 4: Working assumption: The Best cell principle according to absolute priority reselection criteria specified in clause 5.2.4.5 of TS38.304 needs to be met also for slice specific cell (re)selection.
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This email discussion will be carried in 2 phases; currently we are in the second phase:

Phase 1: Understanding company position and shortlisting main options/ issues

Phase 2: Resolving the issues, next-step (e.g., RAN4 LS) and converging

# **Discussion**

## 1st FFS: How the UE determines whether the highest ranked cell supports the selected slice?

This email discussion distinguishes two terms:

1. Slice Info: “Slice info” is defined as frequency priority mapping for each of the slice (slice -> frequency(ies) -> absolute priority of each of the frequency) and therefore consists of these 3 elements (slice, frequency and an absolute frequency priority). The slice info (for a slice or slice group) was agreed to be provided to the UE in the RAN2 meeting#113e using both broadcast and dedicated signaling. Slice info is provided for the serving as well as neighboring frequencies.
2. Slice support: This term is used in this document to signify only the slice(s)/ slice group(s) supported in a particular cell (serving cell or for neighbor cell).

Further, in RAN2#114e meeting, the following was also agreed:

*“RAN2 consider a scenario in its work for slice specific cell (re)selection where it is possible that*

*(Suitable) cells on the same frequency belonging to different TAs support different Slice(s).”*

This practically means that for cell reselections the UE can’t blindly assume that slice support on a frequency is uniform. Therefore, serving cell broadcasting slice support just for neighbouring frequencies may not be sufficient and UE needs to ensure if the highest ranked cell supports the selected slice (i.e., the slice from Step 2). One way to achieve this is to measure the corresponding frequency and check system information of the highest ranked neighbour cell to see if the selected slice is supported.

Further, it is difficult to assume that slice(s)/ slice-group(s) support of a cell can be broadcasted in SIB1 (to not increase SIB1 size too much), the UE may need to acquire other SIB of the neighbour to determine the same. If the highest ranked cell indeed does not support the selected slice, the UE will need to repeat the procedure until the highest ranked cell on some other frequency supports one of the selected slices (down the order). This may/ may not be an optimal solution and some companies may rather prefer that the serving cell provides slice support of neighbour cell. It can be argued that serving cell can’t provide (slice support) information on all neighbour cells; however, network implementation with/ without SON like features can help. If the answer to the following question is “Yes”, it can be assumed that both dedicated and broadcast signalling needs to be supported to provide slice support of neighbour cells.

**Q1: Do companies prefer that a (serving) cell provides slice support of neighbour cells?**

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| --- | --- | --- |
| Company Name | Yes/ No | Comments (e.g., feasible/ not-feasible since…) |
|  |  |  |
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Based on the above discussion, and irrespective of your answer to Q1, we can possibly have following solutions:

Option A: Serving cell broadcast slice support of neighbor cells

This option seems extremely signaling heavy e.g., multiple S-NSSAI for many neighboring frequency/ cells may need to be broadcasted. Some signaling optimizations may be used including use of slice groups (instead of individual S-NSSAIs), use of on-demand SIB – if a new SIB is used, etc.

Option B: Serving cell does **not** broadcast slice support of neighbor cells. TAC is used as a proxy for slice support and therefore neighbour cell’s SIB1 needs to be read

A UE needs to read the SIB1 (of the highest ranked cell) to find out the TAC. Based on this, the UE can determine if the selected slice is supported or not. In Rel. 17 this works due to homogeneous slice support principle. But in future releases if the homogeneous slice support principle is changed, this may become a problem.

Option C: Serving cell does **not** broadcast slice support of neighbor cells. Every cell broadcasts its slice support; therefore, a neighbour cell’s slice support needs to be acquired from that cell’s System Information

A cell should anyway indicate which slice(s)/ slice group(s) are supported to help a camped UE (e.g., a UE that selected this cell or a UE that reselected this cell for a certain slice but may need to check if a different slice, as indicated by NAS, is also supported in the serving cell). For reselection purpose, a neighbor cell’s SI needs to be read. However, as discussed earlier, for reselection this means reading of possibly SI of many neighbour cells, consuming time and battery.

Option D: Any other options??

**Q2: Which option do you prefer to acquire the slice support of a neighbor cell?**

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| --- | --- | --- |
| Company Name | Option | Comments (benefits/ shortcoming of option(s)) |
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**Q3: If Serving cell broadcasts slice support of neighbor cells, which SIB can be used?**

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| --- | --- | --- |
| Company Name | SIB# | Comments |
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**Q4: Which SIB broadcasts slice support of a serving cell?**

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| --- | --- | --- |
| Company Name | SIB# | Comments |
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## 2nd FFS: If the end of the slice list has not been reached go back to step 2?

This FFS intends to keep or remove the step 7 completely.

Argument for keeping Step 7: Even though there’s no guarantee that an application that triggers RRC Connection Est. is really from the highest priority slice an effort can be made esp. since measured frequency needs not be measured again for the “next” slice. Reselecting for highest/ higher priority slice is the main motivation for the work. Further, if the serving cell provides the slice support information for the neighbour cells, it might be more likely that not many iteration of Step 7 may be required.

Arguments for removing Step 7: Too much battery consumption for uncertain gain since it is anyway not clear that an application that triggers RRC Connection Est. is really from the highest priority slice.

**Q5: Does your company want to keep Step 7 (i.e., attempt to reselect on one or more lower than the highest priority available slice)?**

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| --- | --- | --- |
| Company Name | Yes/ No | Comments |
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**Q6: Since Q5 might affect a UE’s performance, would you prefer asking RAN4 if the measurements of frequencies can be assumed valid for the next iteration(s) and/ or if to keep step 7 or not?**

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| --- | --- | --- |
| Company Name | Yes/ No | Comments |
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# **Conclusion**

In this email discussion

# **Contact list**

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| Company Name | Delegate Name | Email Address |
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