**Source: Lenovo, Motorola Mobility – Prateek (pmallick@lenovo.com)**

**Title:****Details of Solution Direction Option 4**

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

# **Introduction**

RAN2 has initiated the following long email discussion.

* [Post114-e][251][Slicing] Solution direction details for slice priorities in cell reselection (Lenovo)

      Scope: Discuss technical details for solution directions identified as part of [AT114-e][250] and identify their pros and cons. Can ask questions on how the solutions work, can discuss combined solutions etc.

      Intended outcome: Discussion report (may include also draft CRs if there is enough convergence)

      Deadline:  Long

Following are the 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.
* 2: RAN2 kindly allow one more meeting cycle for understanding the necessity of Slice priority along with the following shortlisted solution directions for Idle mode mobility:

a) Option 4): Slice priority first looping over slice-frequency combinationb) Option 5): Maximize slice supportc) Option 6): Frequency priority of highest priority slice with adjustment based on actually supported slice(s) in best ranked cell, without multiple iterations of cell reselectiond) Option 7): Perform legacy cell reselection mechanism based on slice specific frequency priority* 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.
* 6: In addition to proposal 2, following aspects are FFS:

a) Content of “Slice Info” – to what extent the information needs to be and should be provided to support the Principle in proposal 5b) If used, who provides the “Slice priority” (NAS/ AS, UE/ Network)c) Can RAN2 continue to use “intended” slice for initial registration and idle-mode mobilityd) How UE in each of the solutions from proposal 2 uses slice info for cell reselection if both slice info and existing cell reselection priority is signaled (in the SIB and/ or dedicated signaling) |

This email discussion will be carried in 3 phases:

Phase 1: Development of Solution directions to one well defined solution

Phase 2: Comparison among solutions out of Phase 1 and selecting the most reasonable one

Phase 3: Coming up with an acceptable draft CR for the selected solution if time and situation permits – depending on the outcome of Phase 2.

# **Phase 1**

## How does Solution Direction (Option 4) work?

The UE Idle mode behavior for slice priorities can be described in following sequence of operation:

Step 1: List Slices in the priority order starting with highest priority slice.

Step 2: Select the first (or next if from Step 7) slice in the list

Step 3: Assign the priorities to frequencies according to the priorities provided to the selected slice

Step 4: Perform cell search according to the legacy procedure using the priorities assigned in step 3

Step 5: If the highest ranked cell is suitable (as defined in 38.304) and belongs to the UE’s RA then camp on the cell and exit this sequence of operation

Step 6: If there are remaining cell frequencies then go back to step 3.

Step 7: If the slice list is not empty go back to step 2

Step 8: Perform legacy cell reselection (using non-slice-based priorities i.e. for frequencies not corresponding to any slice support)

You may now share your understanding and comments in below table:

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| --- | --- |
| Company Name | Comment |
| Nokia | 1) We see two variants of the procedure depending whether the checking of the RA of the UE is performed in step 5, i.e. step 5 can be the following:Step 5: If the highest ranked cell is suitable (as defined in 38.304) then camp on the cell and exit this sequence of operation2) If the TAC is used as slice group identifier then instead of the RA the UE may also check the TAC if the highest ranked cell supports the slice group that was used for cell reselection.3) An important disclaimer for the procedure is that the UE can re-use the measurements on a frequency when the cell reselection with new priorities are repeated.4) We also have a couple of editorial commentsa) We think that it would be clearer if we revise step 7 in the following way:Step 7: If the end of the slice list has not been reached go back to step 2b) We may simplify the description of step 4-6 to emphasize the similarities to legacy procedure in the following way:Step 4: Perform cell reselection according to the legacy procedure using the priorities assigned in step 3Step 5: If a suitable cell is found and belongs to the UE’s RA then camp on the cell and exit this sequence of operation. If no suitable cell is found go to step 7.Step 6: Exclude the frequency of the suitable cell that does not belong to the UE’s RA and go back to step 4c) In the variant when checking of RA is not performed the description can be the following:Step 4: Perform cell reselection according to the legacy procedure using the priorities assigned in step 3Step 5: If a suitable cell is found then camp on the cell and exit this sequence of operation. If no suitable cell is found go to step 7.Step 6: Void |
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## What is the content of “Slice Info” when provided using Broadcast and dedicated signaling?

Without attempting to define stage-2 ASN.1 coding (and rather just for understanding purposes), Slice-Info could look like:

*SliceInfoList ::= SEQUENCE (SIZE (1..maxNrofS-groups) OF* [*SliceInfo*](file:///C%3A%5CUsers%5Cpmallick%5CDesktop%5CDraft_38331-g10.docx_ASN1.html#115)

*SliceInfo ::= SEQUENCE {*

 *SliceGroupId INTEGER(0..maxNrofS-groups),*

 *SliceFreqPriorities* [*CellReselectionPriorities*](file:///C%3A%5CUsers%5Cpmallick%5CDesktop%5CDraft_38331-g10.docx_ASN1.html#111)

*}*

Here SliceGroupId can be conditionally present only for broadcast signaling. In dedicated signaling (RRCRelease) the appearance of the slice/ slice-group can be in the same order as from their appearance in the allowed slice list (e.g. as in the Registration Accept message).

## If used, who provides the “Slice priority” (NAS/ AS, UE/ Network)

Network (e.g. NAS signaling because of registration (update) procedure).

## Can “intended” slice as defined in TR38.832 be used “as is” for in this Solution Direction?

Seems “Yes”.

# **Annex**

*Somewhat* in line with the TR 38.832 following geographies are depicted – only as a checkpoint to see how your solution works here. Only “slice” is mentioned but it can also mean “slice group”. A general term of “desired slice” is used to intentionally avoid using the term “intended slice”. A “desired slice” for one solution may mean higher priority slice (if a slice priority exists) or, for another solution may just point to the slice corresponding to the highest absolute priority for a supporting frequency.



Q1: Best Cell (Cell 1) on a high priority frequency (F1) does not support the-most-desired Slice (Slice 2). Where should the UE camp (or reselect)? Only one of TA1 or TA2 is part of UE’s RA.



Q2: Best Cell (Cell 4) on a high priority frequency (F1) does not support UE’s only desired Slice (Slice 1). Where should the UE camp (or reselect)? Only TA1 is part of UE’s RA.



Q3: Only TA1 is part of UEs Registration area. All Slices (1, 2, 3 and 4) are part of UEs Slice list. From radio quality Cell 6 is the best cell on F1. Where should the UE camp (or reselect) if

1. Slice 1 is most desired
2. Slice 4 is most desired



Q4: F1 has the highest absolute frequency priority according to the *cellReselectionPriorities* provided to the UE but none of the UE desired slices prefer F1 (as configured in the Slice-Info) and cell 8 does not broadcast any Slice support indication. Slice 1 is the only desired slice for the UE and UE’s RA consist of:

1. Both TA1 and TA2 (assuming this is not violating “homogeneous principle in the UE’s RA since cell 11 - TA1 does not prohibit use of any particular slice)
2. Only TA1
3. Only TA2



Q5: F1 has the highest absolute frequency priority according to the *cellReselectionPriorities* provided to the UE but none of the UE desired slices prefer F1 (as configured in the Slice-Info). Cell 10 supports only Slice 2 but Slice 1 is the only desired slice for the UE. UE’s RA consist of:

1. Only TA1
2. Only TA2

# **Annex-2**

List of companies contributing to this option

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| --- | --- | --- |
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| Nokia | Gyuri Wolfner | gyorgy.wolfner@nokia.com |
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