3GPP TSG-RAN WG3 Meeting #110-e R3-206903

E-meeting, 2 – 12 November, 2020

**Agenda item: 17.3**

**Source: Ericsson (moderator)**

**Title: CB: # RANSlicing3-SA2impact - Summary of email discussion**

**Document for: Approval**

# 1 Introduction

This paper provides summary of discussions at RAN#110-e on:

**CB: # RANSlicing3-SA2impact**

**- The slice uniform availability principle (i.e. the slices included in an Allowed NSSAI are available in any cell of a UE’s Registration Area) shall be maintained in Rel17?**

**- The slice support on multiple frequency scenario described by SA2 in S2-2001467 can be supported from RAN3 point of view?**

**- Pending to SA2 conclusion?**

(E/// - moderator)

# 2 For the Chairman’s Notes

The following is proposed to be captured and agreed:

1. **In Rel17, legacy UEs may be handled by allowing them access for slices in the Allowed NSSAI in any cell of a RA, but allowing the RAN to move the UE to overlaying cells where the slice should be served**
2. **In order to reply to the question from SA2 regarding the scenario presented in R3-201524, it is proposed to agree that the scenario can be supported as per Rel16 principles**
3. **Discuss online whether the raply LS from RAN3 should include a solution evaluation or only the agreements achieved on in this offline discussion**
4. **It is proposed to formulate and agree an LS reply to R3-201524 from SA2**

# 3 Discussion

## 3.1 Slice Availability in Rel17

In [1] an analysis of KI#7 documented in SA2’s TR 23.700-40 is carried out. This discussion was agreed to be taken by RAN3 at the last meeting, as per minuted agreement:

*RAN3’s feedback to SA2 concerns KI#7 in Section 5.7 of TR23.700-40 and that no other feedback from RAN3 is requested concerning solutions in 23.700-40, unless explicitly requested by SA2*

In order to tackle the issues of KI#7, the following agreement from RAN3-109 needs to be recalled:

*Status Quo in Rel-16 is that the slices included in an Allowed NSSAI are available anywhere (i.e. in any cell) within the UE’s Registration Area*

This agreement was derived during discussions at RAN3-109 with the intention of confirming that an S-NSSAI included in the Allowed NSSAI of a UE is available, i.e. is supported by the RAN, in every cell of the UE’s RA. Whether, at any point in time, a cell in the RA has sufficient resources to admit a QoS flow of a supported S-NSSAI, is subject to admission control and it is independent of whether the S-NSSAI is supported by that cell or not.

Respecting the slice availability principle in Rel17 would be needed to maintain backwards compatibility with respect to Rel16 networks and UE behaviours. In fact, if the slice availability principle is not respected in Rel17, legacy Rel16 UEs and older would still expect uniform availability to be supported. This implies that uniform slice availability would need anyhow to be supported in order to allow correct operation of legacy UEs.   
As an example, if a slice is not supported in a cell of an RA where the slice is allowed (included in the Allowed NSSAI), a legacy UE will still be able to request access to that slice and the RAN will still need to act as if the slice is supported (i.e. it is not possible for the RAN to reject access to the slice due to “Slice(s) not supported” cause as this may trigger a NAS rejection for the slice).

Companies are invited to provide their view on how to ensure correct operation of legacy UEs (Rel16 and older) expecting that uniform slice availability is respected.

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| --- | --- |
| Company | Comment |
| Ericsson | Uniform Slice Availability shall be supported in Rel17 to ensure correct operation of Rel16 and older UEs, which expect slice support in every cell of a RA. |
| Samsung | There is no need to support Uniform Slice Availability in a TA/RA in R17, as non-uniform slice availablity is benefical for the new scenarios (e.g. multi-layer network) in R17. Based on the principle of non-uniformmly support of slices in TA/RA, operators can easily deploy new slices for new services on current network without impact the TA plainning and waste of resources. It saves the CAPEX and OPEX for operators.  For the example mentioned by the moderator, if there is a slice is not supported in a cell of an RA where the slice is allowed (included in the Allowed NSSAI), it must be an overlapped cell with the cell that support the slice (just as the scenario agreed by RAN2 below). DC or CA can solve the issue if UE selects to a wrong cell based on current spec. Besides, SA2 and RAN2 are discussing the R17 slicing enhancements to let the UE select the right cell with its intended slice. So the issue can always be avioded. |
| Huawei | This is covered by CB: # 71\_CellConfig\_AllowedNSSAI. So no need to be discussed here. But we see benefits that for R17, multiple scells in a single TA can support different slices. |
| Qualcomm | This seems slightly out of scope of the WI. Yes we should ensure BC, but how to do that is not a general exam question – first SA2 and other groups including ourselves need to agree on specific scenarios and context for rel-17, and as part of that the BC aspects need to be considered. |
| CMCC | Share similar view with Samsung. The example raised by moderator can be solved by adding cause values over NG, which will not cause BC issue to legacy UE. |
| Nokia | Agree with Ericsson.  Uniform Slice Availability shall be supported in Rel17 to ensure correct operation of Rel16 and older UEs, which expect slice support in every cell of a RA.  There are other solutions discussed in SA2 to handle the figure shown by Samsung. No need to duplicate the SA2 discussion in RAN3. |
| ZTE | Similar view with Ericsson and Nokia, Uniform Slice Availability shall be supported in Rel17 |
| Bell | Agree with Samsung. A non-uniform slice availablity is highly benefical and required for MOCN scenario. |
| CATT | Agree with CMCC and SS, |
| LGE | Agree with Samsung. In Rel-17, non-uniform slice availability needs to be considered. |

**Conclusion: The issue was mainly targeting how to support legacy UEs, which will follow the principle of uniform slice availability. With respect to this majority (probably all) companies confirm that a legacy UE should be able to access a slice in its Allowed NSSAI in any cell of a RA, but the RAN can move the UE to overlaying cells where the slice should be served.**

**It is proposed to agree to the following:**

**In Rel17, legacy UEs may be handled by allowing them access for slices in the Allowed NSSAI in any cell of a RA, but allowing the RAN to move the UE to overlaying cells where the slice should be served**

## 3.2 Support of Slice deployment in different Frequency Bands

The LS from SA2 in [2] provides a scenario described below for convenience:

*The frequency ranges in which NR can operate are identified as described in Table 5.1-1 in TS 38.101-1 and TS 38.101-2.*

***Table 5.1-1: Definition of frequency ranges***

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| --- | --- |
| ***Frequency range designation*** | ***Corresponding frequency range*** |
| *FR1* | *410 MHz – 7125 MHz* |
| *FR2* | *24250 MHz – 52600 MHz* |

*Roughly speaking, the radio spectrum for 5G can be more than ten times wider than the radio spectrum for 4G, considering that the practical operational spectrum bands of 4G are less than 3 GHz in the most of regions. It is therefore important to manage such a wide range of 5G frequencies efficiently.*

*One of the requirements documented in GSMA 5GJA NG.116 is to define the radio spectrum supported by the network slice. A specific frequency band can be used to access a specific network slice(s). For instance, eMBB slice can be supported in 2.6 GHz and 4.9 GHz while URLLC slice can be supported only in 4.9 GHz. In some other deployment scenarios, the lower frequency band can be used for IoT while using the higher frequency bands for eMBB services. That is, the combination of the spectrum bands and the network slices can be a good tool for operators requiring the service isolation/management as well as the maximum use of the 5G spectrum bands.*

*The example below are the possible deployment scenario and information flows showing the current network slicing mechanism when we introduce the GST attribute,* ***Radio spectrum****, e.g. frequency band X is used to access S-NSSAI #1 whilst frequency band Y is used to access S-NSSAI #2.*

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*[NG-RAN cell coverage]*

It can be concluded that the scenario presented by SA2 can be supported in the following ways:

1. The slice deployment on multiple frequencies scenario, where Frequency Band X is used solely to support S-NSSAI 1 and Frequency Band Y is used to support S-NSSAI 2, can be supported by defining one RA1, including RAN1 coverage and another RA2, including RAN2 coverage. Namely, frequency band X and Frequency band Y belong to two different RA’s.   
   In this way the UE can be provisioned with an Allowed NSSAI in RA1, including S-NSSAI1, and another Allowed NSSAI in RA2, including S-NSSAI2.
2. The slice deployment on multiple frequencies scenario can be supported by creating a single RA, including RAN1 and RAN2 coverage. However, in this case S-NSSAI1 and S-NSSAI2 shall be supported on all cells of such RA, i.e. on cells of both Frequency Band X and Frequency Band Y. In this case, it is still possible to have preferred frequencies per S-NSSAI, so that UEs requesting a given slice will be steered to the frequency preferred for such slice.

**Companies are invited to provide their views on feasibility of the scenario support described above.**

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| Company | Comment |
| Ericsson | The scenario support options described are feasible. The scenario described by SA2 in their LS in [1] can be supported while maintaining uniform slice availability |
| Samsung | The scenario is feasible in the principle of cells in the TA/RA support different slices.  The two options above based on the old principle are not feasible in real network.  For option 1), it breaks the rules of TA planning, which should be based on the geographical distribution of users and paging capacity, and should not be based on the support of slices. If we do that way, two TAs are overlapped in the same area, and the TA borders are most likely in the dense urban areas, it will bring many issues to the network, e.g. frequent TAU, signalling conflicts. It also increases the cost for deploying new slices as well.  For option 2), it’s bad for service extension. With the increasing demands for new slices, the cells in RA/TA need to keep adding new slices and reserving resources for the new slices, even some of the cells may not need to do that, just for sticking to an imperfect principle that cells in a TA/RA should support the same slices.  So RAN3 should conclude that cells in a TA/RA support different slices should be supported in R17. |
| Huawei | About the scenario, it seems to us that CB: # 71\_CellConfig\_AllowedNSSAI is targeting key issue#7 already. So no need to further discuss here.  Besides, does the 2) above actually can not be supported in the figure for the case that “*frequency band X is used to access S-NSSAI #1 whilst frequency band Y is used to access S-NSSAI #2”?*  We agree with Samsung’s view on R17. |
| Qualcomm | It’s not clear where this is going. Yes of course option 1 and 2 are possible (with pros and cons), and maybe other options are also possible. So from RAN3 point of view, as we are not specifically addressing access in the WI, it seems difficult to go beyond this. |
| CMCC | In our view, supporting different slices for cells in a TA/RA is beneficial to the real deployment for operators, so we support it in R17. |
| Nokia | Same view as Ericsson. There are solutions in SA2 which are efficient and allow to not break support of legacy UEs. No need to duplicate the SA2 debate in RAN3. |
| ZTE | Similar view with Ericsson and Nokia. |
| Bell | Agree with Samsung and CMCC. Strongly support different slices for cells in a TA/RA in R17. |
| CATT | Agree with Samsung and CMCC. |
| LGE | Agree with Samsung |

**Conclusion: the intention of this discussion was to check if the scenario SA2 presented to RAN3 in R3-201524 can be supported in accordance with the Re16 uniform slice availability principle.**

**From the comments received, it appears that the scenario presented by SA2 in R3-201524 can be supported as per Rel16 principles.**

## 3.3 Feedback on KI#7 solutions in TR23.700-40

The following feedback is proposed to be provided on the solutions available in TR23.700-40 and concerning KI#7.

Solution 17 is feasible for cases where slices are only supported on some frequencies. The solution allows for fast access to network slices. The solution is backwards compatible with previous UE releases.

Solution 29 is feasible for cases where slices are supported on all frequencies. This solution does not ensure fast access to network slices. The solution may negatively impact the RAN if the UE uses the configured frequency band per slice to steer cell re-selection. The solution cannot be supported by with previous UE releases.

Solution 30 is feasible for cases where slices are supported on all frequencies. This solution does not ensure fast access to network slices. Solution 30 may be useful to aid the UE at cell selection and re-selection The solution may negatively impact the RAN if the UE uses the configured frequency band per slice to steer cell re-selection. The solution cannot be supported by with previous UE releases.

Solution 31 is feasible for cases where slices are supported on all frequencies. Assuming that Solution 31 is conform to the uniform availability principle (slices supported in all cells of an RA), Solution 31 have potential to provide a method for steering UE’s to the preferred frequency band, that works for all UE’s. The solution allows for fast access to network slices, although it needs to be clarified how PDU session procedure is triggered if DC is used to access preferred frequency. Latency in triggering PDU session resource allocation procedures at the RAN delays access to the slice. The solution cannot be supported by with previous UE releases.

Solution 44 is feasible for cases where slices are supported on all frequencies. The solution ensures fast access to network slices. The solution is backwards compatible with previous UE releases. Solution 44 provides a straightforward solution that keep RAN in charge of the radio resources and UE mobility.

Companies are invited to provide their views on the feedback on the solutions above.

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| Company | Comment |
| Ericsson | Agree to the feedback above and agree to include this feedback in a reply LS to SA2. |
| Samsung | No need other feedback for the solutions, as we had common understanding in previous meeting below.  “no other feedback from RAN3 is requested concerning solutions in 23.700-40, unless explicitly requested by SA2” |
| Huawei | Agree with Samsung  No need to feedback RAN views towards those solutions for KI#7 since SA2 has not requested any evaluation of solutions from RAN.  Also those solutions above are not exhaustive since last SA2 meeting agreed new solutions having RAN impact. And further updating is ongoing in the parallel SA2 meeting. |
| Qualcomm | The LS might have been ok if it only focused on neutral comments on the solutions (which is not the case in the draft). However even for that, it seems that it will not add much value to SA2 discussions at this point in time so on balance it seems not essential. And finally, we also acknowledge the point from Samsung. |
| CMCC | No need to feedback for now. |
| Nokia | No need for feedback. Agree with Samsung and Huawei. |
| ZTE | Nice analysis, But no need for feedback without request from SA2. |
| CATT | No need to feedback. |
| LGE | If the feedback for the RAN impact of the solutions in TR 23.700-40 is needed, the SA2 will send a LS to RAN WGs. For now, there is no need to feedback the evaluation of the solutions in SA2 TR. |

**Conclusion: Maybe the discussion was not clear, but we received an LS from SA2 in R3-201524, which is still unanswered and for which SA2 is still waiting for a reply. In this LS SA2 asks RAN3 for feedback on their solutions. The question is therefore how to reply to R3-201524 and whether we want to only add statements derived from the conclusions above or statements concerning the SA2 solutions.**

**Discuss online whether the raply LS from RAN3 should include a solution evaluation or only the agreements achieved on in this offline discussion**

# 4 Conclusion, Recommendations [if needed]

If needed

# 5 References

[1] R3-206435, Analysis of KI#7 on Fast Access To Network Slices (Ericsson)

[2] R3-201524, LS on 5GC assisted cell selection for accessing network slice