3GPP TSG-RAN3 Meeting #109-E R3-205485

E-meeting, 17 – 28 August 2020

Agenda Item: 17.3

Source: Ericsson

Title: SoD for RAN Slicing Slice On Frequencies

Document for: Discussion, Decision

# Introduction

This is a summary of offline discussions for the topic lifted by the SA2 LS in [1].

In the LS in [1] RAN3 is asked to provide feedback to KI#7 in Section 5.7 of TR23.700-40.

The following are the topics to be covered by the offline discussion:

**- For the case that different network slices may be available on different frequencies, if UE Radio Capability Check procedure could be extended to enable the AMF to check if the UE’s radio capabilities are compatible with the RAN configuration for different slices requested by the UE? (Qualcomm)**

**- Signaling of Rejected NSSAI to RAN? (E///)**

**- Pending to RAN2 discussion?**

## Summary of First Round of Discussions

There seem to be consensus on the scope of discussions in RAN3. The only comment received concerning the Remit of Discussion was one pointing at better clarity in the proposal formulated. For this reason it is proposed to agree to the following:

* **Proposal1: To be agreed that 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**

The following statement was discussed:

* *To confirm that the slices included in an Allowed NSSAI are available anywhere (i.e. in any cell) within the UE’s Registration Area*

All companies agree that this statement represents the status quo, i.e. the situation in Rel15 and Rel16.

However, for Rel17 companies are inclined to wait for the SA2 discussion to converge before making any assessment on the statement. It is therefore proposed to agree to the following:

* **Proposal2: The Status Quo in Rel16 is that the slices included in an Allowed NSSAI are available anywhere (i.e. in any cell) within the UE’s Registration Area**

The discussion touched upon possible solutions to the problem of how to enable service continuity when slices on different frequencies are deployed.

There seems to be support for the following solutions:

Solution 1 (TR23.700-40, R3-205085, R3-205186): CN steering of UE towards the frequency supporting the requested slice. For example, CN provides to the RAN the Requested NSSAI and RFSP, so that RAN can move the UE towards cells where the Rejected NSSAI is supported

Solution 2 (TR23.700-40, R3-205085): RAN enables access to the requested S-NSSAI on a frequency different from the serving frequency by means of CA/DC.

Solution 3 (R3-205031): The RAN is configured with preferred frequencies for each slice. A UE requesting access to a slice will be moved by the RAN to a preferred frequency for that slice

There was no consensus on support for Solution 4 below:

Solution 4 (R3-204809): UE Radio Capability Check procedure could be extended to enable the AMF to check if the UE’s radio capabilities are compatible with the RAN configuration for different slices requested by the UE

It is therefore proposed to capture descriptions of solution 1, 2 and 3, in TPs for TR38.832.

Proposal:

**Proposal3: It is proposed that TPs capturing the following solutions are agreed**

* **Solution 1: CN steering of UE towards the frequency supporting the requested slice. For example, CN provides to the RAN the Requested NSSAI and RFSP, so that RAN can move the UE towards cells where the Rejected NSSAI is supported**
* **Solution 2: RAN enables access to the requested S-NSSAI on a frequency different from the serving frequency by means of CA/DC.**

# For the Chairman’s Notes

Following agreements were proposed on the first round of offline discussion:

**Proposal 1: To be agreed that 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**

**Proposal 2: The Status Quo in Rel16 is that the slices included in an Allowed NSSAI are available anywhere (i.e. in any cell) within the UE’s Registration Area**

**Proposal3: It is proposed that a TP capturing the following solutions is agreed**

* **Solution 1: CN steering of UE towards the frequency supporting the requested slice. For example, CN provides to the RAN the Requested NSSAI and RFSP, so that RAN can move the UE towards cells where the Rejected NSSAI is supported**
* **Solution 2: RAN enables access to the requested S-NSSAI on a frequency different from the serving frequency by means of CA/DC.**

# Discussion

## Remit of discussion

As explained in Section 1, SA2 has requested RAN3’s inputs on “5GC assisted cell selection to access network slice”. This is KI#7 in in Section 5.7 of TR23.700-40.

RAN3 has not been requested by SA2 any more input so far on network slicing, hence the remit of discussion should focus on KI#7 in in Section 5.7 of TR23.700-40 and to the parts that affect RAN3 therein.

It is proposed to agree to the following

* **To be agreed that RAN3’s feedback to SA2 concerns KI#7 in Section 5.7 of TR23.700-40 and thatno other feedback from RAN3 is requested concerning solutions in 23.700-40, unless explicitly requested by SA2**

If companies have a different view, comments can be expressed below:

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| Company | Comments |
| Qualcomm | Fine with the first part, but not very clear what the second part of the sentence means. Multiple groups are studying this topic in rel-17, and so the situation is anyway not fixed. Of course we can LS SA2 with any issues to clarify if needed. |

## Scenario Description

The scenario presented by SA2 is shown in the figure below.



In this scenario the assumption is that the S-NSSAIs available in the coverage of RAN1 and RAN2 are respectively S-NSSAI1 and S-NSSAI2 and that the UE’s Allowed NSSAI contains both S-NSSAI1 and S-NSSAI2.

TS38.300 states that

**Slice Availability:**

*Some slices may be available only in part of the network. The NG-RAN supported S-NSSAI(s) is configured by OAM. Awareness in the NG-RAN of the slices supported in the cells of its neighbours may be beneficial for inter-frequency mobility in connected mode. It is assumed that the slice availability does not change within the UE's registration area.*

In order to have a clear understanding of the scenario to treat in this AI and to be in line with the RAN specifications it is proposed to confirm the description in RAN3 specifications:

* **To confirm that the slices included in an Allowed NSSAI are available anywhere (i.e. in any cell) within the UE’s Registration Area**

Companies are invited to provide comments on the above statement.

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| Company | Comments |
| Nokia | Yes. This is a well-known assumption. |
| Huawei | Yes, but this is assumption only for R15/16.  We can revisit this assumption for R17, based on the possible LS from SA2 about the non-uniform slice support in a TA, taking the combination of spectrum bands and the network slices into consideration. |
| Qualcomm | Agree with Huawei, this is current status quo, but is subject to discussion. We do not have to take this as a fixed limit at this point. |
| NEC | Agree with Huawei and Qualcomm.  The current Rel15 assumption on Slice Availability in TS 38.300 is “that the slice availability does not change within the UE's registration area.”  However, in our understanding, the necessity and impact of relaxing the above restriction and the feasibility of smaller granularity slice deployment, in addition to TA level deployment, is subject to discussion. |
| Deutsche Telekom | We see the assumption as still valid. Any relaxation in Rel-17 should be justified by practical use cases and not by artificial ones. |
| CATT | Agree with HW |
| ZTE | The assumption is still valid.  But we are open to the on-going discussion in SA2/RAN2 relate to slice on dedicated frequency scenario. |
| CMCC | Agree with HW. Wait for the progress of SA2. |
| Ericsson | This is a well known and still valid assumption |

## Possible Solutions

A number of solutions have been highlighted in RAN3. The solutions below are those relevant to RAN3 (namely solutions like S-NSSAI broadcast has been purposely avoided as it is within RAN2 scope), and in line with the scenario above.

Solution 1 (TR23.700-40, R3-205085, R3-205186): CN steering of UE towards the frequency supporting the requested slice. For example, CN provides to the RAN the Requested NSSAI and RFSP, so that RAN can move the UE towards cells where the Rejected NSSAI is supported

Solution 2 (TR23.700-40, R3-205085): RAN enables access to the requested S-NSSAI on a frequency different from the serving frequency by means of CA/DC.

Solution 3 (R3-205031): The RAN is configured with preferred frequencies for each slice. A UE requesting access to a slice will be moved by the RAN to a preferred frequency for that slice

Solution 4 (R3-204809): UE Radio Capability Check procedure could be extended to enable the AMF to check if the UE’s radio capabilities are compatible with the RAN configuration for different slices requested by the UE

Companies are invited to provide their comments to the solutions above, highlighting technical correctness and feasibility.

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| Company | Solution | Comments on solution |
| Nokia |  | Solution 1 has limitations if multiple slices are involved.  Solution 2 is feasible.  For solution 3 tdoc 5131 seems not relevant?  For solution 4, the gain of using the UE radio capa match procedure is not clear as long as uniform slice support in the RA. |
| Huawei |  | As we commented in CB: # RANSlicing5-SA2impact   * The RAN based solution is one of the solutions to address the key issue #7. With this solution, the UE will only access the cell with the intended slices during cell (re)selection. That is, the CN does not need to provide the UE with the permissible operating band(s) for each S-NSSAI, or the solution 1 as described above. How the RAN based solution works with those solutions provided in TR 23.700-040 needs further study.   Since the RAN based solution will be discussed in RAN2, RAN3 can further discuss this based on RAN2/SA2 outcome.  About the above solutions:   * Solution 1 needs further discussion for the mapping of RFSP from multiple requested slices, as commented by Nokia. * Solution 2 is feasible, but it implies that the DC (or even CA) is setup for inter-RA case under the above assumption. Further thinking is needed with the possible new scenario. * Solution 3 is similar to solution 1? * Solution 4 is feasible and beneficial to take the UE radio capability into account for the new non-uniform scenario. |
| Qualcomm |  | In general solutions are not all mutually exclusive, and may be part of the overall toolset in rel-17. Note also there is some dependency between this topic and the scenarios allowed in rel-17 , pending SA2. With that,  Solution 1 actually seems to have two components. Use of RFSP is already possible for steering, and it can be further studied how flexible this is for multiple slice case. Informing RAN of rejected slices was previously discussed in RAN3, and could indeed help the RAN with steering decisions.  Solution 2 is feasible: this is either inter-RA as mentioned by Huawei, or linked to new Rel-17 scenario.  Solution 3 is feasible but may need some clarification – seems like equivalent to extra codepoints to RFSP. Not clear for example if it implies that the CN is aware of the frequency-slice mapping.  Solution 4 is feasible and is an aid to some of the solutions and scenarios: enables CN to be aware of whether a slice is available to a UE in a given RA. |
| NEC |  | Agree with Qualcomm. All solutions seem feasible and could be part of the overall toolset in Rel-17. |
| Deutsche Telekom |  | Agree with above analysis provided by companies.  A RAN based solution is preferred from operator’s perspective to avoid complex information exchange between RAN and CN, but this is in scope of RAN2 and RAN3 should wait for corresponding outcome. |
| CATT |  | Agree with HW. RAN based solution should be studied together |
| ZTE |  | Solution 1 is feasible.  Solution 2 is also feasible.  Solution 3 seems to be similar with solution 1 with RFSP enhancement.  While for solution 4, it is not clear the following behavior of the mechanism after Core network check UE capability compatible with RAN configuration. |
| CMCC |  | Agree with all analyses above.  Wait for the outcome of RAN2. |

# Conclusion, Recommendations [if needed]

If needed

# References

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