**3GPP TSG-RAN WG2 Meeting #113 Electronic R2-2101973**

**25 January – 05 February 2021**

**Agenda item: 8.8.1**

**Source: Nokia**

**Title: Summary of [AT112-e][250][Slicing] LS replies to SA2 and RAN3 (Nokia)**

**WID/SID: FS\_NR\_slice - Release 17**

**Document for: Decision**

# 1 Introduction

This document is the summary of the following email discussion:

* [AT113-e][250][Slicing] LS replies to SA2 and RAN3 (Nokia)

Scope:

* + - Ascertain which LS replies to SA2/RAN3 are needed (based on the LSs received so far), including what to answer to each required LS

Intended outcome:

* + - Discussion summary in R2-2101973 (by email rapporteur).

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

* + - Initial deadline (for companies' feedback): 1st week Fri, UTC 0900
    - Initial deadline (for rapporteur's summary): 2nd week Mon, UTC 1200

## Contact person(s) for each participating company

|  |  |  |
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# 2 Discussion

The following document considered during this email discussion

[R2-2100546](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100546.zip) Discussion on slicing related reply LSs (R2-2008759 and R2-2010694) Nokia, Nokia Shanghai Bell discussion Rel-17 FS\_NR\_slice

[R2-2100766](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100766.zip) Cell configuration within TA/RA to Support Allowed NSSAI LG Electronics UK discussion Rel-17

[R2-2100893](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100893.zip) Discussion on SA2 LS OPPO discussion Rel-17 FS\_NR\_slice

[R2-2101061](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101061.zip) Considerations on scenarios and solution space of RAN slicing enhancements Lenovo, Motorola Mobility discussion Rel-17 FS\_NR\_slice R2-2009669

[R2-2101293](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101293.zip) UE slice MBR enforcement in RAN Ericsson discussion Rel-17 FS\_NR\_slice

[R2-2101487](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101487.zip) Rel-15/16 Status of Cell Configuration on Network Slicing Futurewei discussion Rel-17 FS\_NR\_slice

[R2-2101488](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101488.zip) DRAFT Reply LS on Cell Configuration within TA/RA to Support Allowed NSSAI Futurewei LS out Rel-17 FS\_NR\_slice, FS\_eNS\_Ph2 To:SA2, RAN3, CT1

[R2-2101933](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101933.zip) Draft reply LS on Cell Configuration within TARA to Support Allowed NSSAI ZTE corporation, Sanechips LS out Rel-17 FS\_NR\_slice To:SA2 Cc:CT1, RAN3

[R2-2101700](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101700.zip) Discussion on the SA2 incoming LS on Cell Configuration within TA/RA to Support Allowed NSSAI Huawei, HiSilicon discussion Rel-17 FS\_NR\_slice

*(moved from 8.8.2)*

[R2-2101294](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101294.zip) Network slice support in cells Ericsson discussion Rel-17 FS\_NR\_slice

*(moved from 8.8.2)*

Content from other contributions related to email discussion can also be considered in the discussion (as part of company feedback).

## 2.1 Reply LS for [R2-2008759](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2008759.zip): LS on Cell Configuration within TA/RA to Support Allowed NSSAI

Question 1 of the LS is the following

In Rel-15 and 16, is it expected that each cell in the tracking area supports the same S-NSSAI(s)? (or, said otherwise, do all cells advertising the same TAC support the same set of S-NSSAIs?).

CT1 and RAN3 has already replied to the LS. CT1 reply LS states ([R2-2010688.zip](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010688.zip)) that *"CT1 has assumed that all S-NSSAIs in the allowed NSSAI are supported in all tracking areas of the registration area"*. RAN3 reply also states ([R3-207147.zip](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_110-e/Docs/R3-207147.zip)) it is assumed in RAN3.

The answer for this question was discussed in RAN2#112e within email discussion "[AT112-e][250][Slicing] LS replies to SA2 and RAN3". The outcome of the email discussion was that about the same number of companies supported a "YES" answer as a "NO" answer (see [R2-2011102](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2011102.zip)).

Based on the input documents listed above the rapporteur's view is that the divergent view of the companies has not changed. In order to avoid the delay of SA2 progress a way forward may be to send a neutral answer to SA2 clarifying that the handling of TAs is not in the scope of RAN2, and there is no agreement in RAN2 on this assumption.

Some companies also discuss in their papers that even if they agree that there is this assumption in Rel-15/16, this should be removed in Rel-17. Rapporteur's view is that the question in the LS is clearly about Rel-15/16, and thus Rel-17 assumptions are out of the scope of the discussion of the reply LS.

**Q1: Which type(s) of answer is acceptable and which type(s) of answer are not acceptable for Question 1 of the LS from the list below?**

1. **YES, RAN2 confirms that it is assumed that each cell in a TA supports the same S-NSSAI(s) in R15/16.**
2. **NO, from RAN2’s perspective, it is not expected that each cell in the tracking area supports the same S-NSSAI(s) in R15/R16.**
3. **The handling of TAs is not in the scope of RAN2.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Acceptable** | **Not acceptable** | **Comment** |
| ZTE | b) and c) | a) | (1) As we commented last meeting, we understand the target is that the allowed slice is available within the TA but can be achieved in various ways.  One possible deployment is to let all the cells within a TA support the same slice.  Another possible deployment is to deploy cells supporting different slices with overlapped coverage. For example, in the NG-ENDC scenario, some slices are supported via the NR SCG cells with same coverage as the LTE PCell but the LTE PCell itself does not support such a slice. If it is assumed that each cell in the same TA supports the same slice, it would not be possible to support some slice via NG SCG in NG-ENDC scenarios.  As shown in the following figure, different cells on different frequency layer supporting different slices may be deployed with the same coverage. Since slice 1 and 2 can be supported within the coverage of TA#1, they can be configured as allowed NSSAI.  IMG_256  Figure: Example of deployment scenario  In such deployment scenario, the allowed NSSAI is available within the TA but not all the cells in this TA are required to support slice 1and 2.  => Thus, option a) is not acceptable as we do not see the need to have such restriction in deployment and similar opinions have been expressed by operators last meeting.  (2) To avoid the delay of SA2 progress a way forward (as the rapporteur of slice enhancement in SA2, our colleague is anxiously waiting for RAN2 feedback), we are also fine to provide a neutral answer saying there is no consensus in RAN2 on this aspect, which means both understanding a) and b) would be possible and allowed in cell deployment. |
| OPPO | a, c | b | To us, it already implicitly indicates in current spec that each cell in one registration area supporting the same S-NSSAI(s), otherwise the slice availability can not be fulfilled. In addition, RAN3 and CT1 have already provided their feedback, where confirms that the same S-NSSAI(s) are supported in each cell in a tracking area. It is better to align with other work groups, otherwise RAN2 needs to trigger the co-group discussion to check whether any incompatible issue needs to be resolved. So, our first preference is a.  But, if it is still hard to RAN2 to achieve the consensus on this issue, our second preference is to choose c, considering the following we have agreed in RAN2#111e,   * TA discussion will not take place in RAN2, we will wait for SA2 input |
| Xiaomi | a) | b) | For c), we agree that the TA handling is not in the scope of RAN2, but it has impacts on RAN2, so we can also give a definite answer from RAN2 respective.  For b), from RAN2 respective, if the answer is no, the idle/inactive UE will move to a cell where the allowed S-NSSAI(s) may not be supported without awareness, and then UE will fail to establish PDU session of allowed NSSAI because the slice is not supported by current cell. For UE, as the slice is allowed, so when it is rejected to establish a PDU session of the allowed S-NSSAI, it will regard it as resource shortage and continue to request later.  So we think from RAN2 respective, in Rel-15/16, each cell in the same TA should support the same slice to avoid above case, and the reply is also aligned with RAN3. |
| Intel | a) | c)  b) (see comments) | Our understanding of the quoted sentence in 38.300 “it is assumed that the slice availability does not change within the UE’s registration area” implies that RAN2 specs require that the same slices are available in the whole registration area. Note that the UE’s registration area is always larger than a broadcast registration area. The quoted sentence above is a stage 2 text indicates what is supported at the system level. That is, RAN2 spec do not support the scenario where a slice is only available in some areas of the registration area and the slice is not supported in another area of the registration area. This is for Rel-15/16.  We also pointed out in [R2-2100362], more details of the scenarios that can possibility be supported and what cannot be supported by RAN. We do not think it can be supported for all scenarios. If we say b), we think we should also provide more details to SA2 on the exact scenarios it can be supported.  However, we should respond to SA2 that RAN2 is discussing scenarios in Rel-17 where this assumption is not required so that SA2 can feedback on the possible system impact.  As we can see from the discussion, the question is relevant to RAN and has impact on our specifications. So we think c) is not acceptable. |
| CATT | a),c) | b) | With some specific deployments, the cell in same RA support different slice with same physical coverage, Multi-layer cells provide whole supported slice list in RA. But it is specific cases. It is just one case in theory. Within this deployment, the UE cannot work correctly under some cases within the current R15/R16 Spec . |
| Nokia | A) C) | B) | Our preferred answer is A)  There is the following in clause 16.3.1 of 38.300:  "It is assumed that the slice availability does not change within the UE's registration area."  R2-2100546 contains the following observation: "If not all cells in a TA supports the same S-NSSAI(s), then a UE in IDLE/INACTIVE mode may move to cell that does not support all allowed S-NSSAI(s) without noticing it." |
| Lenovo | a and c | b | First preference is a) as it is aligned with CT1 and RAN3 responses.  Option c) is acceptable as compromise.  On option b) we still wonder how it can be supported by the R15/16 specifications. |
| Google | A | B | We agree with others that Option A is consistent with current R2 specs as well as the responses received from RAN3 and CT1.  We think that TA handling is primarily the responsibility of SA2 and CT1 groups, but it may have some impact on UE AS behavior so we do not think it is completely out of RAN2 scope. So we are neutral on C. |
| Futurewei | b) | a) | SA2 LS is asking RAN2 about cell configuration for network slicing, not about TA handling. It is in RAN2 domain, and RAN2 should have clear answer. Furthermore, SA2 notes that this is not just about R15/16, but also is related to R17 works - “Note: SA2 is not considering changing any of the Rel-15 and Rel16 assumption on support of the S-NSSAI in the TA that would create deployments incompatible with Rel-15/16 UEs in the field.”  As analyzed in R2-2101487, the principles of RAN specs from R15 is to allow configuration of different slices on the cells advertising the same TAC. |
| Ericsson | a) | b), c) (to avoid confusion in other groups) | One motivation for a) is: In case a cell does not accept establishment of UP connections (indicated from RAN to CN) for a network slice, this is by CN considered as a “temporary resource shortage”, not expected to be used as normal handling when the cell does not support the network slice (at all). In rel-15/16, there are no other standardized mechanisms (e.g. under RAN2 control) to handle this case than to ensure that all cells of a TA support the network slices of the Allowed NSSAI.  This does not mean that the service support is homogenous in the cells of the TA. Depending on network policy, network load and UE coverage situation, the network may select to serve the UE with required QoS, with lower QoS, or steer the UE to cell/frequency that offers full QoS. |
| Qualcomm | a) + exceptional case  or c) | b) | We prefer to reply a) + exceptional case as below:   1. RAN2 should follow the principle that slice uniform availability in TA (or RA) defined in Rel-15/Rel-16. 2. RAN2 also needs to indicate SA2 that it is possible that a slice may not be available in a cell (e.g. due to resource shortage) in deployment, i.e. an S-NSSAI in the Allowed NSSAI may not be always available in every cell of the TA/RA.   c) suggested by Rapporteur is also acceptable for us.  Finally, we think if RAN2 still can’t converged even on c) in this meeting, maybe we can only reply to SA2: “RAN2 can’t achieve consensus”. |
| Samsung | a) | b) | Based on the sentence in 38.300 "It is assumed that the slice availability does not change within the UE's registration area.", we think a) can be assumed for R15/R16. |
| APT | a) | b) | According to TS 38.300 v16.4.0 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.”, since the slice availability does not change within the UE’s registration area, it is expected that all cells within the UE’s registration area (e.g., cells advertise the same TAC) support the same S-NSSAI(s). Thus, in response to SA2’s first question focusing on Rel-15/Rel-16, we would prefer a).  For Rel-17, we are open whether such assumption can be relaxed. |
| CMCC | b) and c) | a) | Agree with ZTE.  As shown in the figure, cell 5 and cell 6 are covering the same location 3 but supporting different slices. Both slice 1 and slice 2 are available within location 3, by means like HO, re-direction or DC/CA. In such deployment, the slice availability is guaranteed, which is align with the principle that slice availability is not changed within the same TA.    From RAN2 spec perspective, we don’t see there is any limitation to prevent the cells on different frequencies belonging to the same RA and TA to support different slices. |
| LGE | a), c) | b) | We’d also like to ask whether R17 cell configuration in a TA could be changed (whether different cells in a TA may support different S-NSSAI(s). |
| Apple | b) and c) | a) | Besides the deployment option mentioned by ZTE, we think most companies agree that if a cell gets overloaded, some slices may not be supported for a certain time. In this case, it should not be considered as all cells support the same slices. We think this falls into RAN scope thus needs to indicate to SA2.  For the normal deployment scenario, we can rely on SA2 to decide. |

**Summary:**

TBA

The other questions of LS are the following

If the answer is "no":

2a) Can RAN WGs and CT1 explain if it can happen that a UE, e.g. due to local radio conditions, can only use a cell in the TA where not all S-NSSAIs are present in the Allowed NSSAI it received (and that the TA supports), and can RAN WGs and CT1 explain how it is handled today in rel-15/16?

2b) If an S-NSSAI can be rejected depending on which cell the UE camps on even though it is supported in the TA, for the reason that it is not supported in the cell, is there in rel-15/16 a CT1 error code to handle this case (i.e. can a S-NSSAI be rejected, with a suitable cause code, depending on which cell of the TA the UE camps on, even though this S-NSSAI is known to be supported in the TA, for the reason that this S-NSSAI is actually not supported in the cell of the TA)? Is there any provisions in the RAN or CT1 specifications to handle this case?

As answers for these questions are only needed if RAN2 agrees sending a "NO" to question 1, therefore RAN2 should discuss the answer after concluding the answer to question 1.

## 2.2 Reply LS for [R2-2010694](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_112-e/Docs/R2-2010694.zip): LS on restricting the rate per UE per network slice

The answer for this LS was discussed in RAN2#112e within email discussion "[AT112-e][250][Slicing] LS replies to SA2 and RAN3"(see [R2-2011102](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2011102.zip)). As there was no consensus that UL SMBR can be enforced without RAN2 specification impacts RAN2 provided the following reply to [R2-2010694](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010694.zip) on Solution #22 in [R2-2011104](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2011104.zip):

**1) Solution #22**

In this solution RAN enforces uplink and downlink SMBR of UEs. This is a similar function as UE-AMBR enforcement at slice level. With proper configuration (LCG and LCH restrictions), the RAN is able to obtain and control the UL data volume of a slice. Therefore, many companies think the solution can be supported without changes to RAN2 specifications, but some companies do not agree, so RAN2 has no consensus on the matter and will continue to discuss.

As the text highlighted by yellow further feedback is expected from RAN2 on the feasibility of Solution#22, more specifically the enforcement of UL SMBR. Based on the input papers at least one company still have concerns on the UL SMBR enforcement ([R2-2101293](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2101293.zip)), while others clearly think that it is possible (e.g., [R2-2100546](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100546.zip), [R2-2100893](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100893.zip)). The company having concerns does not say that it is not possible, just have concern on a specific method using configuration of existing LCG, PRB and LCH restrictions.

Rapporteur's proposal is to resolve the issue it is proposed to answer SA2 without clarifying the exact method to be used, and whether this has RAN2 specification impacts.

**Q2: Is the following RAN2 feedback on Solution#22 acceptable?**

**"RAN2's view is that SMBR enforcement can be supported but the details of the UL SMBR may require further discussions in RAN2."**

**If not acceptable, please provide a wording suggestion to make it acceptable to all companies.**

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| --- | --- | --- |
| **Company** | **Answer** | **Comments and wording suggestions** |
| ZTE | Yes | The following options to enforce UL SMBR has been raised:   * Option 1 (R2-2100546): With a maximum of 8 LCG, the data volumes of 8 different slices can be reported in uplink. With LCP restrictions, the mapping of a logical channel can be restricted to a subset of the configured cells, numerologies, PUSCH transmission durations, configured grant configurations. Thus, as long as the UE can be configured with isolated physical resources (e.g. cells), the gNB is able to control the UL data volume with a granularity equal to the number of such resources. * Option 2 (R2-2101293): Provide the slice-AMBR to UE and let UE shape the UL data rate, which is similar to the UL session MBR control in R15 and the slice-AMBR can be provided to UE via NAS signaling.   With the option 1 and option 2 on table, I think it is quite clear that solution#22 is feasible and can be supported. If the slice-MBR in option 2 is sent to UE via NAS signaling, there would also be no RAN2 spec impact.  To save our power and time for issues tasking RAN2 in the SID (e.g. slice specific cell (re)selection and RACH configuration), we would prefer to simply reply:  *“Solution#22 is feasible and can be supported from RAN2’s perspective.”*  Further discussion on the details in UL and DL slice MBR enforcement can be discussed in the WI phase if the solution#22 has been selected by SA2 and recommended for normative phase. |
| OPPO | Yes | In our understanding, there is no exact AS impacts of Solution# 22 to RAN2 specification for SMBR enforcement. According to R2-2101293, the provided solutions are more like higher-layer solutions (e.g. application layer), not related to RAN2. Regarding the delivery of SMBR to the UE side, there is not clear instruction in SA2 TR that SMBR will be delivered to UE side.  But, for moving forward, we can compromise. To us, it is better not to touch much details and the version suggested by ZTE looks better. |
| Xiaomi | Yes, and see the comments. | In order not to defer the progress of SA2, we should provide our definite view this meeting.  As SA2 only requires RAN2 to provide feedback about the impacts of the solution, and in our view, we think there is no impact on RAN2, so we think the reply can only be “ Solution# 22 can be supported without RAN2 impacts” which most companies agree. |
| Intel | Yes |  |
| CATT | Yes |  |
| Nokia | Yes |  |
| Lenovo | Yes | Detailed discussion of solution #22 can take place if it is pursued by SA2 in WI. |
| Google | Yes |  |
| Futurewei | Yes |  |
| Ericsson | No | SA2 asked RAN WG2 (and RAN WG3) to check the impacts **on RAN** to rate limit the aggregate of the UL/DL traffic for an S-NSSAI. Option 2 in the ZTE comment is a UE solution. RAN2 should respond such that SA2 can take a decision on where to locate the SMBR enforcement, in CN, RAN or UE.  Option 1 (R2-2100546) assumes that there is always a one-to-one mapping between slices, logical channels and physical resource (e.g. cells). If RAN2 wants more flexible and generic mapping of slices to physical resources, then the existing mechanisms using LCP restrictions etc are insufficient.  Proposal:  “RAN2 understands UL SMBR can be enforced in RAN with existing mechanisms only if the UE is configured with isolated physical resources (e.g. cells) for each slice. If this is not the case, existing mechanisms in RAN cannot be used.” |
| Qualcomm | Yes | For SMBR enforcement, we are not looking at enforcements at every scheduling occurrence but at large periods from RAN2 perspective (Avg. windows of ~2 sec). Thus, we are not sure why LCG can’t work. We don’t see showstopper for solution#22 from RAN2 perspective. |
| Samsung | Yes | We may discuss later whether the existing mechanisms can support the UL enforcement of S-MBR. |
| APT | Yes |  |
| CMCC | Yes |  |
| Apple | Yes | We are fine with the proposed text. We think the solution proposed in R2-2100546 can be used as a baseline, and any potential additional enhancement can be discussed. |

**Summary:**

TBA

# 3 Conclusions