3GPP RAN WG2 Meeting #119bis-e R2-2210821

eMeeting Octorber 10th – 19th, 2022

Agenda Item: 8.18

Source: ZTE corporation,Sanechips

Title: Report of [AT119bis-e][210][R18 Slicing] RAN dependency of FS\_eNS\_Ph3 (ZTE)

Document for: Discussion, Decision

# Introduction

This document is intended address a subset of remaining idle mode open issues as per the following email discussion guidelines:

* [AT119bis-e][210][R18 Slicing] RAN dependency of FS\_eNS\_Ph3 (ZTE)

Scope: Discuss RAN2 reply LS to R2-2209355 and provide agreeable LS.

Intended outcome: Report in in R2-2210821 and LS out in R2-2210822.

Deadline: Deadline 2 (report)

* **Comment deadline:** Friday W1, 0700 UTC (for collecting views)
* **Rapporteur proposals:** Monday W1, 1000 UTC (proposed outcome)
* **Document deadline:** 1h before session (discussion report)

**The following contributions will be treated in this offline discussion:**

[R2-2209355](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209355.zip) LS Out on RAN dependency of FS\_eNS\_Ph3 (S2-2207435; contact: ZTE) SA2 LS in Rel-18 FS\_eNS\_Ph3 To:RAN2, RAN3

[R2-2210669](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210669.zip) Consideration on RAN dependency of FS\_eNS\_Ph3 ZTE corporation, Sanechips discussion Rel-18

[R2-2210670](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210670.zip) [Draft] Reply LS on RAN dependency of FS\_eNS\_Ph3 ZTE corporation, Sanechips LS out Rel-18 To:SA2 Cc:RAN3

[R2-2209900](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209900.zip) Discussion on RAN dependency of FS\_eNS\_Ph3 Huawei, HiSilicon discussion Rel-18 NR\_ENDC\_SON\_MDT\_enh2-Core

[R2-2210103](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210103.zip) Proposed answers to SA2 LS on RAN dependency of FS\_eNS\_Ph3 ([R2-2209355](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209355.zip)/SA2-2207435) Nokia, Nokia Shanghai Bell discussion Rel-18 FS\_eNS\_Ph3

[R2-2210206](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210206.zip) Discussion on LS on RAN dependency of FS\_eNS\_Ph3 Lenovo discussion NR\_slice-Core

[R2-2210229](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210229.zip) Draft reply LS to SA2 on FS\_eNS\_Ph3 Lenovo LS out NR\_slice-Core To:SA2 Cc:RAN3

[R2-2210397](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210397.zip) On FS\_eNS\_Ph3 Ericsson discussion FS\_eNS\_Ph3

[R2-2210403](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210403.zip) Considerations on SA2 Key issue #3 NEC discussion Rel-18 FS\_eNS\_Ph3

[R2-2210622](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210622.zip) Draft Reply LS Out on RAN dependency of FS\_eNS\_Ph3 Ericsson discussion FS\_eNS\_Ph3

[R2-2210647](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210647.zip) Discussion on the LS on RAN dependency of FS\_eNS-Ph3 CATT discussion Rel-18 FS\_eNS\_Ph3

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# Discussion

An LS [1] been sent from SA2 to RAN2 and RAN3 on the RAN dependency of some solutions to address Key Issue #3: Network Slice Area of Service for services not mapping to existing Tas boundaries.

In the coming LS, the following questions have been asked:

-------------------------------------------LS Out on RAN dependency of FS\_eNS\_Ph3-----------------------------------------

*For Key Issue #3: Network Slice Area of Service for services not mapping to existing Tas boundaries, and Temporary network slices, SA2 has following questions:*

1. *Whether NG-RAN can broadcast one or more Secondary TAIs (up to a number RAN2 agrees, we note that for NTN is already possible to broadcast TWO TACs) via an updated SIB or new SIB, and report them to the CN and between gNBs as per existing Tracking Area related information exchange procedures but with indication they are secondary. The additional TAIs are associated with specific S-NSSAI(s) like the existing Tas and will be treated by Ues supporting secondary Tas as a normal Tracking area from RM standpoint (as described in solution#9)*
2. *Whether the NG-RAN can be configured with a slice availability on a per-cell basis and*
   1. *inform AMF and other gNBs in NGAP messages (as described in solution#11 and others)*
   2. *Whether in Constrained Service Area the network slice is still supported but since no dedicated resources are allocated for the network slice the SLA of the network slice is not guaranteed.(as described in solution#45).*
3. *The NG-RAN receives in solution 29 (but conceivably this would be needed for similar solutions) the partially allowed S-NSSAIs in addition to the Allowed NSSAI. Can the NG-RAN in principle trigger handover procedure to a supporting TAI of the partially allowed S-NSSAIs when it is possible to do so? This can happen while in connected mode or when the UE is engaged in transition from Idle to connected mode. The reason is to enable the support of the maximum number of S-NSSAIs in the Allowed and partly allowed S-NSSAIs lists.*

-------------------------------------------LS Out on RAN dependency of FS\_eNS\_Ph3-----------------------------------------

In this offline, we will analyse the questions from RAN2’s perspective, targeting to provide feedback to SA2.

## Broadcasting one or more Secondary TAIs

Regarding the first question from SA2:

1. *Whether NG-RAN can broadcast one or more Secondary TAIs (up to a number RAN2 agrees, we note that for NTN is already possible to broadcast TWO TACs) via an updated SIB or new SIB, and report them to the CN and between gNBs as per existing Tracking Area related information exchange procedures but with indication they are secondary. The additional TAIs are associated with specific S-NSSAI(s) like the existing Tas and will be treated by Ues supporting secondary Tas as a normal Tracking area from RM standpoint (as described in solution#9)*

There has been some discussion in the first online session based on the following proposal:

[R2-2210669](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210669.zip) Consideration on RAN dependency of FS\_eNS\_Ph3 ZTE corporation, Sanechips discussion Rel-18

*Proposal 1: RAN2 understand NG-RAN can now broadcast more than one TAIs per PLMN per cell, with the association between TAIs and NSAGs provided but not differentiate which is the primary TAI and which are the secondary TAI(s). RAN2 impact is foreseen if such differentiation is required when broadcasting the TAIs.*

- Intel thinks multiple TAI is only for NTN and not for TN. It doesn’t even have UE capability so it might create problems. Samsung agrees.

- Lenovo thinks it’s important to understand what SA2 wanted: They wanted to allow more granular slice support within TA.

- OPPO thinks in R17 slicing, only TAI ssociated with NSAG is broadcasted, not TAI ssociated with S-NSSAI. The case of broadcasting more than one TAI is for NTN case, not TN case. So, RAN can not support more than one TAI broadcasting

The understanding shared by several contributions [4-11] is also summarized below:

|  |  |
| --- | --- |
| **Tdoc** | **Proposals related to Q1 from SA2** |
| R2-2209900  (Huawei, HiSilicon) | **Proposal 1: For question#1, RAN2 considers that broadcasting one or more secondary TAIs will cause lots of complexities and specification efforts, so solution#9 is not preferred.**  **Observation 1: Whether NG-RAN can report them the CN and between gNBs is left to RAN3 decision.** |
| R2-2210103  (Nokia, Nokia Shanghai Bell) | **Proposal 1: Send a reply LS that RAN2’s view is that it is feasible to add several TACs per cell identity, and in Rel-17 the limitation is 12 TACs per cell identity.** |
| R2-2210206  (Lenovo) | **Secondary TAI based solution** intends to create new Tas within geographies of an older TA, as shown in Figure 1. This allows the network to signal to Rel. 18 (and beyond) Ues a different TA-list as part of its registration area and thereby allocating different allowed-slice-groups, while not affecting the legacy Ues. This solution allows a granular control over slice deployment but has some problems:   1. Since the slice-group to a legacy Rel. 17 UE needs to be still available in the entire bigger TA (TA1 in Figure 1), this per se does not allow an operator to get away from the Slice homogeneity principle inside a TA. 2. The introduction of Secondary TAI in SIB is not only a signalling burden but will also lead to further complication in UE behaviour when dealing with e.g., *cellAccessRelatedInfo*.   Therefore, this solution should only be used if there’s no better solution available. |
| R2-2210397  (Ericsson) | Proposal 1: RAN2 sends a reply LS to SA2, stating that the solution in Q1 is not feasible to solve KI#3 because:   * **It has a high impact on the whole 5G system** * **It does not work for legacy Ues and it prevents legacy Ues from using the slices available in Secondary TAIs** * **It causes an increase of over the air and network interface signalling, while impacting some well established functions such as mobility and paging** * **It does not fulfil the objective of KI#3 due to lack of flexibility and scalability** * **It does create ambiguity in nodes behaviours, for example in case of connected mode mobility** |
| R2-2210403  (NEC) | **Proposal 1: RAN2 to answer that it is feasible for NG-RAN to broadcast one or more Secondary TAIs, but current NTN mechanism cannot be reused for TN.** |
| R2-2210647  (CATT) | **Observation 1: The specific S-NSSAI(s) with the additional TAIs cannot be broadcasted in SIB directly.**  **Observation2: It is not clear how to map the NSAG with the additional S-NSSAIs**  **Proposal 1: For the solution introducing additional TA, it should be clarified how to map the NSAG with the additional S-NSSAI firstly. So solution#9 is not preferred at this stage.** |

Based on the above views, the rapporteur summarize the following points, **which will be the baseline for answer to the first question asked by SA2**:

* **Point 1: The** **NG-RAN can now broadcast more than one TAIs per PLMN per cell (the the limitation is 12 TACs per cell identity) but it is only for NTN, not for TN, and the broadcast TAI(s) are associated with NSAG not S-NSSAI(s).**
* **Point 2: The introduction of secondary TAI(s) has clear RAN2 impact on, e.g. over the air signaling, mobility and paging and would lead to further complication in UE behaviour.**
* **Point 3: Whether NG-RAN can report them to the CN and between gNBs as per existing Tracking Area related information exchange procedures but with indication they are secondary is out of RAN2 scope and can be left to RAN3 decision.**

**Question 1) Do companies agree with the above points summarized by the rapporteur, which will be the baseline for answer to the first question asked by SA2? If no, please indicate which point is not acceptable, the reasons and the suggested change or improved wording in the “comments” column.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Lenovo | Yes |  |
| Nokia | Yes, but comment on Point 2 | We would like to remove the second part (starting with “e.g.”) of Point 2, as clarifying the RAN2 impacts requires further discussions (e.g., complexity is matter of taste at this point) |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes | On Point 2, we prefer to indicate that there is no concept of differentiating which is the primary TAI and which are the secondary TAI(s) on top of it. |
| OPPO | Yes | Additionally for Point 2, we can also indicate it breaks the legacy rule and thus may impact the whole 5G system work. |
| CMCC | Yes |  |
| CATT | Yes |  |
| Sony | Yes | On point 2, we agree with Nokia to remove the e.g. part. |
| Vodafone | Yes | Point 1: I think it would be good to mention the point that NSAG is on TAC basis, not on TAI. In NTN, the use of multiple TACs per cell was required for the “earth moving (very large) cell” concept, and it has led to quite some CN complexity and loss of CN functionality.  Point 2: Agree, it would have a lot of impact to many concepts like paging or idle mode mobility. Also disagree to remove the point, but we would be fine to remove “**and would lead to further complication in UE behaviour.**” |
| Apple | Yes | We are fine to keep the examples in Point 2. Though the drawbacks are more related to NAS related procedure like Paging and registration update, there is no harm to present our concerns to SA2. |
| Xiaomi | Yes |  |
| Intel | Yes | On P2: OK to remove “and would lead to further complication in UE behaviour.” |
| Ericsson | Yes, see comment | P2 should be kept, the proposal by Vodafone is fine to us.  We propose to add a Point 4: “The secondary Tas will have very limited applicability. Legacy Ues do not benefit from the mechanism, meaning that any slices deployed in the secondary Tas will be unavailable to legacy Ues (also for those that have a subscription for the slices).” |
| NEC | Yes | For point 2, paging may not be necessary as example for now, as paging might be done via primary TA?. |
| Vivo | Yes |  |
| Spreadtrum | Yes | For P2, agree with Nokia to remove the “e.g.” part. |
| LGE | Yes |  |
| Qualcomm | Yes but | Need to add one point that the legacy slicing features can not be applied, e.g. slice-based cell reselection |
| Deutsche Telekom | Yes | The additional point mentioned by Ericsson should be added. |
| ZTE | Yes |  |

**Rapporteur’s summary:**

20 companies commented on this question while all of them are fine with point 1 and 3 while 1 company would like to emphasize that the NSAG is on TAC basis, not on TAI.

On point 2:

* 3 companies (Nokia and Spreadtrum) would like to remove the “e.g. over the air signaling, mobility and paging and would lead to further complication in UE behaviour” . 1 company would like to remove paging as example. 3 companies (VDF, Ericsson and Intel) would like to remove “and would lead to further complication in UE behaviour”.
* 1 company (Samsung) would like to indicate that there is no concept of differentiating which is the primary TAI and which are the secondary TAI(s) on top of it.
* 1 company (OPPO) would like to indicate it breaks the legacy rule and thus may impact the whole 5G system work.

Ericsson and DT would like to add one more point: “The secondary Tas will have very limited applicability. Legacy Ues do not benefit from the mechanism, meaning that any slices deployed in the secondary Tas will be unavailable to legacy Ues (also for those that have a subscription for the slices).”

Qualcomm would like to add one more point that the legacy slicing features can not be applied, e.g. slice-based cell reselection.

Based on the views collected, the following proposal is given:

**Proposal 1: The following points will be taken as baseline for answer to the first question asked by SA2:**

**-Point 1: The NG-RAN can now broadcast more than one TACs per PLMN per cell (the the limitation is 12 TACs per cell identity) but it is only for NTN, not for TN, and the broadcast TAI(s) are associated with NSAG not S-NSSAI(s).**

**-Point 2: Currently there is no concept of differentiating which is the primary TAI and which are the secondary TAI(s). The introduction of secondary TAI(s) has clear RAN2 impact.**

**-Point 3: Whether NG-RAN can report them to the CN and between gNBs as per existing Tracking Area related information exchange procedures but with indication they are secondary is out of RAN2 scope and can be left to RAN3 decision.**

**-Point 4: The secondary TAIs will have limited applicability as legacy UEs do not benefit from the mechanism. And the applicability of legacy slicing features may also be impacted.**

## Slice availability on a per-cell basis

Regarding the second question from SA2:

1. *Whether the NG-RAN can be configured with a slice availability on a per-cell basis and*
   1. *inform AMF and other gNBs in NGAP messages (as described in solution#11 and others)*
   2. *Whether in Constrained Service Area the network slice is still supported but since no dedicated resources are allocated for the network slice the SLA of the network slice is not guaranteed.(as described in solution#45).*

The understanding shared by several contributions [2-11] is summarized below:

|  |  |
| --- | --- |
| **Tdoc** | **Proposals related to Q1 from SA2** |
| R2-2210669  (ZTE corporation, Sanechips) | **Proposal 2: RAN2 understand slice availability on a per cell basis can be supported in the Uu interface but whether the NG-RAN can inform AMF and other gNBs in NGAP messages the slice availability per cell basis or whether in Constrained Service Area the network slice is still supported but since no dedicated resources are allocated for the network slice the SLA of the network slice is not guaranteed is within RAN3 scope.** |
| R2-2209900  (Huawei, HiSilicon) | **Observation 2: Question#2 is within RAN3 scope and there are no RAN2 impacts.** |
| R2-2210103  (Nokia, Nokia Shanghai Bell) | These questions are about the communication between NG-RAN nodes and the CN, between NG-RAN nodes, and about NG-RAN behaviour, therefore we think these questions are primarily in the scope of RAN3. However, a decision that uniform slice support within a TA is not followed anymore (“slice availability on a per-cell basis”) would have AS level UE impacts, as e.g., IDLE Ues can make mobility decisions within a TA without contacting upper layers, and the granularity of the NSAGs is also per TA. Therefore, we think that RAN2 should inform SA2 that such a decision has RAN2 impacts and thus RAN2 investigations are required before such a decision is made.  **Proposal 2: In the reply LS to SA2 RAN2 should notify SA2 that changing the uniform support of slices within a TA has RAN2 impacts and thus this change requires investigations in RAN2.** |
| R2-2210206  (Lenovo) | We think, slice availability on a per-cell basis is the best way forward especially since in Rel. 17 RAN2 and to our knowledge the SA2 specification did not implement any check in the UE for verifying if the allowed slices are really available homogeneously in the entire TA. The *sliceInfoList* & *SliceInfoListDedicated* provides slice information on frequency/ cell basis, not on TA basis. So, if the SA2 intention is to go more granular than a TA, this solution is sufficient to address it – without needing (m)any changes in the specification.  **Proposal: RAN2 may reply to SA2 indicating that slice availability on a per-cell basis is the best way forward.** |
| R2-2210397  (Ericsson) | Proposal 2: RAN2 sends a reply LS to SA2, stating that it is feasible to configure the NG-RAN with an additional per-cell service availability for a supported slice, however   * **There is no need to signal a list of cells configured with slice availability over RAN interfaces** * **It is feasible to leave up to operators´ configuration and based on existing RRM policy configuration tools what resources a slice may access outside its slice availability area** |
| R2-2210403  (NEC) | Regarding the question 2, we assume this is more or less the question to RAN3 scope. From RAN2 point of view, we can respond to b) that RAN2 also understands it is up to network implementation how the SLA of the network slice is guaranteed. In other words, the network should guarantee the SLA of the network slice by its implementation, not by the specification.  **Proposal 2: RAN2 to answer that the SLA of the network slice should be guaranteed by network implementation.** |
| R2-2210647  (CATT) | For the solution configuring the slice availability on a per cell basis in Q2, if this can also impact the UE in IDLE state, this will cause the impact on slice based cell reselection and slice based RA in RAN2. As the granularity of NSAG is per TA, if the slice availability is changed to per cell basis, this will cause the mapping relationship of NSAG and S-NSSAI more complex and introduce more signalling load. And this may make the procedure of slice based cell reselection more complex.  **Proposal 2: For the solution configuring the slice availability on per cell basis, this will introduce more signalling load and make the procedure of slice based cell reselection more complex.** |

Based on the above views, the rapporteur summarize the following points, **which will be the baseline for answer to the second question asked by SA2**:

* **Point 1: Changing the uniform support of slices within a TA, e.g. configuring NG-RAN with a slice availability on a per-cell basis, has RAN2 impacts and thus this change requires investigations in RAN2.**
* **Point 2: Communication between NG-RAN nodes and the CN, between NG-RAN nodes for slice availability on a per-cell basis is out of RAN2 scope and can be left to RAN3 decision.**
* **Point 3: RAN2 understand it is up to NW implementation what resources a slice may access outside its slice availability area.**

**Question 2) Do companies agree with the above points summarized by the rapporteur, which will be the baseline for answer to the second question asked by SA2? If no, please indicate which point is not acceptable, the reasons and the suggested change or improved wording in the “comments” column.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Lenovo | No to Point 1  Fine for Point 2  Yes to Point 3 | RAN2 has understood the homoneous slice support in TA principle but has not made any specification based on this principle. In all the above contributions, no company has categorically showed references or cited text otherwise.  On Nokia’s views:  *“However, a decision that uniform slice support within a TA is not followed anymore (“slice availability on a per-cell basis”) would have AS level UE impacts, as e.g.,* ***IDLE Ues can make mobility decisions within a TA without contacting upper layers****, and the granularity of the NSAGs is also per TA*”  We are not sure about the real implication/ intention of “***IDLE Ues can make mobility decisions within a TA without contacting upper layers”***…isn’t what it is supposed to work given that UE performs slice based reselections according to the NSAG priority list received from NAS? |
| Nokia | Yes | Answer to Lenovo’s comment: Sliced based reselection is optional, and NSAGs are per TA, i.e., non-uniform support of slices per TA will have impacts on slice-based cell reselection as well. |
| Huawei, HiSilicon | Yes | For “**Point 1: Changing the uniform support of slices within a TA**”, we think it has been discussed lots of time in the past (at least in RAN2 and SA2), and there were not much supports on non-homogeneous deployment for slicing.  So we are ok to mention point 1. |
| Samsung | Yes |  |
| OPPO | Yes | We would like to clarify whether the slice availability mentioned in Q2 focuses on S-NSSAI, not including NSAG. If so, we think it is clearly indicated as a per-TA basis in the current TS 23.501 and then the RAN2 design anyway aligns with this SA2 deployment requirement.  *A Network Slice may be available in the whole PLMN or in one or more Tracking Areas of the PLMN.* |
| CMCC | Yes | In R17, both RAN2 and SA2 have discussed on breaking the rule of homogeneous slice within TA, but both RAN2 and SA2 concluded ‘NO’. So the normative work on RAN slicing WI in R17 are based on the TA homogeneous rule. If SA2 want to break the rule in R18, it would be too late and has too much impact and complexity. |
| CATT | Yes | As the slice based cell reselection and slice based RA are based on the principle of homogeneous deployment within TA, if we allow the slice availability on per-cell basis, this will cause the mapping relationship between NSAG and S-NSSAI more complex and introcude more signalling load. Maybe we can indicate that hanging the uniform support of slices within a TA will introduce too much complexity on slice based cell reselction and slice based RA in Point 1. |
| Sony | Yes |  |
| Vodafone | See comments | Point 1:It was a long discussion in rel 17 if the slice is unique within the TA or PLMN or per cell. We should stay with slice boundaries aligned with TA boundaries.  But I am not sure it means that operator has to configure NSAGs in all the cells belinging to the same TA=TAC. I would also like to clarify this either in LS or just for RAN2….If UE is configured over the NAS with NSAG, but a TA includes gNB/cells of 2 vendors, where only 1 implemented rel 17 NSAG. Does the “NSAGs are per TA” as per Nokia comment means operator can not have a configuration as I highlighted above?  Point 2, Ok agree it is RAN3, but we should be aligned between the groups if there is anything to report…  Point 3 : OK |
| Apple | Yes | It’s a fundamental change if we allow cell specific slice availability. |
| Xiaomi | Yes |  |
| Intel | Yes | P1: RAN2 R17 solution was based on homogeneous availability. Imapct of non-homogenous deployment will require discussion in RAN2. P1 is only saying that and does not say anything on the level of impact. So we agree on P1.  Agree with P2 and P3. |
| Ericsson | Yes | P1 and P2 are OK.  On P3: We propose to rephrase for clarity as “RAN2 understand that in case the slice service area (i.e. the area where the operator guarantees the SLA of the slice to Ues) is smaller than a TA that supports the slice, it is up to NW implementation what resources a slice may access outside this slice service area.” |
| NEC | Yes |  |
| vivo | Yes |  |
| Spreadtrum | Yes | For P1, as pointed by many companies, slice availability had been discussed for a quite long time and we finally agreed to support per-TA slice availability. Breaking the rule will introduce too much impact on signalling, and also procedures like slice-based cell reselection. |
| LGE | Yes |  |
| Qualcomm | Yes | As other companies commented, the NSAG grouping and priority is per TA, if per-cell basis slice availability is introduced, the Rel-17 RAN slicing features need to be re-discussed. |
| Deutsche Telekom | Yes |  |
| ZTE | Yes |  |

**Rapporteur’s summary:**

20 companies commented on this question while all of them except one company are fine with point 1.

All the companies are fine with point 2.

Ericsson provide some suggestions to revise point 3 and the rapporteur understands the suggestions make sense and would like to follow them.

Based on the majority’s preference, the following proposal is given:

**Proposal 2: The following points will be taken as baseline for answer to the second question asked by SA2:**

* **Point 1: Changing the uniform support of slices within a TA, e.g. configuring NG-RAN with a slice availability on a per-cell basis, has RAN2 impacts and thus this change requires investigations in RAN2.**
* **Point 2: Communication between NG-RAN nodes and the CN, between NG-RAN nodes for slice availability on a per-cell basis is out of RAN2 scope and can be left to RAN3 decision.**
* **Point 3: RAN2 understand that in case the slice service area (i.e. the area where the operator guarantees the SLA of the slice to Ues) is smaller than a TA that supports the slice, it is up to NW implementation what resources a slice may access outside this slice service area.**

## Partially allowed S-NSSAIs

Regarding the third question from SA2:

1. *The NG-RAN receives in solution 29 (but conceivably this would be needed for similar solutions) the partially allowed S-NSSAIs in addition to the Allowed NSSAI. Can the NG-RAN in principle trigger handover procedure to a supporting TAI of the partially allowed S-NSSAIs when it is possible to do so? This can happen while in connected mode or when the UE is engaged in transition from Idle to connected mode. The reason is to enable the support of the maximum number of S-NSSAIs in the Allowed and partly allowed S-NSSAIs lists.*

The understanding shared by several contributions [2-11] is summarized below:

|  |  |
| --- | --- |
| **Tdoc** | **Proposals related to Q1 from SA2** |
| R2-2210669  (ZTE corporation, Sanechips) | **Proposal 3: RAN2 understand whether the NG-RAN can trigger handover procedure to a supporting TAI of the partially allowed S-NSSAIs should be evaluated by RAN3 while any enhancement to the MT procedure requiring paging triggered cell reselection or indication of preferred band or slice information via paging would have RAN2 impact and requires further discussion.** |
| R2-2209900  (Huawei, HiSilicon) | **Observation 3: Question#3 may have influence on HO decision strategy and the XnAP/ NGAP signalling and RAN3 can check potential impacts.**  **Proposal 2: HO in connected mode of solution#29 has significant impacts to the RRC specification.** |
| R2-2210206  (Lenovo) | **The solution#29, “partially allowed S-NSSAIs in addition to the Allowed NSSAI”** does not go inside a TA, so the Slice homogeneity principle must still be maintained by the operator. It allows that some slices are supported only on certain Tas and other slices on other Tas in the UE’s RA. While this is some respite to the operator but does not allow more granular control of slice support. |
| R2-2210397  (Ericsson) | Observation 7: The UE’s behavior in Solution 29 is the same as legacy UE’s when the slice is in the Allowed NSSAI, so it is unclear what the UE is using the partially Allowed NSSAI for.  Observation 8: RAN could use the partially allowed NSSAI as an indication that a UE may want access to a slice at another frequency band. However, there are other alternatives that also works for legacy UE’s, as Target NSSAI, or solution 45.  Proposal 3: RAN 2 captures the above observations in the reply LS to SA2, stating that “Legacy mobility functions already allow the RAN to carry out handovers of UE’s to other frequency bands, if RAN is aware of the need. RAN could use the partially allowed NSSAI as an indication that a UE may want access to a slice at another frequency band. However, there are other alternatives that also works for legacy UE’s, such as Target NSSAI, or solution 45.” |
| R2-2210403  (NEC) | **Proposal 3: RAN2 to leave an answer to the questions 3 for RAN3.** |
| R2-2210647  (CATT) | For the solution that the NG-RAN receives the partially Allowed S-NSSAIs in addition to the Allowed NSSAI, we think this solution mainly have impact on RAN3 and there is limited impact on RAN2.  **Observation 3: The solution that the NG-RAN receives the partially Allowed S-NSSAIs in addition to the Allowed NSSAI has limited impact on RAN2.** |

Based on the above views, the rapporteur summarize the following point, **which will be the baseline for answer to the third question asked by SA2**:

* **Point: NG-RAN riggering handover procedure to a supporting TAI of the partially allowed S-NSSAIs has limited impact in RAN2 and RAN2 understand the feasibility should be evaluated mainly by RAN3.**

**Question 3) Do companies agree with the above point summarized by the rapporteur, which will be the baseline for answer to the third question asked by SA2? If no, please indicate which part is not acceptable, the reasons and the suggested change or improved wording in the “comments” column.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Lenovo | Yes but | **This third solution does not help** bring the slice support granularity “inside” a TA – so, this does not seem to be a solution really. As we previously indicated:  The solution#29, “partially allowed S-NSSAIs in addition to the Allowed NSSAI” does not go inside a TA, so the Slice homogeneity principle must still be maintained by the operator. **It merely allows that some slices are supported only on certain Tas and other slices on other Tas in the UE’s RA**. While this is some respite to the operator but does not allow more granular control of slice support. |
| Nokia | Yes |  |
| Huawei,  Hisilicon | Yes, but | As we raised in R2- 2209900, this solution may require the gNB to use DL RRC signalling to de-activate or activate DRBs towards the UE, which has not been supported by the current RRC specification yet. Hence, we think it also has significant impacts in RAN2. |
| Samsung | Yes |  |
| OPPO | Yes |  |
| CMCC | Yes |  |
| CATT | Yes |  |
| Sony | Yes |  |
| Vodafone | Yes | Agree the feasibility of this should be investigated by RAN3, but of course if there is an impact to RAN2, we should be involved |
| Apple | Yes |  |
| Xiaomi | Yes |  |
| Intel | Yes | Agree with the point as such. The level of impact on RAN2 specifications (suspend/release DRB etc.) needs further discussion as also mentioned in the previous responses. But agree that it can be mainly discussed by RAN3 first. |
| Ericsson | Yes, but | We acknowledge the comment by Huawei above. Introducing activation/deactivation of DRBs would have significant impact on RRC spec. |
| NEC | Yes |  |
| vivo | Yes |  |
| Spreadtrum | Yes |  |
| LGE | Yes |  |
| Qualcomm | Yes |  |
| Deutsche Telekom | Yes |  |
| ZTE | Yes |  |

**Rapporteur’s summary:**

20 companies commented on this question.

All the companies agree with the point summarized by the rapporteur while 4 companies would like to also mention that RAN2 impact is foreseen.

Based on the views collected, the following proposal is given:

**Proposal 3: The following point will be taken as baseline for answer to the third question asked by SA2:**

* **Point: RAN2 impact is foreseen to support NG-RAN triggering handover procedure to a supporting TAI of the partially allowed S-NSSAIs and RAN2 understand the feasibility should also be evaluated by RAN3.**

## Informing RAN2 status

*---------------------------------------------------Notes for the first online session--------------------------------------------------*

[R2-2210669](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210669.zip) Consideration on RAN dependency of FS\_eNS\_Ph3 ZTE corporation, Sanechips discussion Rel-18

*Observation 1: Whether the one or more Secondary TAIs can be reported to the CN and between gNBs as per existing Tracking Area related information exchange procedures with indication they are secondary is within RAN3 scope.*

*Proposal 1: RAN2 understand NG-RAN can now broadcast more than one TAIs per PLMN per cell, with the association between TAIs and NSAGs provided but not differentiate which is the primary TAI and which are the secondary TAI(s). RAN2 impact is foreseen if such differentiation is required when broadcasting the TAIs.*

*Proposal 2: RAN2 understand slice availability on a per cell basis can be supported in the Uu interface but whether the NG-RAN can inform AMF and other gNBs in NGAP messages the slice availability per cell basis or whether in Constrained Service Area the network slice is still supported but since no dedicated resources are allocated for the network slice the SLA of the network slice is not guaranteed is within RAN3 scope.*

*Proposal 3: RAN2 understand whether the NG-RAN can trigger handover procedure to a supporting TAI of the partially allowed S-NSSAIs should be evaluated by RAN3 while any enhancement to the MT procedure requiring paging triggered cell reselection or indication of preferred band or slice information via paging would have RAN2 impact and requires further discussion.*

*Proposal 4: Agree the draft reply LS [3] to SA2 addressing the RAN dependency of FS\_eNS\_Ph3 from RAN2’s perspective.*

- Intel thinks multiple TAI is only for NTN and not for TN. It doesn’t even have UE capability so it might create problems. Samsung agrees.

- Lenovo thinks it’s important to understand what SA2 wanted: They wanted to allow more granular slice support within TA.

- OPPO thinks in R17 slicing, only TAI assoicated with NSAG is broadcasted, not TAI assoicated with S-NSSAI. the case of broadcasting more than one TAI is for NTN case, not TN case. so, RAN can not support more than one TAI broadcasting

* RAN2 work may be needed to address the issues and there is no corresponding dedicated WI. RAN3 is responsible for some of the questions.

*---------------------------------------------------Notes for the first online session--------------------------------------------------*

Based on the analysis shared by companies [2-11] and the discussion happened in the first online session with the agreement made as shown above, we understand there is need to inform SA2 in the reply LS that RAN2 work is needed to address the issues and currently there is no corresponding dedicated R18 WI in RAN for slicing.

**Question 4) Do companies agree that we need to inform SA2 in the reply LS that RAN2 work is needed to address the issues and currently there is no corresponding dedicated R18 WI in RAN for slicing? If no, please indicate the reasons, the suggested change or improved wording in the “comments” column.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Lenovo | No | RAN2 needs to form an opinion and convey this to SA2. This email discussion should be used to form a RAN2 opinion.  We think this is possible and first some technical discussion, based on the company input e.g., in this email needs to take place.  From our perspective “per cell” solution is sufficient and does not need any work in RAN2. RAN3 should speak for themselves. |
| Nokia | No | This is not scope of this LS exchange (mainly a plenary issue how to allocate time for the necessary RAN2 work) |
| Huawei, HiSilicon | No | Regarding the suggested content “**that RAN2 work is needed to address the issues and currently there is no corresponding dedicated R18 WI in RAN for slicing**”, we do not think it is needed.  Firstly, this LS is related to SA2 Rel-18 study FS\_eNS\_Ph3, and SA2 plan to conclude the SI at Oct meeting, so they would like to check potential RAN2/RAN3 impacts and also concerns.  Secondly, we see that companies provide some analysis regarding RAN2 impacts/concerns, which can be considered as part of replies.  In general, if RAN2 is to reply to SA2, the following aspects can be included:   * For questions in the LS, there may be RAN2 impacts. In addition, RAN2 concerns can be also included * Besides the questions in the LS, there may be RAN2 impacts for solution 29. We think it is important to mention it, otherwise, the feasibility of these parts is unclear |
| Samsung | See comments | We think that the most important thing with this offline is to reach consensus on how to provide RAN2’s answers (e.g. feasibility, concerns, expected RAN2 specification impacts etc) about SA2’s questions. That’s sufficient. After converging it, we can send a reply LS to SA2.  In the LS, we don’t see a strong necessity on mentioning “no dedicated R18 WI in RAN for slicing’ as it may give SA2 the wrong impression that RAN2 has no purpose of addressing it, which should be discussed in the RAN plenary. |
| OPPO | No | Agree with Nokia |
| CMCC | No need | Regarding to “no dedicated R18 WI”, it is a RAN2 and RAN plenary status now. No need to bring it to SA2, otherwise, it would give the wrong impression that RAN2 have no time to do any additional thing in R18. |
| CATT | No | We think we just need to focus on providing the feedback on these questions and no need to add these information. |
| Sony | No | We think answers to above questions anyway indicate that there are RAN2 impacts. |
| Vodafone | No | In my opinion, the best is just to answer the questions as to my understanding there is currently no request from SA2 to introduce any changes and if a second TAI is not going to be introduced, probably the impact on our specs is small |
| Apple | No | We agree with others. |
| Xiaomi | No | We only needs to provide our feedback on these issues. As for whether to have time allocated for further work in R18, it is up to RAN plenary. |
| Intel | See comments | We can provide an LS response on the questions. Regarding the WI, it should already be clear to SA2 that there is no agreed WI at this time. We don’t know yet whether RAN2 will be asked to do the work and if so, what the discussion in RAN plenary will be. So we support the view from other companies to not provide any response on that. |
| Ericsson | No | Agree to comments by others. |
| NEC | No | We understand the concerns from others above, so fine to go without this information. |
| vivo | No | Agree to comments by others |
| Spreadtrum | No | Agree with others. We can just provide feedbacks on the issues from the received SA2 LS. As for TU allocation, it is not in the LS exchange scope. |
| LGE | No | Agree with others. This is out of scope for this email discussion. |
| Qualcomm |  | Whether there is dedicated R18 WI in RAN2 should not impact on SA2. SA2 may make decision based on RAN2 technical answers, and RAN2 may need some alignment works per SA2 request. |
| Deutsche Telekom | No | We agree with Nokia and the comments provided by others companies. |
| ZTE | No | Agree with the majority’s views. |

**Rapporteur’s summary:**

20 companies commented on this question and all of them understand there is no need to inform SA2 in the reply LS that RAN2 work is needed to address the issues and currently there is no corresponding dedicated R18 WI in RAN for slicing.

Since no companies are interested in providing such info, no proposal is given.

# Conclusions

**Proposal 1: The following points will be taken as baseline for answer to the first question asked by SA2:**

* + **Point 1: The NG-RAN can now broadcast more than one TACs per PLMN per cell (the the limitation is 12 TACs per cell identity) but it is only for NTN, not for TN, and the broadcast TAI(s) are associated with NSAG not S-NSSAI(s).**
  + **Point 2: Currently there is no concept of differentiating which is the primary TAI and which are the secondary TAI(s). The introduction of secondary TAI(s) has clear RAN2 impact.**
  + **Point 3: Whether NG-RAN can report them to the CN and between gNBs as per existing Tracking Area related information exchange procedures but with indication they are secondary is out of RAN2 scope and can be left to RAN3 decision.**
  + **Point 4: The secondary TAIs will have limited applicability as legacy UEs do not benefit from the mechanism. And the applicability of legacy slicing features may also be impacted.**

**Proposal 2: The following points will be taken as baseline for answer to the second question asked by SA2:**

* + **Point 1: Changing the uniform support of slices within a TA, e.g. configuring NG-RAN with a slice availability on a per-cell basis, has RAN2 impacts and thus this change requires investigations in RAN2.**
  + **Point 2: Communication between NG-RAN nodes and the CN, between NG-RAN nodes for slice availability on a per-cell basis is out of RAN2 scope and can be left to RAN3 decision.**
  + **Point 3: RAN2 understand that in case the slice service area (i.e. the area where the operator guarantees the SLA of the slice to Ues) is smaller than a TA that supports the slice, it is up to NW implementation what resources a slice may access outside this slice service area.**

**Proposal 3: The following point will be taken as baseline for answer to the third question asked by SA2:**

* + **Point: RAN2 impact is foreseen to support NG-RAN triggering handover procedure to a supporting TAI of the partially allowed S-NSSAIs and RAN2 understand the feasibility should also be evaluated by RAN3.**

# References

1. R2-2209355 LS Out on RAN dependency of FS\_eNS\_Ph3 (S2-2207435; contact: ZTE)
2. R2-2210669 Consideration on RAN dependency of FS\_eNS\_Ph3, ZTE corporation, Sanechips
3. R2-2210670 [Draft] Reply LS on RAN dependency of FS\_eNS\_Ph3, ZTE corporation, Sanechips
4. R2-2209900 Discussion on RAN dependency of FS\_eNS\_Ph3, Huawei, HiSilicon
5. R2-2210103 Proposed answers to SA2 LS on RAN dependency of FS\_eNS\_Ph3 (R2-2209355/SA2-2207435), Nokia, Nokia Shanghai Bell
6. R2-2210206 Discussion on LS on RAN dependency of FS\_eNS\_Ph3, Lenovo discussion
7. R2-2210229 Draft reply LS to SA2 on FS\_eNS\_Ph3, Lenovo
8. R2-2210397 On FS\_eNS\_Ph3, Ericsson
9. R2-2210403 Considerations on SA2 Key issue #3, NEC
10. R2-2210622 Draft Reply LS Out on RAN dependency of FS\_eNS\_Ph3, Ericsson
11. R2-2210647 Discussion on the LS on RAN dependency of FS\_eNS-Ph3, CATT