3GPP RAN WG2 Meeting #119bis-e R2-22xxxxx

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 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

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

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| **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.**

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## 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:

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| **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.**

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## 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:

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| **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 triggerring 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.**

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## 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.**

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# Conclusions

<To be generated based on company input>

# References

1. RR2-2209355 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