[94e-20-R18-MUSIMEnh] - Version 0.0.4
RAN

3GPP TSG-RAN WG Meeting #94 Electronic **RP-213500**

Electronic meeting, December, 6 – 17, 2021

Agenda item: **8A.2**

Source: **vivo**

Title: **Moderator's summary for discussion [94e-20-R18-MUSIMEnh]**

Document for: **Discussion and Decision**

1 Introduction

At RAN#93-e meeting, for potential SI/WI on R18 MUSIM, an email discussion [RAN94e-R18Prep-26] was conduted which concluded with following scope on MUSIM in RP-212716

This contribution further considered how to stabilize **R18 New WID on Dual Tx/Rx MUSIM**.

2 Initial round

2.1 Justification in RP-212716

MUSIM UE's hardware capabilities are shared by the SIMs, and to use the hardware efficiently and economically, the related capabilities need to be dynamically split between the two SIMs. This can lead to a temporary hardware conflict for the UE, which may require UE to release some resources (e.g. SCell/SCG) from one SIM. For example, when the UE's SIM A is in RRC connected state in NW A while the UE's SIM B is in RRC Idle or RRC Inactive in NW B, the two TX chains will be occupied by the SIM A for the communication in NW A. Once the UE's SIM B enters into RRC connected state, one of the TX chain needs to be switched to SIM B. In this case, if the NW A is not aware of the reduced UE's capability change in TX chain, there may be data loss due to demodulation failure and wasting radio resources in NW A. To avoid this, assistance from UE to network A on these temporary UE (capability) restrictions can be beneficial.

Feedback Form 1: Q1: Do you have any comments or suggestions on the justification part?

1 – China Telecommunications

We are fine with this justification.

2 – Xiaomi Communications

We are ok with this justification.

3 – OPPO

We're fine with the justification.

4 – SHARP Corporation

We are fine with the justification.

5 – Samsung R&D Institute India

We are also fine with the justification.

6 – vivo Mobile Communication Co.

We are fine with it.

7 – MediaTek Inc.

We are fine with the justification.

8 – Lenovo (Beijing) Ltd

We are ok with this justification.

9 – CATT

We are OK with the justification.

10 – NEC Corporation

The current justification part is fine for us.

11 – Nokia Corporation

We are fine with the justification but would propose to use "RF chain" instead of "TX chain" (in 3 places) since the impacts can be to both Tx and Rx parts of UE transceivers. So the changes would be as follows (changed parts **bolded**):

*MUSIM UE's hardware capabilities are shared by the SIMs, and to use the hardware efficiently and economically, the related capabilities need to be dynamically split between the two SIMs. This can lead to a temporary hardware conflict for the UE, which may require UE to release some resources (e.g. SCell/SCG) from one SIM. For example, when the UE's SIM A is in RRC connected state in NW A while the UE's SIM B is in RRC Idle or RRC Inactive in NW B, the two **RF** chains will be occupied by the SIM A for the communication in NW A. Once the UE's SIM B enters into RRC connected state, one of the **RF** chain needs to be switched to SIM B. In this case, if the NW A is not aware of the reduced UE's capability change in **RF** chain, there may be data loss due to demodulation failure and wasting radio resources in NW A. To avoid this, assistance from UE to network A on these temporary UE (capability) restrictions can be beneficial.*

12 – Sony Europe B.V.

We are fine with the justifications, preferably including Nokias proposals

13 – HUAWEI TECHNOLOGIES Co. Ltd.

Huawei, HiSilicon We are fine with the justification

14 – LG Electronics Finland

We are fine with the justification.

15 – Deutsche Telekom AG

We do not support this work. It will lead to a highly complex solution which in the end will not be implemented by operators for the rare case of devices simultaneously active in 2 different PLMNs at the same time. This is totally overenginerring the system and introduces only complexity.

We propose to drop the entire topic.

16 – ZTE Corporation

We are fine with the provided justification

17 – Intel K.K.

The above justification is generally acceptable to us.

However, we have a few suggestions to improve the wording:

1. The following phrase is not very clear:

'In this case, if the NW A is not aware of the UE's reduced ~~UE's~~ capability in number of ~~change in~~ TX chains,'

2. Remove phrases like "UE's SIM A is in RRC connected state' as a SIM does not have an RRC state. One suggestion is as follow:

'MUSIM capable UE can be registered to two networks (A and B) associated with 2 SIMs. In this case, MUSIM UE's hardware capabilities are shared by the SIMs, and to use the hardware efficiently and economically, the related capabilities need to be dynamically split between the two SIMs. This can lead to a temporary hardware conflict for the UE, which may require UE to release some resources (e.g. SCell/SCG) from one SIM. For example, when the UE~~'s SIM A~~ is in RRC connected state in NW A while the UE~~'s SIM B~~ is in RRC Idle or RRC Inactive in NW B, the two TX chains will be occupied ~~by the SIM A~~ for the communication in NW A. Once the UE~~'s SIM B~~ enters into RRC connected state in NW B, one of the TX chain needs to be switched for the communication in~~to SIM~~ NW B. In this case, if the NW A is not aware of the UE's reduced ~~UE's~~ capability in number of ~~change in~~ TX chains, there may be data loss due to demodulation failure and wasting radio resources in NW A. To avoid this, assistance from UE to network A on these temporary UE (capability) restrictions can be beneficial.'

18 – Ericsson LM

We are fine with the justification, except the below:

When TX is mentioned, it should be replaced by RX/TX

19 – Apple (UK) Limited

We are fine with the justification, and prefer to include Nokia's correction as well.

20 – Futurewei Technologies

We are fine with the justification

21 – Charter Communications

We are fine with the described justification

22 – Spreadtrum Communications

We are ok with this justification.

2.2 Objective in RP-212716

Enhancements for MUSIM procedures to operate in RRC_CONNECTED state simultaneously in NW A and NW B. [**RAN2**, RAN3, RAN4].

Specify mechanism to indicate preference on temporary UE capability restriction (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE prefers to start/stop connecting to NW B for MUSIM purpose **RAT Concurrency:** Network A is NR SA (with CA) or NR DC. Network B can either be LTE or NR. **Applicable UE architecture:** Dual-RX/Dual-TX UE

The work item shall identify whether the WI will have RAN3 or RAN4 impacts by RAN#99 [**RAN2**].

Feedback Form 2: Q2: Do you have any comments or suggestions on objective part?

1 – China Telecommunications

Specify mechanism to indicate ~~preference on~~ temporary UE capability ~~restriction~~ update(e.g. capability update in connected status, release of cells, (de)activation of configured resources) with NW A when UE prefers to start/stop connecting to NW B for MUSIM purpose **RAT Concurrency:** Network A is NR SA (with CA) or NR DC/ NE-DC. Network B can either be LTE or NR. **Applicable UE architecture:** Dual-RX/Dual-TX UE

We have two suggestions for further revision□

1□The wording ”UE capabilities restriction“ is not precise for the case that UE stop connecting to NW B and want to update to its full capabilities. Furthermore, to distinguish with the normal capabilities update in idle mode we prefer to use the word ”capability update in connected status“ in the example.

2□We suggest to include NE-DC into the scope. We don’t think it will cause more effort compare with NR-DC.

2 – Xiaomi Communications

We agree with the comments of bullet 1 provided by China Telecomm.

Regarding the RAT concurrency, I think that we could clarify a bit on the MR-DC architecture for network B.

3 – OPPO

We still have question on limiting the scope to two connected mode. In our view, even if the USIM B is in idle or inactive mode while the USIM A is in connected mode, the temporary UE capability update may still be beneficial. For instance, USIM A can keep data exchange with network A using one Rx while another Rx is used by USIM B for paging reception. More addition, the restricted UE capability recovery should be considered also, so we suggest the following revision:

Specify mechanism to indicate preference on temporary UE capability restriction (e.g. capability update, release of cells, (de)activation of configured resources) or temporary UE capability restriction recovery with NW A when UE prefers to start/stop connecting to NW B for MUSIM purpose. [RAN2, RAN3, RAN4]

RAT Concurrency: Network A is NR SA (with CA) or NR DC. Network B can either be LTE or NR.

Applicable UE architecture: Dual-RX/Dual-TX UE

4 – SHARP Corporation

We think "UE prefers to start/stop connecting to NW B" may be unclear, UE should not indicate the update of capability until the RRC Connection with NW B has been released. So we prefer to update the description as: Specify mechanism to indicate preference on temporary UE capability restriction (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE prefers to establish RRC connection with NW B or when the RRC Connection with NW B has been released for MUSIM purpose.

5 – Samsung R&D Institute India

We agree with comments on bullet 1 by China Telecom that there would be a need to indicate the removal of capability restriction. Regarding including NE-DC, considering the number of TU allocated, we are not sure if it is possible to include in scope. NE-DC may need additional changes in specification than NR-DC. For e.g. gaps may affect LTE leg also.

6 – vivo Mobile Communication Co.

1 For remove the "preference" and change "restriction" to "update" suggested by Chian telecom, we think that the current wording is OK, becasue there is "e.g. capability update ". For more precise, we can modify "UE capability restriction" to "UE capability change".

2 For add "in connected status" , We are oK with it.

3 For add NE-DC, We prefre not to add it now, because companies do not want to introuduce the LTE change, if it is free for NE-DC, we do not add it explictly either.

4 For description about network B, we have sympathy with companies, actually we will not specify the UE behaivour in network B, So we suggest change to "Specify mechanism to indicate preference on temporary UE capability ~~restriction~~ change (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE needs transmission or reception in network B (e.g., ~~prefers to~~ start/stop connecting to NW B) for MUSIM purpose **RAT Concurrency:** Network A is NR SA (with CA) or NR DC. Network B can either be LTE or NR. **Applicable UE architecture:** Dual-RX/Dual-TX UE"

7 – MediaTek Inc.

1. We think current wording on "temporary capability restriction" is okay. It already implies that the limitation could be removed. It is also fine to change to "temporary capability update" if majorities prefer.

2. We think change to ”capability update in connected status” is not a must. The UE could only reporting its capability in RRC CONNECTED state.

3. We prefer not to add NE-DC. As Vivo commented, if it is comes for free, we don’t have to list it now.

4. On description of network B, we agree with Vivo. The wording ”When UE needs transmission or reception in network B (e.g., ~~prefers to~~ start/stop connecting to NW B)” is better.

8 – CATT

We agree with the change proposed by China Telecom.

9 – NEC Corporation

In general, we are fine with the current objective part. About the wording “capability restriction”, we don’t have strong view since it is understandable. About RAT Concurrency, considering NE-DC may introduce additional change to LTE spec, we prefer to focus on NR-DC or prioritize NR-DC.

10 – DENSO CORPORATION

We prefer to stick to the current wording. Proposed change becomes less comprehensible by repeating the same wording, i.e. temporary UE capability update (e.g. capability update...).

11 – Nokia Corporation

We think the existing wording is fine.

If clarifications that further restrict the scope are needed, then we would be fine to be more precise and already say it’s using ”UE assistance information” (or even *UEAssistanceInformation*, i.e. the RRC message) as that limits the scope more. But we cannot accept just removing ”preference” since the procedure is in network control - that was the best compromise found in the earlier discussion.

Note also that ”preference on restriction” covers both starting and lifting the restrictions (as it refers to the UE assistance information).

We are fine to try to clarify the parts pointed out by Sharp (even if we don’t them them essential).

12 – Sony Europe B.V.

We are fine with the current objectives, and do not think the further clarifications are needed. The scope is quite clear and possible to understand.

13 – HUAWEI TECHNOLOGIES Co. Ltd.

Huawei, HiSilicon We have three comments on the objective.

1) The wording “preference on UE capability restriction” is a bit strange since no UE would have preference to have a capability restriction.

2) Similar comment as the first one from China Telecommunication, i.e., “indicate preference on temporary UE capability restriction” only covers the “start” case of “when UE prefers to start/stop connecting to NW B”, but does not cover the “stop” case.

3) The “configured resources” is not clear. During the email discussion, it actually refers to the SCell/SCG.

So, to address the above issues, we propose to change the objective as below:

Specify mechanism to indicate ~~preference on~~ the temporary UE capability restriction/removal of such restriction

(e.g. capability update, release of cells, (de)activation of configured resources including SCell/SCG) with NW A when UE prefers to start/stop connecting to NW B for MUSIM purpose

14 – LG Electronics Finland

We are fine with the current objective. We think NE-DC scenario would be better to exclude in Rel-18 because it will cause additional impact to LTE specs.

15 – Deutsche Telekom AG

We do not support this work. It will lead to a highly complex solution which in the end will not be implemented by operators for the rare case of devices simultaneously active in 2 different PLMNs at the same time. This is totally overenginerring the system and introduces only complexity.

We propose to drop the entire topic.

16 – ZTE Corporation

We are fine with the current set of objectives

17 – CableLabs

We are supportive on the objectives

18 – Intel K.K.

The current objective is acceptable to us.

19 – Nokia Corporation

Generally, we think haggling on the objective wording will just make it harder to agree on any MUSIM WI. We already spent the previous email discussion doing that.

It's possible to clarify the scope even more, but then we should make clear this is network-controlled: If configured, UE can request capability restriction and network makes the decision when receiving the request, e.g.

*"Specify **network-controlled UE assistance information mechanism to allow UE to request temporary** capability restriction..."*

20 – Ericsson LM

We are fine with the current objectives.

21 – Apple (UK) Limited

We would prefer to address both the imposing and removal of temporary UE capability restriction. To that effect, it is better to reword it as "Specify mechanism to indicate preference on temporary UE capability restriction and removal of such restriction".

We also would like to consider issue of band conflict resolution due to simultaneous TX across both SIM instances. Is this also considered to be part of such capability restriction ?

22 – VODAFONE Group Plc

The feature needs to work for the first RRC connection being on either network A or network B. Hence the first bullet needs to be reworded, e.g.:

- Specify mechanism to indicate preference on temporary UE capability restriction (e.g. capability update, release of cells, (de)activation of configured resources) with **one network** ~~NW A~~ when UE prefers to start/stop connecting to a **second network** ~~NW B~~ for MUSIM purpose

23 – Futurewei Technologies

Generally we are with comments from China Telecom. Also, clarification proposed by Nokia seems useful.

24 – Charter Communications

We are fine with the described objectives.

25 – Spreadtrum Communications

We agree with the change proposed by China Telecom.

2.3 Impacted TS in RP-212716

1 TS 38.300 Stage-2 description of the feature

2 TS 38.306 UE capabilities of the feature

3 TS 38.331 Signalling aspects of feature

4 TS 38.321 MAC aspects of feature (If needed)

Feedback Form 3: Q3: Do you Agree to add the above the impacted TS in R18 MUSIM WID ?

1 – China Telecommunications

We are fine to include these specifications.

2 – Xiaomi Communications

If scheduling gap enhancement is included in the Rel-18 MUSIM, we need to include the RAN4 specifications.

3 – OPPO

At this stage, rapporteur's suggestion seems reasonable.

4 – Samsung R&D Institute India

We also think that if scheduling gap enhancements are included, we need to include RAN4 specifications. For DC support, we may need to include TS 37.340.

5 – MediaTek Inc.

We think there should be no change to 38.321 or 37.340 but fine to have it with ”if needed” marking.

6 – vivo Mobile Communication Co.

we suggest to add RAN2 specification impact only for now, and can add RAN3 or RAN4 specification at later stage, if RAN3 and RAN4 impact are clear.

7 – Lenovo (Beijing) Ltd

We are fine to include these specifications for current stage.

8 – CATT

No strong view. TS 38.321 can be kept or added later as it is not clear for now whether there are impacts to 38.321.

9 – NEC Corporation

We can take those above as baseline. Other impacted TS, for example RAN3/RAN4 specs, can be added if necessary.

10 – DENSO CORPORATION

Not sure if 38.321 is impacted at this moment. Perhaps, it is to be added later, when the specification impact becomes clear.

11 – Nokia Corporation

The draft WI in already included these specifications, as well as the RAN34 specifications that might need to be impacted (based on RAN2 work): This is the list of affected specifications already in RP-212716: **38.300, 38.306, 38.321, 38.331**

- Note also that the draft WI already marks 38.321 as affected ”*if needed”,* i.e. there may be no impacts as DENSO also mentioned.

Then on RAN3/RAN4 specifications, the following are also tentatively listed: **38.413, 38.423, 38.463, 38.473, 38.133**

- Whether those are needed depends on the evaluation during WI.

12 – Sony Europe B.V.

We are fine to include these specs, we also think that at least some RAN4 impact should be indicated.

13 – HUAWEI TECHNOLOGIES Co. Ltd.

Huawei, HiSilicon We are fine to include these specifications.

14 – LG Electronics Finland

We are fine with the current list.

15 – ZTE Corporation We are fine with the current list
16 – Intel K.K. We are fine with the above list of impacted TSes.
17 – Ericsson LM We are fine with the current list.
18 – Charter Communications We are fine with the suggested list, and include RAN4 38.133 if RAN agree on the proposal: ***Remaining R17 MUSIM gap RRM requirement is included in Rel-18 MUSIM enhancement WI***
19 – Apple (UK) Limited Agree with the current list. Maybe we should consider 38.133 as well, considering RRM impacts (arising out of potential R17 enhancements and R18 topics) ?
20 – Futurewei Technologies We agree with this list
21 – Charter Communications Agree
22 – Spreadtrum Communications We are fine with the current list.

2.4 R17 remaining RRM requrierment in RAN4

About R17 MUSIM gap, a reply LS (R4-2120342) was sent to RAN2 which was also Cc RAN.

Table 1:

[RAN4 Response]: Multiple activated gaps and aperiodic gaps for MUSIM have impact on UE RRM measurement for NW A, such as RRM measurement performance RLM/BFD/CBD/L1-RSRP and L1-SINR measurement performance - RAN4 would like to inform RAN2 that MUSIM WI does not have RAN4 objectives to define the RRM requirements and this is subject to RANP decision.

Based on RAN4 discussion some measurements will be impacted for R17 MUSIM gap introduction. Considering that RAN4 TU is full already.

This contribution (In RP□213274) further considered how the R17 remaining MUSIM gap RRM requirement is include in R18 MUSIM WI, and give the below proposal.

Proposal:Remaining R17 MUSIM gap RRM requirement is included in Rel-18 MUSIM enhancement WI.

Feedback Form 4: Q4: Do you Agree to include remaining R17 MUSIM gap RRM requirement in Rel-18 MUSIM enhancement WI ?

1 – China Telecommunications Yes, but we think it is better to consider this when Rel 17 progress is more clear.
2 – Xiaomi Communications Yes
3 – OPPO We think more discussion is still needed as the gap enhancement is a common topic in RAN4, if RAN4 would like to have a new WID for gap enhancement, the leftover issue for MUSIM gap can be included in common gap WID; but if RAN4 doesn't have the intention to enhance gap further in R18, R18 MUSIM WID can revisit this bullet in RAN#99. For now, it's better to not have this objective.
4 – Samsung R&D Institute India Yes
5 – MediaTek Inc. We share same view as OPPO and prefer NOT to have this objective. Please note that RAN4 is overloaded since Rel-15 and we think it is fine to leave MUSIM gap requirement to UE implementation.
6 – vivo Mobile Communication Co. R17 remaining RAN4 requierment should be added R18, we are ok to come back this after RAN4 R18 work discussion.
7 – CATT Maybe we can wait for the R17 conclusion as it seems a part of R17 work.
8 – NEC Corporation Yes, we think multiple activated gaps and aperiodic gaps are useful. If MUSIM gap RRM requirement cannot be specified by RAN4 in Rel-17, it should be included in Rel-18.
9 – DENSO CORPORATION The intention is O.K. But, it is not too late to wait for the Rel-17 progress.

10 – Nokia Corporation

Yes - the Rel-17 RRM requirements should be done during Rel-18 since RAN4 identified there is an impact to RRM (see RP-212692). This would be something RAN4 can start working on immediately when Rel-18 starts.

However, we would note that the objective in the WI about RAN4 impacts is about **the Rel-18-specific** RRM work, and that would be **additional** to the Rel-17 RRM work. So that part still depends on RAN2 outcome on Rel-18 mechanisms, and the checkpoint at RAN#99 is still valid for that.

11 – LG Electronics Finland

Yes if RAN4 agrees.

12 – HUAWEI TECHNOLOGIES Co. Ltd.

Huawei, HiSilicon Currently, it is still not clear how to handle it in Rel-17, and the guidance from RAN Plenary is needed. So we don't think it should be included as a Rel-18 objective.

13 – ZTE Corporation

We are fine to include it in Rel-18, if it can not be completed in Rel-17

14 – CableLabs

We support to include left over from Rel-17 for MUSIM RRM handling. Exact scope may be defined based on RAN guidance on Rel-17 RAN4 work on MUSIM.

15 – Intel K.K.

Our understanding is that the RAN4 RRM requirements for MUSIM gaps is still under discussion. Whether to add it in Rel-18 needs further discussion and depends on the outcome of the Rel-17 discussion.

16 – Nokia Corporation

RAN4 has no remaining TUs left for Rel-17 work. Therefore, we think it's better to just admit the Rel-17 MUSIM RRM requirements are done in Rel-18.

17 – Ericsson LM

Yes we agree that all the RRM requirements for MUSIM related gaps and procedures in Rel-17, should be included in Rel-18 WI. Rel-17 MUSIM RRM requirements are pre-requisite for Rel-18 MUSIM RRM requirements. Therefore, RAN4 should first complete the RRM requirements for Rel-17 MUSIM before starting work on Rel-18 requirements.

18 – Charter Communications

MUSIM RRM requirements have been completely left out in RAN4 due to lack of time. However, during the RAN4 LS reply discussion in November, RAN4 identified quite a list of RRM requirements that would benefit from being digested there, if RAN4 have had the Time Units for it. Hence, we agree with Ericsson, that all the RRM requirements for MUSIM related gaps and procedures in Rel-17, should be included in Rel-18 WI.

19 – Apple (UK) Limited

If RAN4 is not able to conclude within R17 timeline, we should consider the remaining R17 MUSIM gap RRM requirement as part of R17 TEI or R18.

20 – Futurewei Technologies

We prefer to wait for Rel. 17 conclusion

21 – Spreadtrum Communications

Although this issue is solved in R17, it shall be included in Rel-18 WI. Because the assumption for RX/TX chain is different in R18.

2.5 scheduling gap enhancements

This contribution (In RP□213330) discuss the scheduling gap enhancements in R18, and give the below proposal.

Proposal: Support scheduling gap enhancements in Rel-18 MUSIM scope, including:

- **Specify MN and SN coordination for scheduling gap**
- **Specify scheduling gap for Dual-Rx/Dual-Tx UE**
- **Support scheduling gap with smaller granularity and/or gap with reduced capability**

Feedback Form 5: Q5: Do you Agree the above proposal, i.e., support further enhancements on scheduling gap in Rel-18 MUSIM enhancement WI ?

1 – China Telecommunications

We are interested in the following aspects□

Support scheduling gap with reduced capability.

For dual Rx /single Tx UE, it can perform reception/transmission with reduced MIMO layer during the gap e.g. the UE may tune away partial of Rx chains to NW-B for paging monitoring.

As there are only 5 TUs estimated we'd better not to expand the scope too much.

2 – Xiaomi Communications

We are open to discuss further enhancements on scheduling gap. Maybe we can leave the objective description for the scheduling gap more open to allow more detailed stage-3 discussions. Considering the limited TUs for Rel-18 MUSIM, we think that RAN2 can decide which detalied enhancement is really needed for the scheduling when the work item starts.

3 – Samsung R&D Institute India

We think that for R18 objectives, some enhancements of scheduling gaps -for e.g. MN-SN coordination or scheduling gap for Dual-Rx/Dual-Tx UE will be needed. But we may not increase the scope too much

considering the TU allocation.

4 – OPPO

We are open to discuss further enhancements on scheduling gap. Maybe using 'special scheduling window' is more suitable than 'scheduling gap' as it's a common understanding that no data exchange is desirable during gap, which is quite different than the 'scheduling gap' concept here. As commented by above companies, limited TUs are allocated for R18 MUSIM, we can leave this issue open now and consider it if time allowed. In our view, this new proposed objective is implicitly included in the current R18 MUSIM objective.

5 – MediaTek Inc.

No. We disagree on further enhancement for the MUSIM scheduling gap in Rel-18. The gap design in Rel-17 is quite complicate and we believe that it already covers most use cases. We don't think the motivation is strong enough to further enhance it. Please also note the TU is limited, we should focus on the objective with great consensus (i.e. the current one on temporary UE capability restriction).

6 – vivo Mobile Communication Co.

We are ok to discuss it. however we also would like to clarify that "**or gap with reduced capability** " is not related to scheduling gap, during this period the UE still can receive and transimit, it is a kind of temporary reduced capability. it is in the R18 MUSIM scope.

7 – CATT

The justification of enhancing scheduling gap for Dual-Rx/Dual-Tx UE is expected to be clarified further.

In our understanding, scheduling gap is useful for single TX UE which does not support connected state in NW A and NW B simultaneously, as specified in R17.

8 – NEC Corporation

Yes. Scheduling gap is useful for IDLE/INACTIVE state service (e.g. paging reception and idle/inactive state measurement) at network B. In Rel-17 only per-UE scheduling gap is supported for 1Tx/1Rx and 1Tx/2Rx UE. For 2Tx/2Rx UE configured with DC, it is also beneficial to introduce scheduling gap, as well as MN and SN coordination on scheduling gaps. And similarly to the objective of simultaneous RRC Connection for both networks, we can also enhance the scheduling gap mechanism such that UE can have simultaneous transmission/reception ongoing at both networks during the gap period.

9 – DENSO CORPORATION

For the proposed objectives, it has to build the common understanding on the scenario and motivation. On the second objective, it is not clear if there exists the gap tailored for dual Rx/Tx, and why the Rel-17 mechanism to be specified is not sufficient. For the third objective, NCSG is to be specified, which could be a sort of "smaller gap". So, it is not clear what is missing on top of the Rel-17 standard. The first object could be a potential candidate if it fits into the TU allocation.

10 – Nokia Corporation

We prefer to keep the WI scope small as that was the outcome of earlier discussion.

The MN/SN coordination signalling could perhaps be done within the existing TUs, but optimizing the scheduling gaps for dual Tx/Rx could get complicated so we think there aren't enough TUs to do that in Rel-18.

11 – Sony Europe B.V.

Yes, we are open to discuss further enhancements of the scheduling gaps in Rel-18 as it can be used for UEs in idle/inactive state for single Rx/Tx as well as Dual Rx/Tx UEs without using the reduced capability feature.

12 – LG Electronics Finland

We agree with this proposal, as we think the scheduling gap in Rel-17 is likely to be simple, e.g. request and response only always, due to lack of discussion time. Some enhancements to support more flexible gap activation/modification/deactivation via inter-network coordination due to reduced capability needs to be discussed in Rel-18.

But, for this proposal, we want to limit TU increase as much as possible.

13 – HUAWEI TECHNOLOGIES Co. Ltd.

Huawei, HiSilicon No. We have spent quite a lot time to discuss the justification and objective, and finally converge on the current ones. We don't think we should consider any further scope at this stage, especially consider the limited TUs for MUSIM.

14 – ZTE Corporation

We don't see a clear need to further enhance the scheduling gap. Multi-SIM with scheduling gap in MR-DC implies that the UE needs to maintain three connections simultaneously, which seems complex both from UE side as well as from the network side (for MN SN coordination) and is not necessary. SCG release seems sufficient for such case.

15 – Intel K.K.

We do not see the need for this further optimisation on scheduling gap for Dual-Rx/Dual-Tx UE on top of temporary reduction of UE capability.

16 – Ericsson LM

We do not see need for different type of gaps (e.g. with different smaller granularity and/or gap with reduced capability), specific for DualTX/DualRX UE, since we believe that the gaps defined in Rel.17 already cover most of the use cases and can be used for Rel.18, as well.

17 – Apple (UK) Limited

We are open to discuss further enhancements on this topic, especially on aspects of scheduling gaps for Dual Rx/Dual Tx UEs, scheduling gaps with smaller granularity and/or gap with reduced capability.

18 – Futurewei Technologies

We prefer not to increase the scope

19 – Charter Communications

We are open to discuss this, however concerned about increased scope of this WI, particularly considering the limited TU that this WI is likely to get.

20 – Spreadtrum Communications

For this enhancement, multiple types of GAPs shall be introduced, which is complex. So we prefer not to include it.

2.6 Moderator Summary and recommendation for further discussion

Summary for Q1 (justification part):

19 of 20 companies are generally ok with this justification part. Several companies propose to change "TX" to "RX" for the clarification about the example as suggested by Nokia. One company also would like to enhance some wording about the "UE's SIM A" part.

Moderator think that change "TX" to "RX" for the clarification about the example is correct. Some wording about the "UE's SIM A" part is not needed because we all know that it means as the MUSIM UE with SIM A handling in RAN side.

Moderator suggest that We only change "TX" to "RX" for the clarification about the example as suggested by Nokia.

Summary for Q2 (Objective part):

For "indicate preference on temporary UE capability restriction (e.g. capability update, release of cells, (de)activation of configured resources)" part, several companies would like to remove " preference" and change the wording about the "restriction" to cover the removal of restriction. However some companies also would like to keep the existing wording and keep the network control. One companies also suggest some wordings about "(de)activation of configured resources". Moderator think that the wording is a good compromise to cover some concerns from previous pre-email discussion.

Moderator suggest the wording as "indicate preference on temporary UE capability restriction <u>and removal of restriction</u> (e.g. capability update, release of cells, (de)activation of configured resources)"

For network A part or network B part, serval companies would like to give more clear description about the network B, however actually we will not specify the UE behaivour in network B. One company also would like to change "network B" and "network A" to "one network" and "second network" the moderator think there is no difference because we also use the "network B" and "network A" in R17 MUSIM WID to represent "one network" and "second network".

Moderator suggest the wording as "when UE needs transmission or reception in network B (e.g., start/stop connecting to NW B) for MUSIM purpose"

For adding NE-DC part, majority company do not add it.

Moderator suggest that we do not add NE-DC in R18 WID.

Summary for Q3 (TS impact part):

Majorities are fine to add RAN2 specification now with some "if needed" marks.

Moderator suggest that TS 38.300, 38.306, 38.321 with " if needed" mark, 38.331 are add to R18 WID

now.

Summary for Q4 (R17 remaining RRM requrierment in RAN4):

Majorities are fine to add R17 remaining RRM requrierment in RAN4 to R18 MUSIM WID, however also fine to postpone this discussion with R18 RAN4 package discussion.

Moderator suggest to postpone the discussion about adding R17 remaining RRM requrierment in RAN4 to R18 MUSIM WID with R18 RAN4 package discussion

Summary for Q5 (scheduling gap enhancements):

There are no consensus to add scheduling gap enhancements in R18.

Moderator suggest that we do not add scheduling gap enhancements in R18 WID.

3 Intermediate round

Base on initial round discussion, the moderator would like to kick off the intermediate round discussion for the below two parts. The updated WID is also provided in draft folder based on initial round discussion.

3.1 Justification in RP-212716

MUSIM UE's hardware capabilities are shared by the SIMs, and to use the hardware efficiently and economically, the related capabilities need to be dynamically split between the two SIMs. This can lead to a temporary hardware conflict for the UE, which may require UE to release some resources (e.g. SCell/SCG) from one SIM. For example, when the UE's SIM A is in RRC connected state in NW A while the UE's SIM B is in RRC Idle or RRC Inactive in NW B, the two **RX** chains will be occupied by the SIM A for the communication in NW A. Once the UE's SIM B enters into RRC connected state, one of the **RX** chain needs to be switched to SIM B. In this case, if the NW A is not aware of the reduced UE's capability change in **RX** chain, there may be data loss due to demodulation failure and wasting radio resources in NW A. To avoid this, assistance from UE to network A on these temporary UE (capability) restrictions can be beneficial.

Feedback Form 6: Q1: Are you OK with the updated justification or do you have any comments?

1 – Nokia Corporation We think there's been a typo in the update: The intent of our comment to replace the "TX chain"# was to use "R**F** chain" (as in **R**adio **F**requency). Using "RX chain" again only considers UE reception, while RF chain considers both reception and transmission.
2 – OPPO Share the same view with Nokia and we are fine with the rest.
3 – DENSO CORPORATION Agree with Nokia

4 – Qualcomm CDMA Technologies Agree with Nokia on using ”RF chain” instead. We can replace ”can be beneficial” at the end with ”is needed” but no strong opinion. ”reduced UE’s capability” should be ”UE’s reduced capability”.
5 – SHARP Corporation Agree with Nokia.
6 – Xiaomi Communications Agree with Nokia
7 – CATT Agree with Nokia that ”RF chain” is more appropriate.
8 – HUAWEI TECHNOLOGIES Co. Ltd. Huawei, HiSilicon We are OK with the modification proposed by Nokia
9 – NEC Corporation We also agree to use “RF chain” instead.
10 – Spreadtrum Communications Agree with Nokia.
11 – LG Electronics Finland Agree with Nokia
12 – vivo Mobile Communication Co. We can chagne it based on Nokia comments.
13 – Samsung R&D Institute India Agree to use RF chain (or TX/RX chain)
14 – Lenovo (Beijing) Ltd Agree with Nokia. RF chain or TX/RX chain can be used.
15 – MediaTek Inc. OK with Nokia’s update
16 – Sony Europe B.V. Agree with Nokia

17 – Ericsson LM We agree with Nokia on using “RF chain”. The rest of the text is fine.
18 – ZTE Corporation We are fine with the edits provided by Nokia
19 – China Telecommunications **Sony Europe B.V.** # 16 Agree with Nokia
20 – Charter Communications Agree with ”RF chain” suggestion from Nokia.
21 – Intel K.K. Agree with the change by Nokia. Maybe it is better to just use TX/RX to be clear. Although using ‘UE’s SIM A is in RRC connected state’ is strange (i.e. it seems to mean that SIM has RRC state), we think the intention of the current text is clear enough and so will not insist. However, we still think that the following phrase is not very clear and hope it can be updated: ‘In this case, if the NW A is not aware of the UE’sreduced ~~UE’s~~capability in number of ~~change in~~ TX chains,’
22 – Futurewei Technologies Agree with corrections proposed by Nokia.
23 – Apple (UK) Limited Agree with correction proposed by Nokia.

3.2 Objective in RP-212716

Enhancements for MUSIM procedures to operate in RRC_CONNECTED state simultaneously in NW A and NW B. [**RAN2**, RAN3, RAN4].

Specify mechanism to indicate preference on temporary UE capability restriction **and removal of restriction** (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE **needs transmission or reception in network B** (~~prefers to~~ **e.g.,** start/stop connecting to NW B) for MUSIM purpose
RAT Concurrency: Network A is NR SA (with CA) or NR DC. Network B can either be LTE or NR.
Applicable UE architecture: Dual-RX/Dual-TX UE

The work item shall identify whether the WI will have RAN3 or RAN4 impacts by RAN#99 [**RAN2**].

Feedback Form 7: Q2: Are you OK with the updated objective or do you have any comments?

1 – VODAFONE Group Plc

No. It still does not seem to address my repeated comment that the UE can be using an LTE connection on one SIM and afterwards open another RRC connection on the other SIM.

2 – OPPO

Fine with the updated wording.

3 – DENSO CORPORATION

O.K

4 – SHARP Corporation

We are OK.

5 – Qualcomm CDMA Technologies

Fine with the suggestion. To Vodafone: I believe your scenario is also covered by this objective; it doesn't say that the UE has to enter Connected state first on NW A and it is just that the signaling will be defined only on the NR side.

6 – Xiaomi Communications

Fine with the updated wording.

7 – CATT

We are OK.

8 – Nokia Corporation

We are fine with the updated wording.

9 – HUAWEI TECHNOLOGIES Co. Ltd.

Huawei, HiSilicon

- Considering that in the previous email discussion, only SCell/SCG (de)activation were considered and discussed, to make the "(de)activation of configured resources" part more clear, we still think it's better to change to "(de)activation of configured resources, including SCell/SCG", or simply change to "(de)activation of SCell/SCG"
- We could not understand the reason for the change "when UE **needs transmission or reception in network B**", and actually with this change, the case that "stop connecting to NW B" is missed. So we suggest to change "when UE needs transmission or reception in network B (e.g. start/stop connecting to NW B)" to "when UE needs to start/stop connecting to NW B".

10 – NEC Corporation

OK

11 – LG Electronics Finland

Fine with the update

12 – Spreadtrum Communications

We are OK with the updated wording.

13 – vivo Mobile Communication Co.

1 For vodafone's comments, we also same view with QC, the existing wording has covered that case.

2 For Huawei's comments, again we do not preclude the case "stop connecting to NW B" becasue we list it in e.g., part. I think we all have same understanding. For precise, we suggest to change the wording as "Specify mechanism to indicate preference on temporary UE capability restriction **and removal of restriction** (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE **needs transmission or reception in network B** ~~(prefers to **e.g.,** **and to start/stop connecting to NW B**)~~ for MUSIM purpose"

14 – MediaTek Inc.

We are fine with the update.

15 – Samsung R&D Institute India

Fine with the updated objective.

16 – VODAFONE Group Plc

At Qualcomm and others, thanks, but the text is not clear (and hides the fact that the device may be in an MR-DC connection on network B when the connection on network A is opened). Hence I'd suggest adding "***ongoing connection with NW B"*** as below.

***

Specify mechanism to indicate preference on temporary UE capability restriction **and removal of restriction** (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE **needs transmission or reception in network B** (~~prefers to~~ **e.g.,** ***ongoing connection with NW B*** or start/stop connecting to NW B) for MUSIM purpose **RAT Concurrency:** Network A is NR SA (with CA) or NR DC. Network B can either be LTE or NR. **Applicable UE architecture:** Dual-RX/Dual-TX UE

17 – Sony Europe B.V.

We are fine with the proposal

18 – Ericsson LM

The text is fine.

19 – ZTE Corporation

We are fine with the updated wording

20 – China Telecommunications

Fine with the update.

21 – Charter Communications As the moderator summarized above, the majorities are fine to add R17 remaining RRM requirement in RAN4 to R18 MUSIM WID. We believe this RAN4-related aspect should also be captured in the objective.
22 – Intel K.K. We prefer the original objective and do not see any of the proposed changes necessary.
23 – Futurewei Technologies We agree with other companies in that there is still some ambiguity of current text. The revision proposed in the moderator's comment above seems better.
24 – Apple (UK) Limited We are fine with the update.

3.3 Moderator Summary and recommendation for further discussion

Summary for Q1 (justification part):

All the companies agree to change RX to RF suggested by Nokia. Two companies sugest to change "the reduced UE's capability" to "the UE's reduced capability". One company sugest the wording "'In this case, if the NW A is not aware of the UE'sreduced ~~UE's~~capability in number of ~~change in~~ TX chains,' however the moderator do not suggest to use "in number of " because the number of RX chain may not be change. "

Moderator suggest the wording as

"MUSIM UE's hardware capabilities are shared by the SIMs, and to use the hardware efficiently and economically, the related capabilities need to be dynamically split between the two SIMs. This can lead to a temporary hardware conflict for the UE, which may require UE to release some resources (e.g. SCell/SCG) from one SIM. For example, when the UE's SIM A is in RRC connected state in NW A while the UE's SIM B is in RRC Idle or RRC Inactive in NW B, the two **RF** chains will be occupied by the SIM A for the communication in NW A. Once the UE's SIM B enters into RRC connected state, one of the **RF** chain needs to be switched to SIM B. In this case, if the NW A is not aware of the **UE's** reduced ~~**UE's**~~ capability change in TX chain, there may be data loss due to demodulation failure and wasting radio resources in NW A. To avoid this, assistance from UE to network A on these temporary UE (capability) restrictions can be beneficial. "

Summary for Q2 (Objective part):

Majority companies think the updating for objective part is ok. Two companies want to clarifify the network B part. The moderator think that all have the same understanding about the network B part, i.e., we do preclude the cases in network B and we will not specify the UE behaviour in network B. For precise

Moderator suggest the wording as

"Specify mechanism to indicate preference on temporary UE capability restriction **and removal of restriction** (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE **needs**

transmission or reception in network B ~~(prefers to **e.g.,**~~ **and to start/stop/be ongoing connection** ~~**connecting**~~ **to NW B**~~)~~ for MUSIM purpose”

4 Final round

Base on intermediate round discussion, the moderator would like to kick off the final round discussion for only objecti part. The updated WID is also provided in draft folder based on initial round discussion.

4.1 Objective in RP-212716

Specify mechanism to indicate preference on temporary UE capability restriction **and removal of restriction** (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE **needs transmission or reception in network B** ~~(prefers to **e.g.,**~~ **and to start/stop/be ongoing connection** ~~**connecting**~~ **to NW B**~~)~~ for MUSIM purpose

Feedback Form 8: Q1: Do you agree the update for objective part and do you have any comments?

1 – SHARP Corporation How about update it as: **when UE needs to start connecting to NW B or when UE stops connecting to NW B** to align with ”indicate preference on temporary UE capability **restriction** and **removal of restriction**”?
2 – vivo Mobile Communication Co. I do not think that only ”start” and ”stop” cover all cases. we would like to suggest to agree the latest version. thank you.
3 – Qualcomm CDMA Technologies I understand people’s intentions but the latest sentence became a little confusing. The UE can’t start an ongoing connection since it was already started. Also not clear what ”be ongoing” is. How about ”**when UE needs transmission or reception in ongoing connection at NW B or to start/stop connection to NW B**. We can also use setup/release instead of start/stop since those are the RRC terms.
4 – vivo Mobile Communication Co. QC’ update is better, we are also fine.
5 – SHARP Corporation Fine with QC’s text.
6 – Xiaomi Communications Fine with QC’s text.

7 – Nokia Corporation

First, sorry to sounds like a broken record but there is still one ”TX chain” in the justification:

”In this case, if the NW A is not aware of the UE’s reduced capability change in **TX** chain” should be changed to ”In this case, if the NW A is not aware of the UE’s reduced capability change in **RF** chain”

Second, sorry for not spotting this in previous round, but about the objective: **We cannot accept the proposed wording as it enlarges the scope unnecessarily.**

Our concern is about ”**when UE needs transmission or reception** in network B and to start/stop/**be ongoing** connection to NW B for MUSIM purpose” since the underlined text implies very dynamic capability changes, e.g. when UE is not scheduled in NW B, it can suddenly use its capabilities in NW A. That kind of allowance will simply prolong discussions in RAN2, and was never dsicussed before. What has been discussed is that UE capabilities can change when NW B connection starts or stops, nothing else. We can accept the following but not any references to UE capability changes constantly (as the proposal now implies):

”*Specify mechanism to indicate preference on temporary UE capability restriction and removal of restriction (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE* ***needs to start or stop connection to NW B*** *for MUSIM purpose*”

We need to be realistic and limit the WI scope as there aren’t that may TUs: Limiting to the start/stop of connection is sufficient because that is the use case we have discussed all the time, and is what the justification also states. Let’s keep the scope realistic so it’s possible to achieve in Rel-18.

8 – CATT

we prefer QC’s text

9 – vivo Mobile Communication Co.

For Nokia comments, we will not specify the UE behaviour in network B, Vodafone raised the MR-DC case in network B, it means that if UE releases one leg in netwrok B, the capability of UE in network A can be added.

It is valid case, so we can discuss this details in RAN2. if companies do not want to support this case, it is still OK.

the TU will not be consumed too much even we support this case because we understanding is they will use the same procedure, So we suggest that we do no preclude it now. and agree the wording from QC.

10 – HUAWEI TECHNOLOGIES Co. Ltd.

Huawei, HiSilicon We support QC’s wording, i.e. ”when UE needs transmission or reception in ongoing connection at NW B or to start/stop connection to NW B”

11 – OPPO

We can accept QC’s version.

12 – Intel K.K.

We support the text in the intermediate round as follow:

Specify mechanism to indicate preference on temporary UE capability restriction **and removal of restriction** (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when

UE **needs transmission or reception in network B** (~~prefers to~~ **e.g.,** start/stop connecting to NW B) for MUSIM purpose

The scenario when temporary UE capability restriction can be applied should be further discussed during the WI phase.

13 – Intel K.K.

We also support Nokia's proposal

14 – LG Electronics Finland

we think QC's suggestion is clearer.

15 – Lenovo (Beijing) Ltd

Fine with QC's update.

16 – Nokia Corporation

To reiterate our concerns: The whole original justification of the WI was about UE being in NW A and starting connection to NW B. That was discussed for the whole half a year, and expanding the WI scope now requires further work and more TUs, which are not there. The WI should focus on the essential case, not the optimization that cater to rare cases (e.g. 3Tx UE that can handle MR-DC and second NW at the same time are rather unlikely to happen).

We are fine with the text from intermediate round still (even if we would be happier if "e.g." was removed from before the "start/stop") since it focuses on the essential part only.

17 – Ericsson LM

The "**/be ongoing**" in the proposed text should be removed.

18 – China Telecommunications

Fine with QC's text. We don't have to elaborate UE's behavior in NW-B since we won't specify the action in NW-B. We can discuss in the WI phase how to prevent UE frequently updating its capabilities.

19 – ZTE Corporation

We are okay in general and QC's text looks fine to us.

20 – Apple (UK) Limited

We are fine with the clarification provided by Qualcomm.

21 – Charter Communications

Agree with QC. Reg Ericsson suggestions; should it be "maintain ongoing connection"?

22 – Futurewei Technologies

Fine with QC's update.

23 – VODAFONE Group Plc

Thanks for the moderator's work. I'm fine with QC's wording.

4.2 Moderator Summary and recommendation for further discussion

Summary for Q1 (Objective part):

Majority companies agree QC's wording, however some companies can not agree to add "be ongoing" part and can accept the intermediate rond wording. The intermediate round gives some flexibility and also foucs on main case. For compromise

Moderator suggest to go back the intermediate version

Specify mechanism to indicate preference on temporary UE capability restriction **and removal of restriction** (e.g. capability update, release of cells, (de)activation of configured resources) with NW A when UE **needs transmission or reception in network B** (~~prefers to~~ **e.g.,** start/stop connecting to NW B) for MUSIM purpose

5 Summary and Conclusion

After discussion, the WID can be found in **RP-213549** with supporting companies.