3GPP TSG-RAN WG2 Meeting #116-e Tdoc R2-21xxxxx

Electronic meeting, November 01 – 12, 2021

Agenda: 8.3.5

Source: Ericsson

Title: Summary of agenda 8.3.5: UE capabilities (MUSIM)

Document for: Discussion, Decision

# 1 Introduction

This contribution summarizes the documents submitted to the following AI in RAN2#116-e:

### 8.3.5 UE capabilities and other aspects

This agenda item may use a summary document (decision to be made based on submitted tdocs).

This agenda item may be deprioritized in this meeting.

Including discussion on UE capabilities and any other essential aspects of MUSIM that need to be resolved during Rel-17.

# 2 Discussion

The proposals from contributions submitted to 8.3.5 are listed within boxes throughout this document. Proposals may be listed twice when touching upon different topics and may not be in the same order as in their original documents.

## 2.1 Paging collision avoidance

The following aspect on paging collision was proposed:

1. There is no need for AS capability for Paging collision avoidance.[1]
2. No need to define AS UE capability for paging collision avoidance feature. [6]
3. No UE RAN capability needs to be defined for paging collision feature.[8]
4. AS capability for paging collision avoidance is not needed for both NR+NR case and LTE+LTE case.[7]

Since all proposals indicate no need for this capability, it is suggested to capture this in RAN2:

1. AS capability for paging collision avoidance is not needed for both NR+NR case and LTE+LTE case.

## 2.2 UE notification on network switching for multi-SIM

For busy indication, the following was proposed:

1. There is no need for AS capability for Busy indication.[1]
2. No UE RAN capability needs to be defined for busy indication feature.[8]

Both proposals indicate no need for this capability, it is thus suggested to capture this in RAN2:

1. There is no need for AS capability for Busy indication.

On UE assistance information for network switching, the following proposals were raised:

1. Separate UE capability bits are used for RRC based switching procedures for leaving RRC\_CONNECTED state and without leaving RRC\_CONNECTED state.[5]
2. Two separate UE capabilities are introduced to support switching notification, one for without leaving RRC\_CONNECTED state, the other one is for leaving RRC\_CONNECTED state. Both capabilities are defined per UE. [6]
3. Introduce separate AS capability for switching procedure without leaving RRC\_CONNECTED and RRC-based switching procedure with leaving RRC\_CONNECTED. The capabilities are optional and in “per UE” level.[7]
4. A per UE bit is used to indicate support of RRC UE indication of network switchover with leaving RRC\_CONNECTED state.[8]
5. A per UE bit is used to indicate support of RRC UE indication of network switchover without leaving RRC\_CONNECTED state.[8]

While 1) – 5) have the same proposal in essence, the paper in [1] proposes that no additional capabilities are needed for this UE assistance information and, instead, the only capabilities defined for this case should be separate UE capabilities for periodic and aperiodic gap request for MUSIM:

1. Network should be able to configure whether UE can initiate gap requests for MU-SIM. It should be possible for network to configure individually whether UE is allowed to request periodic and aperiodic gaps.[1]
2. Introduce separate UE capabilities for periodic and aperiodic gap request for MUSIM.[1]
3. There is no need for additional capabilities with regard to assistance information or purpose for gap requests.[1]

Firstly, considering 1)-5) and 8), the following proposal can be captured:

1. RAN2 to discuss whether to introduce the following UE capabilities:

1 optional per UE bit (without xDD/FRx differentiation) for RRC based switching procedures for leaving RRC\_CONNECTED state, and

1 optional per UE bit (without xDD/FRx differentiation) for RRC based switching procedures without leaving RRC\_CONNECTED state.

Note the proposal above also takes into consideration 9) below from [5], where it is suggested that the UE capabilities described in the proposal above should be optional and without FDD/TDD and FR1/FR2 differentiation.

1. Capabilities for MUSIM switching are per-UE, optional and there is no FDD-TDD DIFF or FR1-FR2 DIFF.[5]

On 6), it can be discussed separately from the other proposals above. It is thus captured below, with some rewording to clarify the proposal (considering the UE assistance information framework does not account for requests but rather indication of preferences).

1. Network should be able to configure whether UE can send gap preferences for MU-SIM. It should be possible for network to configure individually whether UE is allowed to send preferences for periodic and aperiodic gaps.

Even though 7) is a follow up proposal from 6), it is suggested to postpone this topic since it depends a lot on how periodic/aperiodic gaps are captured in 38.331. For instance, the same IE may be used for both periodic and aperiodic gaps, and there may be not much need to differentiate between the two cases from UE capability perspective. Hence, it is suggested to first further progress on the ASN.1 definition of the gaps before discussing 7). In line with this suggestion, 7) is also mentioned in section 2.5 on proposals suggested to be postponed.

As a follow up from proposal 3, 3) proposes the independent configuration of UE assistance information for leaving RRC\_CONNECTED state and without leaving RRC\_CONNECTED. Note this is already the consequence of Proposal 3 above, i.e. if the UE is able to indicate separately the support of the feature, the network should also be able to independently configure the feature between leaving RRC\_CONNECTED state and without leaving RRC\_CONNECTED; but it may be good to confirm this aspect.

1. NW can configure the UE to report MUSIM UE assistance information for leaving RRC\_CONNECTED state and without leaving RRC\_CONNECTED state independently.[5]
2. Network can configure the UE to report MUSIM UE assistance information for leaving RRC\_CONNECTED state and without leaving RRC\_CONNECTED state independently.

## 2.3 Paging with service indication

The following aspect on paging cause was proposed:

1. There is no need for AS capability for Paging cause value.[1]
2. A per UE RAN capability is introduced for paging cause for Multi-USIM.[8]
3. AS capability for paging with service indication is not needed for both CN paging and RAN paging.[7]
4. No need to define AS UE capability for paging cause indication feature.[6]

Except for 2), all proposals indicate no need for an AS capability in this case. Given the motivation provided in [1], [6] and [7], it could be concluded that indeed a AS capability is not needed in this case.

1. There is no need for AS capability for Paging cause value.

## 2.4 Indication of overall support of MUSIM

In [1], [2] and [4], different way forwards were suggested on whether there is a need to indicate overall support of MUSIM, i.e. inclusion of this indication in UE capability report would imply that the UE supports at least one of the defined features for MUSIM.

1. There is no need for an overall MUSIM capability at AS level.[1]
2. UEs can indicate its MUSIM capability implicitly by indicating support for MUSIM switching gaps to NW as part of its UE Capability signalling.[2]
3. Agree that MUSIM capability is indicated to network via signalling of “MUSIM capability information” which is per UE.[4]

The suggestions in 1) and 2) can be seen as complimentary, while 3) seems to suggest that an explicit UE capability signaling would be needed. Therefore, RAN2 should mainly discuss whether an explicit indication is needed or not in this case.

1. RAN2 to select one of the options below:

Option 1: There is no need for an overall MUSIM capability at AS level, i.e. it is sufficient to have AS capabilities defined for specific MUSIM features.

Option 2: An AS capability is introduced to indicate overall support of MUSIM, i.e. inclusion of this indication in UE capability report would imply that the UE supports at least one of the defined features for MUSIM.

## 2.5 Miscellaneous proposals (suggested to be postponed)

The proposals in this section are mainly suggested to be postponed, due to multiple reasons explained below. But an overall reason is that we first need to discuss the baseline for remaining configuration aspects and UE capabilities for the features we already have developed, whether further aspects should be considered can be discussed later.

Furthermore, some proposals may simply not be needed, considering the other proposals above – those are also indicated in this section. Some proposals may be out of the scope of the Rel-17, those are also indicated in this section.

The following proposals may not be needed:

1. As a baseline, RAN UE capabilities defined for Multi-USIM are optional and without dependency between them.[8]
2. UEs can indicate its MUSIM capability explicitly as part of its UE Capability signalling[2]

1) had the intention to set up a baseline for the UE capabilities, but considering the plurality of proposals below, a baseline may not be applicable/needed. 2) seems to suggest that AS UE capabilities are defined for the MUSIM features, which is already implied by the proposals discussed above.

The following proposals could be postponed:

1. Introduce separate UE capabilities for periodic and aperiodic gap request for MUSIM.[1]
2. RAN2 to discuss in switching notification in dual connectivity scenario request to release the SCG rather than leaving RRC\_CONNECTED fully with dual connectivity. [4]
3. If RAN2 decided to support release of SCG for switching without leaving RRC connection, UAI can include new parameter ‘SCG-Release’ within leave-indication information. [4]
4. RAN2 to further discuss the capabilities of “leave without response timer” and “reception of paging cause”.[4]
5. Clarify in LTE and RRC specifications for Release-17 that the existing RRC Processing Delay requirements is applicable only for UE operating in Single-SIM mode and is NOT applicable for RRC procedures for UE’s operating in MUSIM mode of operation.[3]
6. RAN2 to further study the RRC Processing Delay Requirements for MUSIM UEs based on the solutions agreed for the other MUSIM WI objective (Paging Collision, Network Switching, Busy Indication etc.)[3]
7. RAN2 to consider such Band conflict scenarios for MUSIM to arrive at a graceful specification-based solution intended to mitigate such conflicts.[3]
8. RAN2 to consider the problem statements for MUSIM UEs related to caller ID identification and optimal signalling to ensure faster RRC Connection Release with the intent to avoid radio resource wastage.[3]

4) can be discussed once we further progress on ASN.1 for MUSIM gap framework, as discussed in section 2.2. 5) and 6) are related to MR-DC, but since it is FFS whether MR-DC is supported in Rel-17, those proposals can be discussed once the FFS is resolved. 7) can be considered once we have agreed on the baseline aspects for MUSIM capabilities. 8) – 11) seem to raise additional solutions for MUSIM, it is not entirely clear whether those are essential for the current objectives in the Rel-17 WID, but can be considered once we have further progressed on MUSIM capabilities.

The following proposals may be out of the scope:

1. RAN2 to consider dynamic capability update to network regarding UEs supported bands and/or band/bandwidth combinations. [4]
2. RAN2 to discuss the further optimization of switching for Dual Rx/Tx capable UEs. [4]

12) and 13) seem to raise aspects that are out of the scope of the Rel-17 WID, while those can be considered postponed in RAN2, those proposals should rather be raised in RAN plenary as a suggestion to revise the Rel-17 WID.

# 3 Conclusion

The following proposals are considered to be the baseline for MUSIM UE capabilities and essential configuration aspects:

[Proposal 1 AS capability for paging collision avoidance is not needed for both NR+NR case and LTE+LTE case.](#_Toc86226293)

[Proposal 2 There is no need for AS capability for Busy indication.](#_Toc86226294)

[Proposal 3 RAN2 to discuss whether to introduce the following UE capabilities:](#_Toc86226295)

[1 optional per UE bit (without xDD/FRx differentiation) for RRC based switching procedures for leaving RRC\_CONNECTED state, and](#_Toc86226296)

[1 optional per UE bit (without xDD/FRx differentiation) for RRC based switching procedures without leaving RRC\_CONNECTED state.](#_Toc86226297)

[Proposal 4 Network should be able to configure whether UE can send gap preferences for MU-SIM. It should be possible for network to configure individually whether UE is allowed to send preferences for periodic and aperiodic gaps.](#_Toc86226298)

[Proposal 5 Network can configure the UE to report MUSIM UE assistance information for leaving RRC\_CONNECTED state and without leaving RRC\_CONNECTED state independently.](#_Toc86226299)

[Proposal 6 There is no need for AS capability for Paging cause value.](#_Toc86226300)

[Proposal 7 RAN2 to select one of the options below:](#_Toc86226301)

[Option 1: There is no need for an overall MUSIM capability at AS level, i.e. it is sufficient to have AS capabilities defined for specific MUSIM features.](#_Toc86226302)

[Option 2: An AS capability is introduced to indicate overall support of MUSIM, i.e. inclusion of this indication in UE capability report would imply that the UE supports at least one of the defined features for MUSIM.](#_Toc86226303)

Further proposals from section 2.5 can be considered if needed.

# 4 References

1. [R2-2109625](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2109625.zip), UE capabilities for MU-SIM, Intel Corporation, RAN2#116e, e, November 2021

1. [R2-2110049](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2110049.zip), Aspects of MUSIM UE Capability, Apple, RAN2#116e, e, November 2021

1. [R2-2110050](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2110050.zip), Additional issues related to MUSIM, Apple, RAN2#116e, e, November 2021

1. [R2-2110145](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2110145.zip), On MUSIM UE capability and additional switching scenario, Nokia, Nokia Shanghai Bells, RAN2#116e, e, November 2021

1. [R2-2110150](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2110150.zip), Discussion on UE capability for MUSIM, Samsung, RAN2#116e, e, November 2021

1. [R2-2110395](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2110395.zip), Multi-USIM related UE capabilities, vivo, RAN2#116e, e, November 2021

1. [R2-2110543](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2110543.zip), Discussion on UE capability for MUSIM, Huawei, HiSilicon, RAN2#116e, e, November 2021

1. [R2-2110788](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs//R2-2110788.zip), UE capabilities for Multi-USIM, Ericsson, RAN2#116e, e, November 2021