**3GPP TSG RAN WG1 Meeting #103-e R1-2008871**

**e-Meeting, October 26 – November 13, 2020**

**Source: Moderator (Intel Corporation)**

**Title: Pre-meeting Issue Summary for NR Mobility Enhancements**

**Agenda item: 7.2.9**

**Document for: Discussion**

# Introduction

In this contribution, we summarize all issues submitted on Rel-16 NR mobility enhancement WI for RAN1 #103-e meeting. Section 2 contain a summary of issues identified from contributions submitted to RAN1 #103-e [1] ~ [9]. The list of issues in Section 2 are **not** ordered in terms of criticalness/discussion priority.

Section 3 contain a summary of the discussion that took place during the preparation period for RAN1 #103-e meeting, and suggestions from the feature lead for the candidate set of issues for email discussion for RAN1 #103-e.

# Summary of Issues Identified from Contributions

## Issue #1) DAPS HO with m-TRP [1][6]

One company has identified that some description is needed in order to fix the support of DAPS HO during multiple TRP operation scenarios. The following are the proposal and corresponding TP for the suggested correction.

* Proposal from [1]
	+ During DAPS-HO,
		- UE is not required to monitor CORESETs associated with CORESETPoolIndex = 1, and UE is not required to decode the PDSCH with the second TCI state if two TCI states are indicated by a codepoint of the DCI field ‘Transmission Configuration Indication’.
	+ The following is proposed TP:

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| < Start of the text proposal >**15 Dual active protocol stack based handover**< Unchanged parts are omitted >For DAPS operation in a same frequency band, a UE does not transmit PUSCH/PUCCH/SRS to the source MCG in a slot overlapping in time with a PRACH transmission to the target MCG or when a gap between a first or last symbol of a PRACH transmission to the target MCG in a first slot would be separated by less than $N$ symbols from a last or first symbol, respectively, of the PUSCH/PUCCH/SRS transmission to the source MCG in a second slot. For DAPS operation in a same frequency band, a UE does not transmit PRACH on the source MCG in a slot overlapping in time with a PUSCH/PUCCH/SRS transmission on the target MCG or when a gap between the first or last symbol of a PUSCH/PUCCH/SRS transmission on the target MCG is separated by less than $N$ symbols from a last or a first symbol, respectively, of a PRACH transmission on the source MCG. $N=2$ for $μ=0$ or $μ=1$, $N=4$ for $μ=2$ or $μ=3$, and $μ$ is the SCS configuration of the active UL BWP for the PUSCH/PUCCH/SRS transmission to source MCG. During DAPS operation, the scheduled PDSCH(s) for the UE is associated with *CORESETPoolIndex* = 0 and the UE shall monitor one or more CORESETs associated with *CORESETPoolIndex* = 0 and UE is not required to monitor CORESETs associated with *CORESETPoolIndex* = 1. If the UE is indicated with two indicated TCI states in a codepoint of the DCI field ‘*Transmission Configuration Indication*’, only the first TCI state is applied to the PDSCH and UE is not required to decode the PDSCH with the second TCI state during DAPS operation.< End of the text proposal > |

* Observation from [6]
	+ As per RAN#89e agreements simultaneous operation with multi-TRP and DAPS is not supported in Rel-16. Definition of a mechanism to avoid simultaneous operation with multi-TRP and DAPS falls under RAN2.

## Issue #2) Intra-frequency DAPS definition clarification [2][4]

[2] provides an draft CR to clarify the intra-frequency DAPS definition. [2] notes that intra-frequency measurement definition for SSB and CSI-RS is different by nature, and therefore suggests clarifying to how to handle intra-frequency DAPS depending on which RS is used for the measurement and HO. [4] also points out RAN4 definition for intra-frequency is actually defined in Clauses 6.1.3.2 and the current specification should be updated to reflect this.

* TP from [2]

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| 15 Dual active protocol stack based handover< Unchanged parts are omitted >The UE determines intra-frequency as described in Clause 9.2.1 of [10, TS38.133]. The carrier frequencies of target MCG and source MCG are intra-frequency if both SSB based measurement, if configured, and CSI-RS based measurement, if configured, are intra-frequency measurement. |

* TP from [4]

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| 15 Dual active protocol stack based handover< Unchanged parts are omitted >If the UE indicates support for dynamic power sharingand is provided *uplinkPowerSharingDAPS-Mode-r16* = *Dynamic*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *nrdc-PCmode-FR1-r16* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG.Intra-frequency DAPS handover is described in Clause 6.1.3.2 of [10, TS38.133].~~If~~ For DAPS handover that is not intra-frequency, if~~-~~ - the UE does not indicate support of *ul-TransCancellationDAPS-r16*, and- UE does not indicate a capability for power sharing between source and target MCG in DAPS handover or the UE is not provided with *uplinkPowerSharingDAPS-Mode-r16*, the UE does not expect transmissions on the target and source cell in overlapping time resources.For intra-frequency DAPS handover, if ~~If~~ - the UE indicates support of *ul-TransCancellationDAPS-r16*, and~~- the carrier frequencies of target MCG and source MCG are not intra-frequency, and~~- UE does not indicate a capability for power sharing between source and target MCG in DAPS handover or the UE is not provided with *uplinkPowerSharingDAPS-Mode-r16*, and - UE transmissions on the target cell and the source cell are in overlapping time resources, the UE transmits only on the target cell, and cancels the transmission to source cellFor intra-frequency DAPS handover, if ~~If~~ ~~- the carrier frequencies of target MCG and source MCG are intra-frequency, and~~ - UE transmissions on the target cell and the source cell are in overlapping time resources, the UE transmits only on the target cell and cancels the transmission on the source cellThe UE does not expect to cancel a transmission on the source cell if a first symbol of the transmission on the source cell is less than $T\_{proc,2}+d$after a last symbol of a CORESET where the UE receives a PDCCH providing a DCI format scheduling a transmission on the target cell. $T\_{proc,2}$ is the PUSCH preparation time for the corresponding PUSCH processing capability [6, TS 38.214] assuming $d\_{2,1}=1$, $d$ is a time duration corresponding to 2 symbols for SCS configuration $μ$, and $μ$ is the smallest SCS configuration between the SCS configuration of the PDCCH providing the DCI format and the SCS configuration for the transmission on the source cell. If the UE transmits PRACH using 1.25 kHz or 5 kHz SCS on the source cell, the UE determines $T\_{proc,2}$ assuming SCS configuration $μ=0$. A UE does not expect to cancel a transmission on the source cell in symbols from the set of symbols that occur, relative to a last symbol of a PDSCH reception conveying a RAR message with a RAR UL grant on the target cell, after a number of symbols that is smaller than $N\_{T,1}+N\_{T,2}+0.5$ msec, where $N\_{T,1}$ is a time duration of $N\_{1}$ symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured, $N\_{T,2}$ is a time duration of $N\_{2}$ symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214] and the UE considers that $N\_{1}$ and $N\_{2}$ correspond to the smaller of the SCS configurations for the PDSCH on the target cell and the transmission on the source cell. For $μ=0$, the UE assumes $N\_{1,0}=14$ [6, TS 38.214].~~The UE determines intra-frequency as described in Clause 9.2.1 of [10, TS38.133].~~For intra-frequency DAPS HO handover~~operation~~, the UE expects that an active DL BWP and an active UL BWP on the target cell are within an active DL BWP and an active UL BWP on the source cell, respectively.  |

## Issue #3) Processing capability for Tx cancellation [3][5]

[3] notes that processing capability for PUSCH can be different for different cells. In case of DAPS, the processing capability for source and target may be different. In such case, [3] claims that there is ambiguity in which processing capability should be applied for the Tx cancellation.

[5] notes that PUSCH cancellation due to collision with PRACH is performed based on symbol level cancellation. However, for PUSCH cancellation due to collision with other PUSCH, the cancellation is performed based on whole transmission level cancellation and suggest to align the two cancellation.

* TP from [3]

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| 15 Dual active protocol stack based handover\*\*\* Unchanged text is omitted \*\*\*If - the carrier frequencies of target MCG and source MCG are intra-frequency, and - UE transmissions on the target cell and the source cell overlapping time resources, the UE transmits only on the target cell and cancels the transmission on the source cellThe UE does not expect to cancel a transmission on the source cell if a first symbol of the transmission on the source cell is less than $T\_{proc,2}+d$after a last symbol of a CORESET where the UE receives a PDCCH providing a DCI format scheduling a transmission on the target cell. $T\_{proc,2}$ is the PUSCH preparation time for the corresponding PUSCH processing capability [6, TS 38.214] assuming $d\_{2,1}=1$, $d$ is a time duration corresponding to 2 symbols for SCS configuration $μ$, and $μ$ is the smallest SCS configuration between the SCS configuration of the PDCCH providing the DCI format and the SCS configuration for the transmission on the source cell. If the UE transmits PRACH using 1.25 kHz or 5 kHz SCS on the source cell, the UE determines $T\_{proc,2}$ assuming SCS configuration $μ=0$. The PUSCH processing capability is chosen from the processing capability of source or target cell resulting the larger *T*proc,2.\*\*\* Unchanged text is omitted \*\*\* |

* TP from [5]

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| 15 Dual active protocol stack based handover< Unchanged parts are omitted >A UE does not expect to cancel a transmission on the source cell ~~[in symbols from the set of symbols] that~~ if the first symbol of source cell transmission occurs, relative to a last symbol of a PDSCH reception conveying a RAR message with a RAR UL grant on the target cell, after a number of symbols that is smaller than msec, where  is a time duration of  symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured,  is a time duration of  symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214] and the UE considers that  and  correspond to the smaller of the SCS configurations for the PDSCH on the target cell and the transmission on the source cell. For , the UE assumes  [6, TS 38.214]. |

## Issue #4) Capability split between source and target cell [5]

[5] notes that some capabilities such as CSI-RS-forTracking, and CSI-RS-IM-receptionForFeedback are per CC capability and not shared between source and target cells. Therefore [5] asks to clarify whether the PDCCH monitoring capability is also a capability that is not shared between source and target cell or not.

* Proposal from [5]:
	+ Per CC UE capabilities, including the number of monitored PDCCH candidates and the total number of non-overlapped CCEs, are not to be shared between source and target cells, which means a “duplicated capability”. That is, if UE reports intra-freq DAPS for an FS, it means UE can do 2x of reported capability: 1x for source and 1x for target.
	+ The capabilities which are reported per band (Ex. codebookParameters - maxNumberResourcesPerBand), per band combination (Ex. csi-RS-IM-ReceptionForFeedbackPerBandComb) or across all CC (Ex. csi-RS-ForTracking- maxConfiguredResourceSetsAllCC) should be shared (split) between source and target NR cells. If 2x of a reported per CC capability exceeds the UE reported capability across all CC, then UE only has to support up to the UE reported capability across all CC.

## Issue #5) Handling of SUL and DAPS capability [6]

[6] notes that Based on existing SUL capabilities, it cannot be unambiguously determined whether UE can or cannot support SUL during DAPS HO. Suggest to send an LS to RAN2 to let them know so that they can take this into account.

* Proposal from [6]:
	+ RAN1 sends a LS to RAN2 informing that from RAN1 perspective simultaneous operation of SUL and DAPS is not supported in Rel-16.

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| **1. Overall Description:**RAN1discussed the simultaneous operation of SUL and DAPS and concluded that, in order to limit the UE complexity, RAN1 perspective simultaneous operation of SUL and DAPS is not supported in Rel-16.**2. Actions:****To RAN2:****ACTION:** RAN1 respectfully asks RAN2 to take the above information in to account.  |

# Proposed set of Issues for discussion at RAN1 #101-e

The following are inputs received from interested companies on the above issues and their preferred priority for discussions.

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|   | **High Priority Issues** | **Additional Comments** |
| **Issue #1** | MTK: High (should be resolved in RAN1)HW/HiSi: HighSamsung: No | ***Moderator****: the main issue for this is likely whether RAN1 needs to resolve this issue or whether RAN1 should wait for RAN2 to resolve this issue. Along with your preference on the priority, please provide feedback on whether this should be resolved in RAN1 or not.*Ericsson: should be discussed in RAN2 firstHW/HiSi: we see it is high priority for closing the discussion for this issue. If companies prefer to wait RAN2’s discussion first due to RANP tasking RAN2 for the solution. We would be ok also to hold on a while to see RAN2 situation and resume the discussion of the RAN1 impact in this meeting upon RAN2 has progress.Qualcomm: We should wait for RAN2 progress.Samsung:Suggest to wait for RAN2 conclusion as per RAN#98e decision:

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| **RAN#89e endorsement:**- UE is not required to support simultaneous operation of multi-DCI/single-DCI mTRP and DAPS in Rel-16. No UE capability is defined for this in Rel-16. - Task RAN2 to decide on solution(s) to avoid that a Rel-16 UE operates simultaneously with multi-DCI/single-DCI mTRP and DAPS. RAN2 should strive to conclude in 2020/Q4. |

ZTE: This issue should be resolved by RAN2 according to the RAN#89-e agreements. RAN1 should wait for the RAN2 conclusion.Apple: following RAN guidance, RAN2 will take this work, to avoid discrepancy between RAN1 and RAN2. RAN1 should wait for RAN2 conclusion. |
| **Issue #2** | MTK: Medium (TP from [4] seems requiring modification because intra-freq DAPS HO should support *ul-TransCancellationDAPS-r16*)EricssonQualcommSamsungAppleZTE: high | Samsung: The reference for 38.133 for the intra-frequency DAPS HO should be updated. The clarification of SSB/CSI-RS measurement can be further discussed during the meeting.ZTE: This issue should be resolved because intra-frequency and inter-frequency are important conditions for the UE behavior. Otherwise, the UE behavior cannot be expected.  |
| **Issue #3** | MTK: HighEricssonSamsungZTEApple | Ericsson: seems editorial.ZTE: We are OK to discuss this issue. |
| **Issue #4** | MTK: High (prefer to discuss in 7.2.9)HW/HiSi: High | ***Moderator****: given that this issue is a UE capability issue. We may wish to discuss this in the UE feature list discussion. I would like to get feedback from companies on whether this should be discussed in 7.2.9 agenda or the UE feature agenda. If companies agree to discuss this in UE feature agenda, we will need to coordinate with Ralf (AT&T) on how this will be handled there. Please provide your inputs.*Ericsson: The issue is relevant but would seem to fit better in UE feature AIHW/HiSi: it is urgent to clarify because RAN2 is designing the signaling. No strong view in which agenda it should be discussed. Qualcomm: The issue should be discussed under UE featureSamsung: agreed this can be discussed in 7.2.9*.*ZTE: It is more related to UE feature and should be discussed under UE feature. Apple: we are ok to discuss this in UE feature session. |
| **Issue #5** | MTK: High (the proposal is acceptable to us)EricssonHW/HiSi: HighQualcommZTE | ***Moderator****: Given that this is a request to send LS to RAN2, it would be good to see if companies think the proposal is conceptually acceptable. If it is reasonable, we may be able to do this quickly as part of some other email discussion thread. So please provide your thoughts here.*Ericsson: quick agreement should be possible. But we need to stop excluding feature combinations as part of the normative work. HW/HiSi: We are also interested in discussing the operation of SUL and DAPS which also involves UE’s implementation when reporting the corresponding capability and NW’s understanding of the reported capability similarly to the discussion of mTRP and DAPS. However, there are some cases different from mTRP, but the details can be discussed later. At this stage, we see it is high priority. Qualcomm: We should have further discussion.Samsung*:* principle ok and can be discussed further.Apple: we are ok to discuss this, but don’t want to introduce new sub-features for DAPS. |
| Other comments received |
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Based on discussion above, feature lead suggests the following two email discussion threads:

Email Discussion #1)

* Issue #2 on intra-frequency DAPS definition clarification

Email Discussion #2)

* Issue #3 Processing capability for Tx cancellation
	+ Also squeeze a quick discussion and conclusion to send LS to RAN2 on SUL and DAPS capability (Issue #5).
* Issue #4 on capability split between source and target, many companies believe this is important since it touch on UE capability. Moderator suggest to move this discussion to UE feature list agenda, and ask the Moderator (Ralf) to include this issue in the discussion.
* Issue #5 on handling of SUL and DAPS capability, many companies agree that this is important. The proposal is to send an LS to RAN2, Moderator suggest to work on the LS as part of either email discussion #1 or #2.
* Issue #1 on DAPS HO with mTRP, given that RAN2 was tasks by RAN Plenary to resolve the issue, it might be better to wait for RAN2 progress.

# Reference

1. R1-2007593, “Remaining issues on DAPS,” Huawei, HiSilicon
2. R1-2007738, “Draft CR on intra-frequency DAPS handover,” ZTE
3. R1-2008144, “Draft CR on clarification of processing capability on DAPS HO dropping timeline,” Samsung
4. R1-2008209, “Correction to DAPS HO,” Ericsson
5. R1-2008502, “Remaining issues on per CC UE capability and UL cancellation for DAPS-HO,” MediaTek Inc.
6. R1-2008733, “Remaining physical layer aspects of dual active protocol stack based HO,” Nokia, Nokia Shanghai Bell