**3GPP TSG-RAN WG2 Meeting#109 electronic draft R2-20xxxxx**

**e-meeting, 24th February - 6th March, 2020**

**Source: Intel Corporation**

**Title: Email discussion of Idle mode mobility for non-BL UE**

**Agenda item:** **7.1.8.1**

**Document for:** **Discussion and Decision**

# Introduction

In RAN2#107 meeting, following agreement was made.

FFS if, from Rel-16, it should be possible for a non-BL UE that fullfills S criteria for normal coverage to camp in a “normal” cell, i.e. not standalone, in enhanced coverage.

In the following, we discuss whether a Rel-16 non-BL UE is allowed to camp in enhanced coverage when S criterion for normal coverage is fulfilled and whether network control is not be supported. This discussion considers all the related details provided in RAN2#109-e contributions summarized in [1].

# Is a Rel-16 non-BL UE allowed to camp in a cell (non-standalone case) on enhanced coverage mode when S criteria for normal coverage is fulfilled?

Please include your company view below a Rel-16 non-BL UE allowed to camp in a cell (non-standalone case) on enhanced coverage mode when S criteria for normal coverage is fulfilled:

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| **Company** | **Yes/No** | **Any further comments** |
| Intel | Yes | We are OK keeping legacy operation also for Rel-16 UE i.e. it is up to UE implementation to decide whether a UE can camp in a cell (non-standalone case) on enhanced coverage mode when S criteria for normal coverage is fulfilled. Note that when eMTC topic was specified in Rel-13, there was understanding then some UE vendors may use non-BL UE for MTC deployments and therefore, it would be possible for a non-BL UE in RRC\_IDLE to decide whether it requires operating in WB or BR when S criteria for normal coverage is fulfilled. However we understand current concerns from network vendors and could also be ok to allow this restriction under network control.**[Intel-3 March]**The term “*UE in enhanced coverage*” was used to refer to any non-BL UE that operates in BR (i.e. acquires MIB, SIB1-BR and other SI-BR messages). In TS 36.300 section 27.3b, the sentence “*A UE in enhanced coverage is a UE that requires the use of enhanced coverage functionality to access the cell*” only refers from stage-2 point of view to a UE that needs or wants to use enhanced coverage functionality to access the cell (i.e. operate in BR).  We would also like to highlight that TS 36.304 and TS 36.331 specifies that any UE operating in BR (i.e. BL UE or UE in EC) can camp in normal coverage understanding that normal criteria is always first checked before checking the ones for CE and CE1. |
| Qualcomm | No | We don’t agree a non-BL UE fulfilling normal S criteria should switch to using BR channels. This behaviour confuses the definition of *UE in CE*. 36.300 section 23.7b does says “*A UE in enhanced coverage is a UE that requires the use of enhanced coverage functionality to access the cell*” and a UE fulfilling normal S criteria does not require the use of enhanced coverage functionality to access the cell.Furthermore, a non-BL UE should apply cell suitability in the order defined in 36.304, i.e. normal criteria first, then CE and then CE1. |
| Ericsson | No | We don't completely agree with the Intel view that this is under UE control in the specifications or that this was the intention when eMTC was initially specified.Agree with QC concern on clash against the definition already given in TS 36.300.  |
| Apple | Yes | We strongly would like to keep the existing behavior for R16 as well. To support the argument, we had also presented in RAN2#108, [R2-1915883](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_108/Docs/R2-1915883.zip), which clearly identified power saving benefits for the UE, which is important. We also would like to bring to attention, the observations made in [2] to indicate that there is no degraded system performance while having such a legacy behavior. |
| Huawei, HiSilicon | Yes | We think it allows UE to take advantage of narrow bandwidth operation while in idle mode, providing power saving gain.  |
| Sequans | No | Agree with Qualcomm and are not convinced of the pro/cons have been sufficiently explored |
| ZTE | No | We also disagree with the above view that this is under UE control in the specifications, or that this was the intention when eMTC was initially specified, or that this is the existing behavior. As mentioned by Qualcomm, the existing requirement is that a non-BL UE should apply cell suitability in the order defined in 36.304, i.e. normal criteria first, then CE and then CE1. We can understand the benefit in UE for power saving, but it’s obviously such process may cause unnecessary network resources consumption that in turn will harm all the UEs. Moreover, it may be unfair to other UEs, e.g., BL UE in NC. |

# Whether network control is needed to allow non-BL UE to camp on a cell in CE mode when S criteria for normal coverage is fulfilled

Please include your company view below on whether network control should be allow or not a Rel-16 non-BL UE of camping in a cell (non-standalone case) on enhanced coverage mode when S criteria for normal coverage is fulfilled. If supported, provide details on the desirable mechanism for providing the network control:

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| **Company** | **Yes/No** | **Mechanism for network control and any further comments** |
| Intel |  | Understanding that legacy operation allows non-BL UEs to camp in a cell (non-standalone case) on enhanced coverage mode when S criteria for normal coverage is fulfilled, we have slight preference for using a new broadcast network indication to barred R16 non-BL UEs of camping in a cell (non-standalone case) on enhanced coverage mode when S criteria for normal coverage is fulfilled (i.e. therefore when this new indication is not sent, Rel-16 non-BL UE would behave same as legacy UEs).   |
| Qualcomm |  | The implications of UE in normal coverage *pretending* to be in enhance coverage have not been fully evaluated (e.g. power saving advantage vs impact on specification and impact no UEs that can only use BR channels). |
| Ericsson |  | If the above behaviour (camping in EC mode even with NC criterion fulfilled) is agreed to be allowed in RAN2, then there needs to be a mechanism for the network to control such behaviour.On the comments that this would mean such behaviour would then always be disabled we respectfully disagree with. The concern is that if UEs capable of "normal" operation would in massive amounts start to camp in EC, it can mean the network capacity especially for control channels for LTE-M is reached resulting in congestion, resulting in reduced performance for all of the UEs and the network. Otherwise, if there would not be such concerns NW could allow the behaviour.Full evaluation of the benefits for the UE side are not clear and we have a concern on network resources in a massive deployment scenario as explained above.  |
| Apple | No | Our concern about adding an additional restriction of controlling this feature from NW side is that there is a definite potential to disable this UE behavior in all cases. Power saving benefits have been presented in #2 above. |
| Huawei, HiSilicon | **FFS** | Given that some legacy UE may already do this, and some may not, it is probably be better to not have any indication because it is unclear how to define and set the bit. We are open, though. |
| Sequans | Yes, if behavior is agreed | Even assuming it is agreed that non-BL UEs can camp in CE when normal S criterion is fulfilled and assuming their effect is rather small, which has not been sufficiently shown, if enough UEs start to camp that way it will eventually cause capacity issues while regular channels may still be free, so NW must have control to protect UEs that do not have such flexibility and must camp in CE.Even if some legacy UEs may do this, it is not in itself a sufficient reason to propagate this behavior going forward.We do not see why a NW would continuously disable this feature if it is advantageous. |
| ZTE | Yes, if behavior is agreed | Agree with Qualcomm, Ericsson and Sequans. |

# Miscellaneous proposals

There are also further proposals suggested by [2] and [3].

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| Thales(0251) | **Proposal 3:** The network may indicate whether the fulfillment of the S-criterion for CE mode is required for all non-BL devices or whether it only applies for the non-BL UEs trying to newly camp (select or re-select) to said cell. |

Please include your company view on the definition of the network control indication described in previous section 3 if network control indication is broadcast:

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| **Company** | **Yes/No/FFS** | **Any further comments** |
| Intel | FFS | It is not clear whether this differentiation is strictly needed |
| Qualcomm | FFS | RAN2 needs to first decide whether non-BL UE in normal coverage be allowed to camp on a cell in CE mode. Only RAN2 agree then we can discuss network control of this behaviour. |
| Ericsson | FFS | Agree with Intel, not clear whether such differentiation is needed. |
| Apple | No | We do not see a need for a NW control as described earlier. |
| Huawei, HiSilicon | FFS | Given that some legacy UE may already do this, and some may not, it is probably be better to not have any indication because it is unclear how to define and set the bit. |
| Sequans | FFS | a-priori the differentiation is unclear, but in any case it is too early to discuss given such camping has not been agreed yet and implications are not widely accepted. |
| ZTE | FFS | Agree with Qualcomm. |

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| Huawei(1067) | **Proposal3: Absolute priorities rather than ranking applies for non-BL UEs using enhanced coverage when S criteria for normal coverage is fulfilled.** |

Please include your company view on whether absolute priorities rather than ranking should be applied for Rel-16 non-BL UEs camping in a cell (non-standalone case) on enhanced coverage when S criteria for normal coverage is fulfilled.

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| **Company** | **Yes/No/FFS** | **Any further comments** |
| Intel | FFS |  |
| Qualcomm | FFS | Same comment as for previous question. |
| Ericsson | FFS | If camping is up to UE consideration, it would mean also which methods are used for cell re-selection are also up to UE control which is not acceptable and not the intention in the specifications. This is another reason why such behaviour cannot be allowed especially without any network control.We assume the intention of the proposal is to say that the "normal rules" would apply in this case, i.e. ranking still applies to intra-frequency and equal priority inter-frequency cell re-selection. |
| Huawei, HiSilicon | Yes | Since UE is in normal coverage and just operating as enhanced coverage there is no reason for switching to use ranking as a UE truly in enhanced coverage would.  |
| Sequans | FFS | It’s unclear what the implications will be since the implications of such camping are not clear enough and it has not been agreed yet. This needs to be investigated further, if underlying behaviour is agreed. |
| ZTE | FFS |  |

# Conclusions and Potential proposals

TBA

# References

[1] R2-2001864 Summary of contributions on Idle mode mobility Intel Corportation

[2] R2-2001067   Enhancements to idle mode mobility for non-BL UEs   Huawei, HiSilicon

[3] R2-2000251   Clarification to idle mode mobility for non-BL UEs   THALES