**3GPP TSG-RAN WG2 Meeting #116bis electronic \_** **R2-2201751**

**Online, January 17-25, 2022**

Agenda Item: 8.12.2.2

Source: Huawei, HiSilicon

**Title:** Summary of [AT116bis-e][103][RedCap] Identification and access restriction (Huawei)

Document for: Discussion and Decision

# Introduction

This paper aims at capturing the summary of email discussion.

* [AT116bis-e][103][RedCap] Identification and access restriction (Huawei)

Updated scope: Continue the discussion on identification and access restriction aspects based on [R2-2201734](file:///C:\Data\3GPP\RAN2\Inbox\R2-2201734.zip)

Updated intended outcome: Summary of the offline discussion with e.g.:

* + - List of proposals for agreement (if any)
    - List of proposals that require online discussions
    - List of proposals that should not be pursued (if any)

Updated deadline (for companies' feedback): Friday 2022-01-21 1400 UTC

Updated deadline (for rapporteur's summary in R2-2201751): Friday 2022-01-21 1600 UTC

Proposals marked "for agreement" in R2-2201751 not challenged until Monday 2022-01-24 1000 UTC will be declared as agreed via email by the session chair (for the rest the discussion might continue in the GTW session).

**Contact Table**

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1. Discussion
   1. IFRI

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| Proposal 4: [Discussion] In case the cell is barred due to not supporting RedCap, intra-frequency cell reselection considered by RedCap UE is agreed as option 1:  Option 1: as “allowed”, i.e. allow/up to UE implementation to consider intra-frequency cell;  Option 3: follow the IFRI in MIB; |

In the phase 1 discussion, Option2 has minority. Based on the comments, it seems option 1 and 4 are quiet similar: “allowed” means no limitation on UE implementation to consider intra-frequency cells. Rapporteur understand that the legacy meaning of “allowed” is also to leave further action to UE implementation. Then we have below: Option 1/4: 11, Option 3: 14.

It is indeed better if we can control this by considering whether it is homogeneous or non-homogeneous deployment. But this cannot be achieved by the IFRI in MIB, because that’s based on the deployment of non-RedCap UE, rather than RedCap deployment.

**Question 1: Do you have any concern to compromise as option 1 in proposal 4 above?**

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| --- | --- | --- |
| **Companies** | **Concern, or no concern?** | **Comments** |
| MediaTek | No concern |  |
| Sequans | No concern | If the cell does not support RedCap, then the MIB IFRI cannot imply information for RedCap (this is doubly true if we agree to continue to read SIB1 IFRI in Q3) |
| Apple | No concern |  |
| CATT | No strong concern | But we suggest discussing and confirming the concept of “not supporting RedCap”, just not supporting Redcap UE access, or not supporting all the Redcap UE related features including Redcap UE specific IFRI. And we prefer that Release 17 or after release cell, which just can’t support Redcap UE access, can also present Redcap UE specific IFRI if it wants to give a clear indication to UE. |
| Samsung | No concern | - |
| Intel | Concern | We should make UE behavior clear, otherwise operator cannot control which frequency the UE will prioritize. Therefore we still prefer option 3.  Option 1 is the compromise solution between option 1 and 4, not the compromise with option 3. |
| Qualcomm | No concern |  |
| Futurewei | No concern |  |
| OPPO | No concern |  |
| BT | Concern | With option 1, UE behaviour is completely unknown unless RAN2 specify how this is “allowed”. That result in an unpredictable behaviour for the network if it is left to UE implementation or extra work to define the specific mechanisms.  With that in mind, BT’s preference is Option 3: follow the IFRI in MIB;  Being the results of first round Option 1/4: 11, Option 3: 14, does make sense to try to compromise on the most supported? |
| T-Mobile USA | Concern | Agree with Intel’s comment |
| ZTE | No concern | Legacy gNB will only consider the deployment of legacy intra-freq neighbor cells when setting the IFRI in MIB, but the deployment of RedCap capable cells can be different from legacy NR cells. |
| vivo | No concern |  |
| Fujitsu | No concern |  |
| DENSO | Concern | Have a sympathy with what operators are concerned. |
| LGE | No concern |  |
| Deutsche Telekom | Concern | Agree with the comments of Intel and BT. |
| NEC | No concern |  |
| Nokia |  | We prefer Option 3. |

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| Proposal 7: [Discussion] In case the cell is barred due to being unable to acquire the SIB1, intra-frequency cell reselection considered by RedCap UE is agreed as option 1:  Option 1: as “allowed”  Option 2: follow IFRI in MIB. |

In pahse 1 dsicussion, we have:

Option 1: as “allowed” 17

Option 2: follow IFRI in MIB (should use same principle as Q4): 6

Even though there is clear majority to option 1, we still marked this as “discussion” to check the conclusion of P4 together as commented.

**Question 2: Do you have any concern to compromise as option 1 in proposal 7 above?**

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| --- | --- | --- |
| **Companies** | **Concern, or no concern?** | **Comments** |
| MediaTek | No concern |  |
| Sequans | No concern | Not really different than Q1 |
| Apple | No concern |  |
| CATT | No concern |  |
| Samsung | No concern | - |
| Intel | Concern | It would be good to control the UE in clear way, and therefore IFRI in MIB should be followed. |
| Qualcomm | No concern |  |
| Futurewei | No concern |  |
| OPPO | No concern |  |
| BT | Concern | It seems that we are missing the important point. We don’t see the difference between a non-RedCap cell where SIB1 is not transmitted from a case where RedCap UE is unable to decode SIB1 from a RedCap cell.  There are no two questions, is a single one because from UE side, the case is exactly the same. We propose to have a single agreement:   * If RedCap specific IFRI in SIB1 is not transmitted or it is unable to be acquired by the UE, intra-frequency cell reselection considered by RedCap UE is agreed as option [x]   BT support follow IFRI in MIB. |
| T-Mobile USA | Concern | Follow IFRI in MIB. |
| ZTE | No concern | gNB will only consider the deployment of legacy intra-freq neighbor cells when setting the IFRI in MIB, but the deployment of RedCap capable cells can be different from legacy NR cells. |
| vivo | No concern |  |
| Fujitsu | No concern |  |
| DENSO | Concern | Same as Q1 |
| LGE | No concern |  |
| Deutsche Telekom | Concern | A common approach should be adopted for P4 and P7. We prefer option 2, “Follow IFRI in MIB”. |
| NEC | No concern |  |
| Nokia | Concern | Agree with DT. |

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| Proposal 6: [Discussion] If the cellBarred field in MIB is set to barred, RedCap UE should:  Option 1: follow the legacy IFRI in MIB.  Option 2: continue to read SIB1 of the barred cell and follow the intraFreqReselectionRedCap indicated in SIB1. [Majority] |

In phase 1 discussion, even though option 2 has the majority, as Intel point out, option2 seems conflict with the agreement that RedCap UE should also follow cellbarring in MIB, which is used together with IFRI in MIB. Rapporteur propose this for online check if we really want to somehow change the agreed principle.

**Question 3: Do you have any concern to compromise as option 2 in proposal 6 above?**

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| --- | --- | --- |
| **Companies** | **Concern, or no concern?** | **Comments** |
| MediaTek | No concern |  |
| Sequans | No concern | NW may prefer to handle RedCap and non-RedCap UEs differently |
| Apple | No concern |  |
| CATT | No concern |  |
| Samsung | No concern | - |
| Intel | Concern | We still prefer option 1.  RAN2 already agreed  Agreements:   1. RedCap UE applies the existing cellBarred field in MIB   To our understanding, RAN2 agreements should also be applied for IFRI, i.e. legacy cell barred indication should still be applicable for any UEs (including RedCap) as RAN2 only agreed to an additional barring indication specific to RedCap on top of the legacy one. |
| Qualcomm | No concern |  |
| Futurewei | No concern |  |
| OPPO | No concern |  |
| BT | No concern | We don’t see the problem raised by Intel. From our understanding, the cell is barred but we allow the RedCap UE to do IFRI based on how RedCap network is engineered and for that, UE should read RedCap IFRI in SIB1. |
| T-Mobile USA | Concern | Need to default to non-RedCap UE procedures when intraFreqReselectionRedCap isn’t present. |
| ZTE | No concern |  |
| vivo | No concern |  |
| Fujitsu | No concern |  |
| DENSO | No concern | In this case, RedCap UE should follow RedCap specific cell access information, if present. |
| LGE | No concern |  |
| Deutsche Telekom | Concern | Share the views of Intel and T-Mobile USA. |
| NEC | Concern on lacking clarification | As commented in phase 1, our understanding had been Opt1 (same as Intel), while we could give compromise but need clarification about following UE behaviour when the IFRI in SIB1 is also absent (even after reading SIB1). In this case, our understanding is that RedCap UEs shall follow the IFRI in MIB. |
| Nokia | No concern |  |

* 1. ASN.1 for cell barring in SIB1

In phase 1, there is clear majority go with option 1 on the signalling design for cellBarredRedCap1Rx/2Rx:

**Option 1: use two mandatory sub-IEs with {barred, notBarred} values included in one optional parent IE cellBarredRedCap-r17.**

cellBarredRedCap-r17        SEQUENCE {

cellBarredRedCap1Rx-r17        ENUMERATED {barred, notBarred},

cellBarredRedCap2Rx-r17        ENUMERATED {barred, notBarred}

}                         OPTIONAL,  -- Need R

**Option 2: use two optional Ies with {barred} values**

cellBarredRedCap1Rx-r17 ENUMERATED{barred} OPTIONAL, -- Need R

cellBarredRedCap2Rx-r17 ENUMERATED{barred} OPTIONAL, -- Need R

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| Proposal 8: [Easy] For the cell barring in SIB1, RAN2 agree to use two mandatory sub-IEs with {barred, notBarred} values included in one optional parent IE cellBarredRedCap-r17. |

We received the email comments as “*TMUSA Reply: As T-Mobile and BT commented if this IE isn’t present the UE is allowed to access the network, ASN.1 uses a need code of “O”.* “ rapporteur understand legacy UE can access the NW, since the proposal mean the parent IE is optional.

**Question 4: Do you have any concern to compromise as proposal 8 above?**

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| **Companies** | **Concern, or no concern?** | **Comments** |
| MediaTek | No concern |  |
| Sequans | No concern |  |
| Apple | No concern |  |
| CATT | No concern |  |
| Samsung | No concern |  |
| Intel | No concern |  |
| Qualcomm | No concern |  |
| Futurewei | No concern |  |
| OPPO | No concern |  |
| BT | Neutral | We prefer option 2 but we can accept majority views. |
| T-Mobile USA | No Concern |  |
| ZTE | No concern |  |
| vivo | No concern |  |
| Fujitsu | No concern |  |
| DENSO | No concern |  |
| LGE | No concern |  |
| Deutsche Telekom | No concern |  |
| NEC | No concern |  |
| Nokia | No concern |  |

In phase 1 discussion, following proposal has received on P9.

“ TMUSA Reply: If this IE is present the UE uses legacy methods/ IE’s”

“CATT: we suggest having a FFS in Proposal 9, like:

* FFs whether the Release 17 or after release cell not supporting Redcap can also present the intraFreqReselectionRedCap in SIB1.”

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| Proposal 9: [Easy] The cell supporting RedCap should always present the intraFreqReselectionRedCap in SIB1. |

**Question 5: Do you have any concern to compromise as proposal 9 above?** (NOTE that if any strong concern is received, rapporteur will directly remove this proposal from the summary, since it is just to confirm the previous agreement.)

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| **Companies** | **Concern, or no concern?** | **Comments** |
| MediaTek | No concern |  |
| Sequans | No concern |  |
| Apple | No concern | This is our agreement from previous meetings. |
| CATT | No concern | we can discuss our suggested FFS in Question 1. |
| Samsung | No concern |  |
| Intel | No concern |  |
| Qualcomm | No concern |  |
| Futurewei | No concern |  |
| OPPO | No concern |  |
| BT | No concern | With RAN2#115-e agreement “If RedCap-specific IFRI is absent from broadcast SI, the UE considers the cell does not support RedCap” and RAN2#116-e agreement “In case the cell is barred due to not supporting RedCap, UE behaviour for intra-frequency cell reselection is FFS”, do we need to discuss this again?  If the RedCap IFRI in SIB1 is not present, the cell is not supporting RedCap and the RedCap UE cannot access. We believe this was already clear. |
| T-Mobile USA | Concern | This increases complexity of RedCap deployment without any direct benefit. RedCap is competing against CAT1 and CAT1bis devices which don’t require all of the extra development imposed on RedCap devices. |
| ZTE | No concern |  |
| vivo | No concern |  |
| Fujitsu | No concern |  |
| DENSO | No concern |  |
| LGE | No concern |  |
| Deutsche Telekom | No concern |  |
| NEC | No concern |  |
| Nokia | No concern |  |

* 1. Cell (re)selection parameters

In phase 1, there is clear majority to support the proposal. But, indeed, we see some doubt on the necessity. Rapporteur propose this as working assumption. It means if RAN2 can achieve the consensus on the detailed parameters, it will be supported.

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| **Proposal 10: [Easy] Working assumption: RAN2 support the RedCap specific cell (re)selection parameter.** |

Some alternatives on the parameters to be RedCap specifc can be:

**Alt.1**: the ‘minimum required signal strength/quality level’ (i.e. Qrxlevmin/Qqualmin from the cell selection criterion S);

**Alt.2**: priority for cell reselection in SIB2&4;

**Alt.3**: others to be added.

**Question 6: Do you have any concern to compromise as proposal 10 above? Also please indicate the parameters to be RedCap specific, so that we can converge on at least one of them.**

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| --- | --- | --- | --- |
| **Companies** | **Concern, or no concern?** | **Preferred parameters to be RedCap specific** | **Comments** |
| MediaTek | Concern |  | As indicated over email, this WA is overly broad indicating that R2 will support RedCap specific cell (re)selection parameters without knowing what parameters these are. Unless there’s some consensus on the parameter(s) we’re referring to, this working assumption shouldn’t be taken. |
| Sequans | No concern | Alt2, Alt1 | We see no real issue since this is a WA. If eventually no detail can be agreed, it can be reverted.  We see benefit in both Alt2 (compared to non-RedCap UEs) and Alt1 (especially for 1-rx branch UEs) |
| Apple | Concern |  | Same view as Mediatek |
| CATT | No concern |  |  |
| Samsung | No concern | Alt2, Alt1 | Since RedCap UE can only camp and be connected to a gNB that supports a RedCap UE, Alt2 is an essential feature for the RedCap UEs.  Also, especially for 1RX UE, we understand that cell selection criteria need to be differentiated considering its limited receiving capability. Perhaps RAN2 can agree the general principle as prepared by the moderator, and then the detailed decision can be made next meeting. So far, we only see two alternatives (i.e. Qrxlevmin/ Qqualmin or Qrxlevminoffset/Qqualminoffset for the 1RX UE), so it won't take too much time, if RAN2 agrees on the principle. |
| Intel | No concern | Alt 1 with comments | It should be Rx specific threshold. |
| Qualcomm | No concern | Alt2, Alt1 | Same comment as Sequan |
| Futurewei | Concern |  | Same view as Mediatek |
| OPPO | Concern |  | Same view as Mediatek |
| BT | No concern |  |  |
| T-Mobile USA | Concern |  | As we commented earlier increased functionality runs counter to low complexity UE’s. The wide range of use cases and RX sensitivities don’t necessarily work with a single set of parameters. |
| ZTE | No concern |  | Based on the comments from companies, maybe it is better to restrict the scope of this proposal, see below example:  (It means solutions other than Alt.1 and Alt.2 are not considered, which solution is supported can be discussed next meeting)  **Proposal 10: RAN2 support the RedCap specific cell (re)selection parameter, including:**   * **Alt.1: the ‘minimum required signal strength/quality level’ (i.e. Qrxlevmin/Qqualmin from the cell selection criterion S);** * **Alt.2: priority for cell reselection in SIB2&4;** * **FFS on support of Alt.1, or Alt.2 or both.** |
| vivo | No concern | Alt1, Alt2 | With this WA, we could discuss what parameter(s) could be RedCap specific. If it has not been concluded finally, this WA could be reverted. |
| Fujitsu | No concern | Alt1, Alt2 |  |
| DENSO | No concern | Alt.1 | For single Rx UE |
| LGE | No concern | Alt1 or Alt2 | FFS on support of both Alt1 and Alt2 |
| Deutsche Telekom | Concern |  | Same view as Mediatek. |
| NEC | Concern |  | Same view as MediaTek. For Alt.1 (if supported), we understand the views from companies supporting this is to apply different value for only 1Rx UE, which should be confirmed. For Alt.2, we think both Alt.2 and neighour cell information in Q7 are not necessary (either one is sufficient). If only Alt.1 with restricting to 1 Rx UE, we can support for that, as working assumption. |
| Nokia | No concern | Alt1 | No need for any additional signalling. |

* 1. Neighbour cell supporting

In phase 1, there is clear majority to support the proposal and with minority objection (see many neutral answers).

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| **Proposal 11’: [Easy] System information may provide information on which cells and/or frequencies accept RedCap UE access (e.g. by considering whether supporting RedCap).** |

**Question 7: Do you have any concern to compromise as proposal 11’ above?**

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| **Companies** | **Concern, or no concern?** | **Comments** |
| MediaTek | No concern |  |
| Sequans | No concern | We are fine to limit to frequencies if this eventually leads to an agreement, but we do not really see the need as the agreement specifies may. |
| Apple | Concern for a modification (reverting to earlier text) | While we want to have the SI provide RedCap specific info, we think it’s better to have this as an operating framework (rather than optional), and that RedCap UEs would use the SI information for re-selection. The ‘optional’ status means that RedCap UEs has to operate with and without the SI info, which is unnecessary.  We understand the argument behind making it optional, but like may other things with RedCap, the OM configuration and RAN3-type inter-gNB communication is anyway needed for handling RedCap, and so deployments which support RedCap can also update their SI (and it would not be very often that gNB would b upgraded to RedCap, for contant change of SI info).  On the other hand, this helps with power-saving all the “numerous” RedCap UEs that roam into these gNBs.  **System information provides information on which cells and/or frequencies accept RedCap UE access (e.g. by considering whether supporting RedCap).** |
| CATT | No concern |  |
| Samsung | No concern but | The frequency information can be indicated by the Alt 2 in Question 6, so no additional information may be needed. |
| Qualcomm | No concern |  |
| Futurewei | No concern | Prefer to limit it to frequencies only. |
| OPPO | No concern |  |
| BT | No concern |  |
| T-Mobile USA | Concern | Adds unnecessary complexity. |
| ZTE | No concern |  |
| vivo | Not strong | We tend to agree with Apple. The suggested wording is more reasonable. |
| Fujitsu | No concern |  |
| DENSO | No concern |  |
| LGE | - | No objection if the majority want. |
| Deutsche Telekom | Concern | Agree with T-Mobile USA. If a compromise is achieved, frequency information seems to be sufficient. |
| NEC | Concern for “cell” information | We still have concern on the overhead and some doubts for availability of sufficient information about which cells are supporting Redcap (pending RAN3 discussion). If RAN2 goes to this direction, then we prefer only “frequency” information which seems more useful in assuming homogeneous support on the same frequency. And should select either this frequency information or Alt.2 in Q6 (frequency priority). |
| Nokia | No concern | We are OK with the compromise for NW to choose between cells and frequencies – or even use both. |

1. Conclusion and proposals

Based on the above summary, following proposals are given.

1. Reference
2. R2-2201734 [offline-103] identification and access restriction aspects Huawei discussion
3. R2-2200287 Open issues on Early identification, camping restrictions and NCD-SSB Intel Corporation
4. R2-2200554 Identification and access restriction of RedCap UE, and NCD-SSB related issues Huawei, HiSilicon
5. R2-2200597 Remaining issues on NCD SSB, identification and access for RedCap vivo, Guangdong Genius
6. R2-2201113 RedCap UE power-saving aspects at cell re-selection Apple discussion NR\_redcap-Core
7. R2-2200208 Cell barring aspects Samsung Electronics Co., Ltd
8. R2-2200249 Discussion on RedCap UE's identification and camping restrictions OPPO
9. R2-2200332 Cell (re)selection details for RedCap UEs Samsung Electronics
10. R2-2200343 System Information and supporting for RedCap UEs KDDI Corporation
11. R2-2200468 Discussion on UE access restrictions for Redcap devices Beijing Xiaomi Mobile Softwar
12. R2-2200469 Discussion on early Identification for Redcap devices Beijing Xiaomi Mobile Softwar
13. R2-2200568 Camping restrictions of RedCap UE Fujitsu
14. R2-2200609 On Access and Camping Restrictions ZTE Corporation, Sanechips
15. R2-2200616 Further considerations on access restrictions NEC
16. R2-2200639 Discussion on the open issues of identification and access restrictions for RedCap UE Spreadtrum Communications
17. R2-2200686 Discussion on the remaining issues of early identification and IFRI CATT discussion
18. R2-2200725 Corrections for cellBarred in MIB handling for RedCap UE InterDigital, Europe, Ltd.
19. R2-2200797 Early indication & access restriction for RedCap UEs Ericsson
20. R2-2200836 NR-REDCAP access restriction/allowance indication to ease mobility THALES
21. R2-2200861 Discussion on access restrictions and early identification CMCC
22. R2-2201207 Discussion on identification and access restrictions for RedCap UEs LG Electronics UK
23. R2-2201232 Early identification and camping restrictions for RedCap UE Sierra Wireless. S.A.
24. R2-2201237 Neighbour cell information and cell (re)selection for RedCap UE DENSO CORPORATION
25. R2-2201587 Further details of identification, access, and camping restrictions Nokia, Nokia Shanghai Bell
26. R2-2201623 Support and network behaviour for RedCap early indication messages BT Plc, Deutsche Telekom AG, Telecom Italia S.p.A., TurkCell, CMCC, NTT DOCOMO INC., Orange, Vodafone, KDDI