3GPP TSG-RAN WG2 Meeting #121-bis electronic \_R2-2304362

April 17th - 26th, 2023

Agenda Item: 7.19.3

Source: Huawei, HiSilicon

**Title:** **Summary of [AT121bis-e][752] Further reduced UE complexity in FR1 (Huawei)**

Document for: Discussion and Decision

# Introduction

This paper aims at capturing the summary of the offline discussion.

**[AT121bis-e][752] Further reduced UE complexity in FR1 (Huawei)**

Scope:

* + - Summarize and identify agreeable proposals for agenda item 7.19.3

      Intended outcome:

* + - Report with agreeable proposals in R2-2304362

      Deadline:

* + - Deadline for comments: Wednesday 23:59 UTC
		- Rapporteur proposals: Thursday 10:00 UTC
		- Document deadline: 1h before session

RAN2 related agreements:

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| * Introduce Msg3/MsgA PUSCH based early indication for Rel-18 eRedCap. FFS how to implement this in the spec (e.g., new LCIDs or not).
* We will wait for RAN1 progress to see if there is a need for a Msg1 early indication for eRedCap.
* The NR MIB “cellBarred” bit applies to all UEs (Normal UEs, Redcap UEs and eRedcap UEs).
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RAN1 related agreements:

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| ConclusionThere is no consensus to continue discussion on “whether additional separate initial DL/UL BWP specific to Rel-18 RedCap UEs is allowed to be configured by the SIB in the cell”.  |

RAN #99 related conclusion:

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| **Rel-18 eRedCap UE capable of 20MHz + PR1 and Rel-18 eRedCap UE capable of BW3/PR3 + PR1 are designed/targeted to same peak data rate, i.e., 10Mbps**Note 1: Peak data rate of "Rel-18 eRedCap: UE capable of 20MHz + PR1" and "Rel-18 eRedCap: UE capable of BW3/PR3 + PR1" is same including unicast and broadcast respectively.Note 2: PRB processing capability of "Rel-18 eRedCap: UE capable of 20MHz + PR1" is not limited to "25 PRBs for 15 kHz SCS and 12 PRBs for 30 kHz SCS" and it corresponds to PRB size corresponding to 20 MHz.Note 3: The only difference between "Rel-18 eRedCap: UE capable of 20MHz + PR1" and "Rel-18 eRedCap: UE capable of BW3/PR3 + PR1" is Note 2 and ***vLayers*·*Qm*·*f***  in order to have the same peak rate.Note 4: The initial access procedure of Rel-18 eRedCap UE capable of 20MHz + PR1 is realized by following:* Same as Rel-18 eRedCap UE capable of BW3/PR3 + PR1
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# Discussion

**2.1 NW capability (eRedCap UE supporting/allowing indication)**

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| **Tdoc** | **Related proposals** |
| R2-2302528Futurewei | Proposal 2. RAN2 study the question of whether a network supporting R18 eRedCap shall also support R17 RedCap and reach a conclusion on it.Proposal 3. Pending on RAN2’s conclusion on proposal 2, if a network is allowed to support R18 eRedCap but not R17 RedCap, introduce R18 eRedCap-specific 1Rx and 2Rx barring indications and half-duplex FDD indication (cellBarredERedCap1Rx-r18, cellBarredERedCap1Rx-r18, and halfDuplexERedCapAllowed-r18). The presence of these IEs in SIB1 is conditioned only on that the cell supports R18 eRedCap (i.e., the intraFreqReselectionERedCap-r18 is present in SIB1), and is completely decoupled from whether R17 RedCap is supported or not.Proposal 4. Pending on RAN2’s conclusion on proposal 2, if a network supporting R18 eRedCap shall also support R17 RedCap, RAN2 decide whether to specify that the R17 1Rx and 2Rx barring indications and the half-duplex FDD indication are also used for R18 eRedCap, if supported, or introduce a 1-bit indication indicating whether these R17 indications are also used for R18 eRedCap or similar R18 indications are separately provided in SIB1, if R18 eRedCap is also supported in the cell. |
| R2-2303069Huawei | Proposal 1: The eRedCap UE is not allowed to access to the R15/R16/R17 legacy cell (including the legacy cell supporting or not supporting RedCap) or the R18 cell not supporting eRedCap.Proposal 2: SIB1 should be able to indicate whether the cell supports eRedCap UE or not.Proposal 3a: Network should ensure to handover eRedCap UE to a gNB which supports/allows eRedcap UE. Proposal 3b: RAN2 send LS to ask RAN3 to support the corresponding Xn signalling (similar to R17 RedCap Broadcast Information IE in 38.423). |
| R2-2303306MediaTek  | Proposal 1: An indication is introduced in SIB1 to indicate a cell’s support of eRedCap operation. How such an indication is signalled to left to later ASN.1 discussions. |
| R2-2303543CMCC  | Proposal 2: One new IE in SIB1 may be introduced to control the R18 eRedCap UE access the cell and another new IE in SIB1 is designed to allow R18 eRedCap UE to select another cell on the same frequency if the current cell is barred and re-selection criteria are fulfilled. |
| R2-2303568 Spreadtrum | Proposal 3: Introduce an indication in SIB1 to control whether Rel-18 RedCap UE can access this cell or not, for example, IFRI-like indication. |
| R2-2304064Ericsson | Proposal 2 It should be possible for the NW to support Rel-18 RedCap but not Rel-17 RedCap in the serving cell. |

Similar as R17 RedCap UEs not allowed to access any legacy cell not supporting RedCap, it is observed that the eRedCap UE is not allowed to access to the R15/R16/R17 legacy cell (including the legacy cell supporting or not supporting RedCap) or the R18 cell not supporting eRedCap.

Based on the proposals from companies, it is suggested to discuss how the NW indicates/controls the eRedCap access.

**Question 1a: Do you agree SIB1 should be able to indicate whether the cell supports eRedCap UE or not (assuming that eRedCap UE is not allowed to access to the legacy cell nor the cell not supporting eRedCap)?**

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Yes | How to indicate can be FFS. |
| Xiaomi | Yes | Agree |
| Spreadtrum | Yes | Agree |
| MediaTek | Yes |  |
| Nokia | Yes | FFS how |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes | Using eRedCap specific IFRI, gNB can control cell (re)selection to intra-frequecy cells for eRedCap UEs, and also barring for eRedCap UEs |

Based on the proposals from companies, it is also suggested to clarify the relationship on the NW capability between R17 RedCap and R18 eRedCap supporting.

Note that, regardless the RAN2 understanding, it is not necessarily implying some spec impact to capture this kind of NW restriction. Also, some company mentions the logic between this assumptions with the need of introduce new R18 eRedCap specific cellbarring or IFRI etc. It is worth to clarify companies’ understanding on the meaning of “supporting eRedCap UE but not supporting RedCap UE”, i.e. whether this R18 cell supporting eRedCap UE but not supporting RedCap UE can use/configure some R17 IEs in SIB1, which was used for RedCap. If yes, it seems this is purely the NW implementation, to which we don’t even to clarify.

**Question 1b: Do you think it is a valid case that the NW only supports eRedCap UE but does not support RedCap UE (not necessarily implying any spec impact)?**

**Please clarify your understanding on whether this cell “supporting eRedCap UE but not supporting RedCap UE” can still use some R17 RedCap parameters in SIB1.**

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| **Companies** | **Valid or Invalid?** | **Comments** |
| OPPO | Invalid | It would be reasonable for network to also support RedCap UE. |
| Xiaomi | Valid | Is the question meaning whether a cell supporting eRedCap UE but not supporting RedCap UE can still reuse some R17 RedCap parameters or IEs in SIB1?Seems yes. An example:For a cell supporting Rel-18 RedCap UEs only, we can reuse the R17 RedCap IE (initialDownlinkBWP-RedCap-r17) to configure initial DL/UL BWP specific to Rel-18 RedCap UEs. No new IE is needed.[Rapp]: Yes, that’s the question |
| Spreadtrum | invalid | R18 network can reuse R17 IEs to configure them for eRedcap UEs. |
| MediaTek | Valid | R17 IEs may still be used (e.g. HD-FDD UEs not supported), but that does not imply that the NW needs to support R17 RedCap operation. |
| Nokia | Valid | It can be left up to network implementation which (e)RedCap devices are supported. R17 RedCap SIB parameters can be reused in R18 eRedCap i.e. no need to duplicate all the barring/allowed indications.  |
| Huawei, HiSilicon | See comment | Leave it to NW implementation.The cell “supporting eRedCap UE but not supporting RedCap UE” can always use some R17 RedCap parameters in SIB1, if needed/agreed by RAN2. |
| Samsung | Valid | eRedCap UEs have further reduced UE complexity (in FR1) compared to RedCap UEs. For example, eRedCap UEs support 5MHz BB bandwidth while RedCap UEs support 20MHz bandwidth. Therefore, they are different type of UEs. Besides, considering RedCap was introduced in Rel-17 while eRedCap is scope of Rel-18, NW should have separate access/barring control for these two types of UEs.. |

**2.2 UE capability (eRedCap UE type indication)**

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| **Tdoc** | **Related proposals** |
| R2-2302566CATT  | Proposal 3：One Rel-18 RedCap UE type with further UE complexity reduction should be defined, and some agreements in Rel-17 related with Redcap UE type can be revised:* Introduce explicit bit to indicate the support of Rel-18 RedCap;
* The capability “support of Rel-18 RedCap” is per UE capability.
* The network needs to unambiguously know whether the UE is a Rel-18 RedCap UE from its reported UE capability information.
* For extended DRX for RRC\_INACTIVE, introduce new capability bits extendedDRX-r17 covering DRX values larger than 10.24s
 |
| R2-2302640ChinaTelecom | Proposal 2: Introduce a new UE type indicator in the capability signaling for Rel-18 eRedCap UE. |
| R2-2302705Xiaomi | Proposal 3 A new UE capability parameter (e.g. supportOfRedCap-r18) is introduced to indicate Rel-18 eRedCap UE type. |
| R2-2302826ZTE | Proposal 3: Use one UE capability indication (e.g. supportOfEnhanceRedCap-r18) for eRedCap UEs to indicate it’s capability of supporting UE peak data rate reduction and 5 MHz BB bandwidth only for PDSCH and PUSCH). |
| R2-2303070Huawei | Proposal 1: There should be an explicit IE in the capability signaling, which is dedicated and mandatory for the enhanced RedCap UE (eRedCap UE) type. FFS on the stage3 signaling details.  |
| R2-2303562 Qualcomm | Proposal 8: A new supportOfRedCap-r18 is introduced for Rel-18 eRedCap capability on top of Rel-17 RedCap capability and the detailed functions should wait for RAN1/RAN2 progress. Proposal 9: A separate capability is introduced to indicate whether Rel-18 eRedCap supports BW3/PR3. Proposal 10: Except the supportOfRedCap pending on more discussions in RAN1/RAN2, the RAN2 specific Rel-17 RedCap UE capabilities is appliable for Rel-18 eRedCap UE with necessary field updates and whether RAN1 specific Rel-17 RedCap UE capabilities is applied for Rel-18 eRedCap UE should check with RAN1. |
| R2-2304171Sequans | Proposal 1: The eRedcap PRB processing capability (limited/full) is indicated by a new capabilityProposal 2: No additional difference is introduced related to eRedcap PRB processing capability (in particular, both variants share same initial access, same access control)Proposal 3: An eRedcap UE is a “Redcap UE with 10Mbps peak data rate”, with optional PRB processing capability limitation |

As proposed by companies and also similar to R17 RedCap capability signaling design, the eRedCap UE’s capability signaling should be able to indicate its UE type explicitly. Since RAN2 may wait for more detailed UE feature list information from R1, it is suggest to first agree on the high-level intention and leave the stage 3 details to the later phase.

**Question 2a: Do you agree there should be an explicit IE in the capability signaling, which is dedicated and mandatory for the eRedCap UE type?**

(The details of ASN.1 design is still FFS and can wait for the RAN1 UE feature list)

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Yes |  |
| Xiaomi | Yes |  |
| Spreadtrum | Yes |  |
| MediaTek | Yes |  |
| Nokia | Yes | Capabilities at least for UE peak data rate reduction and 5 MHz BB bandwidth only for PDSCH and PUSCH are needed.  |
| Huawei, HiSilicon | Yes | This is the eRedCap UE type indication, and its detailed components and the exact IE can wait for more RAN1 progress.Note the RP conclusion: “Rel-18 eRedCap UE capable of 20MHz + PR1 and Rel-18 eRedCap UE capable of BW3/PR3 + PR1 are designed/targeted to same peak data rate, i.e., 10Mbps” |
| Samsung | Yes |  |

One related clarification, which will be important when we discuss the following questions in section 2.3/2.4/2.5/2.7, is whether R18 eRedCap UE has to support some R17 RedCap UE capabilities, e.g. by understanding/reusing some R17 RedCap UE specific configuration/indications.

**Question 2b: Do you agree that:**

**Even though the R18 eRedCap type UE does not have to indicate the support of legacy *supportOfRedCap-r17*, R18 eRedCap UE can still reuse some R17 RedCap configurations (e.g. initial BWP configuration, etc.), if agreed any.**

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Yes |  |
| Xiaomi | Yes | The WID has made it clear “The existing UE capability framework is used, and changes to capability signalling are specified only if necessary. By default, all UE capabilities applicable to a Rel-17 RedCap UE are applicable unless otherwise specified.”R18 eRedCap type UE can still support Separate initial DL BWP for R17 Redcap UE.[Rapp]: agree, but the question is actually about whether eRedCap UE has to support RedCap UE mandatory feature. |
| Spreadtrum | Yes | As mentioned by Xiaomi, all UE capabilities of R17 Redcap UE are applicable to R18 eRedcap UE. |
| MediaTek | Yes |  |
| Nokia | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes, but | We do not think UE can be both eRedCap and RedCap UE at the same time. Thus, if UE indicates support of RedCap (i.e.,supportOfRedCap-r17), UE cannot indicate support of eRedCap, and vice versa. So, in our understanding “**R18 eRedCap type UE ~~does not have to~~ should not indicate the support of legacy *supportOfRedCap-r17***”Since RAN1 agreed not to introduce eRedCap-specific initial BWP, R18 eRedCap UE can reuse at least RedCap specific initial BWP. Not sure for the other configurations. |

**2.3 IFRI (intraFreqReselection indicator)**

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| **Tdoc** | **Related proposals** |
| R2-2302528Futurewei  | Proposal 1. Introduce intraFreqReselectionERedCap-r18 IE, which is to be included in SIB1 to indicate that the network supports R18 eRedCap. The absence of the intraFreqReselectionERedCap-r18 IE in SIB1 indicates that the network doesn’t support R18 eRedCap. |
| R2-2302544OPPO | Proposal 2 Separate IFRI is introduced in SIB1 for eRedCap UEs. |
| R2-2302566CATT  | Proposal 2: Rel-18 RedCap UE specific cellBar, intraFreqReselection or Half-duplex FDD indication in SIB1 is not needed.  |
| R2-2302640ChinaTelecom | Proposal 1: Introduce a eRedcap specific intraFreqReselection in SIB1. |
| R2-2302705Xiaomi | Proposal 2 To introduce a eRedcap specific intraFreqReselection in SIB1. |
| R2-2302736Intel | Proposal 1. Network can indicate whether a cell is or not barred for Rel-18 eRedCap UEs via a new information included as part of cell baring information (i.e., within RedCap-ConfigCommonSIB-r17).Proposal 1.1. For Rel-18 eRedCap UEs, RedCap specific IFRI is not used for barring purposes (to avoid confusions as Rel-17 RedCap specific IFRI was identified during ASN.1 review as not aligned to how legacy IFRI behaviour is usually defined in previous releases). |
| R2-2302817vivo | Proposal 5: Introduce an additional eRedCap specific IFRI indication (e.g. intraFreqReselection-eRedCap-r18) in SIB1 for Rel-18 eRedCap UEs. Rel-18 eRedCap UEs should apply this parameter when cellBarred-eRedCap-r18 in SIB1 is set to barred. Proposal 6: Similar to Rel-17 RedCap, Rel-18 eRedCap UEs consider one cell does not support Rel-18 eRedCap if the eRedCap specific IFRI (e.g. intraFreqReselection-eRedCap-r18) is absent in SIB1.Proposal 7: Similar to Rel-17 RedCap, Rel-18 eRedCap UEs should acquire SIB1 and follow the eRedCap-specific IFRI provided in SIB1 when cellBarred in MIB is set to barred. Proposal 8: Similar to Rel-17 RedCap, Rel-18 eRedCap UEs should consider IFRI as “allowed” when i) cell does not indicate support for eRedCap UEs or ii) eRedCap UE is unable to acquire SIB1.  |
| R2-2302949NEC | Proposal 2 RAN2 agree to introduce a separate IFRI (e.g., intraFreqReselectionERedCap) for Rel-18 eRedCap UEs. If the eRedCap specific IFRI is not present in SIB1, Rel-18 eRedCap UE consider the cell as barred and perform barring as if eRedCap specific IFRI is set to allowed. |
| R2-2303069Huawei | Proposal 5: Introduce eRedCap UE specific IFRI in SIB1. |
| R2-2303149Sharp | Proposal 1: Introduce a separate intraFreqReselection indication for eRedCap UEs in SIB1, and eRedCap UEs perform barring as this indication is set to allowed if SIB1 cannot be acquired. |
| R2-2303306MediaTek  | Proposal 2: An indication is introduced in SIB1 to indicate whether cell selection/reselection to intra-frequency neighbour cells is allowed or not for eRedCap UEs, when a cell is considered as barred. |
| R2-2303323Samsung | Proposal 2. eRedCap specific IFRI (e.g., intraFreqReselectionEnhancedRedCap) is introduced in SIB1. |
| R2-2303543CMCC  | Proposal 2: One new IE in SIB1 may be introduced to control the R18 eRedCap UE access the cell and another new IE in SIB1 is designed to allow R18 eRedCap UE to select another cell on the same frequency if the current cell is barred and re-selection criteria are fulfilled. |
| R2-2303562 Qualcomm | Proposal 4: The eRedCap specific IFRI is introduced in SIB1. If eRedCap specific IFRI is absent from SIB1, UE considers the cell does not support eRedCap.Proposal 5: The eRedCap UE should follow the RedCap-specific IFRI provided in SIB1 when cellBarred in MIB is set to barred. |

It is a clear majority to propose introducing R18 eRedCap UE specific IFRI in SIB1. If you have different view, please clarify whether you can compromise to the majority view and the critical argument if any.

**Question 3a: Do you agree/accept to introduce R18 eRedCap UE specific IFRI in SIB1?**

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Yes |  |
| Xiaomi | Yes | For a cell not supporting R17 eRedCap, R17 eRedCap UE specific IFRI may be absent, so it can not be used by R18 eRedCap UE. |
| Spreadtrum | Yes |  |
| MediaTek | Yes |  |
| Nokia | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |

**Question 3b: If introducing the R18 eRedCap UE specific IFRI, do you agree it has the functionality similar to the R17 one?**

* + - **i.e. “Controls cell selection/reselection to intra-frequency cells for eRedCap UEs when this cell is barred, or treated as barred by the eRedCap UE, as specified in TS 38.304 [20]. If not present, an eRedCap UE treats the cell as barred, i.e., the UE considers that the cell does not support eRedCap.”***(modified from the legacy field description)*

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Yes |  |
| Xiaomi | Yes |  |
| Spreadtrum | Yes |  |
| MediaTek | Yes to text in yellow, FFS on text in green | Fundamentally, we agree that IFRI type functionality is needed, i.e. text highlighted in yellow above. Whether to overload this parameter to also imply whether eRedCap is barred or not can be left to ASN.1 discussions when the signalling structure is clearer.[Rapp]: I guess you mean how the ASN.1 achieves the Q1a can be discussed later |
| Nokia | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |

**2.4 cellBarredRedCap**

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| **Tdoc** | **Related proposals** |
| R2-2302544OPPO | Proposal 1 Separate cellBarred indications are introduced in SIB1 for eRedCap UEs. |
| R2-2302566CATT  | Proposal 2: Rel-18 RedCap UE specific cellBar, intraFreqReselection or Half-duplex FDD indication in SIB1 is not needed.  |
| R2-2302705Xiaomi | Proposal 1 To introduce an eRedcap specific cellbar in SIB1 for Rel-18 eRedCap UE. FFS whether need to differentiate 1RX, 2RX and half-duplex FDD. |
| R2-2302736Intel | Proposal 2. To confirm that network wants to be able to indicate its support/barred control for Rel-18 eRedCap UEs that are half duplex and with 1 or 2 RX branch. If so, to discuss how this is implemented considering: option (1) Rel-17 RedCap barring signaling applies (halfDuplexRedCapAllowed-r17, cellBarredRedCap1Rx-r17, cellBarredRedCap2Rx-r17) for Rel-18 eRedCap UEs (in which case a new barring flag, i.e. cellBarredERedCap-r18, would also be defined to indicate whether Rel-17 RedCap barring information also applies to Rel-18 eRedCap UEs) or option (2) new Rel-18 barring specific parameters are defined to Rel-18 eRedCap UEs for half duplex and with 1 RX or 2 RX branch. |
| R2-2302802Nokia | Proposal 1: NW can control whether cell is barred Rel-18 RedCap devicesProposal 2: NW can allow Rel-17 RedCap devices, but bar Rel-18 RedCap devicesProposal 3: Rel-17 RedCap barring and allowance indications (cellBarredRedCap1Rx, cellBarredRedCap2Rx, halfDuplexRedCap-Allowed and intraFreqReselectionRedCap) are not applicable to Rel-18 RedCap devices Proposal 4: NW can signal whether Rel-17 RedCap barring and allowance indications (cellBarredRedCap1Rx, cellBarredRedCap2Rx, halfDuplexRedCap-Allowed and intraFreqReselectionRedCap) are applicable to Rel-18 RedCap devices |
| R2-2302817vivo | Proposal 1: An indication in system information is needed to indicate whether a Rel-18 eRedCap UE can camp on the cell. Proposal 2: Introduce two separate cell bar IEs(e.g. cellBarred-eRedCap1Rx-r18 and cellBarred-eRedCap2Rx-r18) in SIB1 to indicate whether to bar Rel-18 eRedCap UEs with 1Rx/2Rx or not respectively. |
| R2-2302825ZTE | Proposal 5a: A cellBarredEnhRedCap bit is introduced in SIB1 for eRedCap UE.Proposal 5b: If the cellBarredeEnhRedCap bit is absent in the SIB1, or cellBarredeEnhRedCap is present in the SIB1 and set to barred, the UE supports UE peak data rate reduction and 5 MHz BB bandwidth only for PDSCH and PUSCH shall consider the cell as barred. |
| R2-2302949NEC | Proposal 3 RAN2 agree to introduce separate cellbarred indications for Rel-18 eRedCap UEs with 1 Rx branch, 2 Rx branches and indication for support of Rel-18 eRedCap UEs in Half-Duplex FDD mode via system information. |
| R2-2303069Huawei | Proposal 4a: It is up to the NW implementation on whether to configure eRedCap UE specific cell barring indications in SIB1, i.e. the optional field cellBarredRedCapEnhanced1Rx-r18 and cellBarredRedCapEnhanced2Rx-r18.Proposal 4b: In case the eRedCap UE specific cell barring indication is absent in SIB1 (of the cell supporting eRedCap), the eRedCap UEs follow the R17 RedCap cell barring indication.  |
| R2-2303149Sharp | Proposal 3: Introduce a separate cellBarred1Rx for eRedCap UEs and a separate cellBarred2Rx for eRedCap UEs in SIB1.Proposal 4: If RedCap UEs are barred, eRedCap UEs consider the cell as barred; and if RedCap UEs are allowed to access, eRedCap UEs further check cellBarred indications for eRedCap UEs. |
| R2-2303306MediaTek  | Proposal 3: Existing Rel-17 barring indications for 1Rx, 2Rx and half-duplex FDD UEs can be reused for eRedCap operation. |
| R2-2303323Samsung | Proposal 4. FFS whether additional eRedCap specific access/barring (e.g., half duplex FDD, 1 or 2 RX branch) can be introduced. |
| R2-2303562 Qualcomm | Proposal 2: The Rel-18 eRedCap, the separate cellBarred indications for 1Rx and 2Rx are introduced in SIB1 for cell barring indication for eRedCap UE. |
| R2-2303568 Spreadtrum | Proposal 4: Introduce separate “Cellbarred” indications for BW3/PR3+PR1 and 20MHz+PR1 eRedCap UEs, and reuse the R17 “Cellbarred” indications for 1Rx, 2Rx and half-duplex FDD eRedCap UEs. |
| R2-2303657Sierra Wireless | Separate SIB Cell barring indications for BW3+PR1 devices and PR1 only devices should be supported |
| R2-2304064Ericsson | Proposal 1 Cell barring parameters, i.e., cellBarredRedCap1Rx, cellBarredRedCap2Rx, and halfDuplexRedCapAllowed, introduced for Rel-17 RedCap UEs are used for Rel-18 RedCap UEs. |
| R2-2304190NTT DOCOMO | Proposal 3. RedCapUE and eRedCapUE may have different use cases and should be able to be controlled at a finer granularity |
| R2-2304171Sequans | Proposal 4: As a baseline, similar (but separate) Access Control parameters can be introduced for eRedcap UEs |

Similar to the last RAN2 meeting, it is quite diverse on whether to introduce R18 eRedCap UE specific cell barring indication(s). Please note this is about introducing “cellBarredEhancedRedCap-r18” rather than any IFRI/HD-HDD with similar functionality.

**Question 4a: Do you agree to introduce the R18 eRedCap UE specific cell barring indication(s)?**

**Option 1: Yes, introduce a new R18 eRedCap UE specific cell barring indication(s);**

* + - **FFS on whether NW can control/indicate the eRedCap UE to use either the R18 or the R17 cell barring indication.**

**Option 2: No, eRedCap UEs reuse the R17 RedCap UE specific cell barring indication(s);**

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Option 1 |  |
| Xiaomi | Option1 |  |
| Spreadtrum | Option2 |  |
| MediaTek | No, option 2 | Cell barring indication in Rel-17 was introduced to control the access of UEs with fewer antennas than a normal UE. We see no reason to add R18 eRedCap specific cell barring indications unless a usecase is found to motivate its introduction. Why would a NW not be ok to support 1Rx Rel-17 UEs while supporting 1Rx Rel-18 UEs (or vice-versa)? |
| Nokia | Option 2 | No need to extend broadcast message size by duplicating all the indications. R17 indications could be easily reused. |
| Huawei, HiSilicon | Option 1 | The purpose is to let NW control the load by barring eRedCap UEs but not barring RedCap UEs.This is not about the NW capability. This is about how many RedCap UEs and eRedCap UE may occur in the cell. In case of access congestion/high load, it is NW flexibility to decide to stop the access of eRedCap UEs or RedCap UEs by considering the number of each type UEs. |
| Samsung | Option 1 | eRedCap UE and RedCap UE are different type of UEs. So it is necessary to define separate barring indications, if RAN1 confirms. |

**Question 4b: If introducing the R18 eRedCap UE specific cell barring indication(s), whether to support 1Rx and 2Rx eRedCap UE respective indications?**

* + - **Option 1, 1Rx and 2Rx eRedCap UE use separate cell barring indications;**
		- **Option 2. 1Rx and 2Rx eRedCap UE share the same cell barring indication;**
		- **Any other option of granularity?**

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| --- | --- | --- |
| **Companies** | **Option(s)?** | **Comments** |
| OPPO | Option 2 | Similar as Rel-17 RedCap |
| Xiaomi | Option1 | Use the same way as R17. |
| Huawei, HiSilicon | Option 2 |  |
| Samsung | Option 1 | We support Option 1, and LS seems needed for RAN1 confirmation. |

**2.5 HD-FDD indication**

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| **Tdoc** | **Related proposals** |
| R2-2302566CATT  | Proposal 2: Rel-18 RedCap UE specific cellBar, intraFreqReselection or Half-duplex FDD indication in SIB1 is not needed.  |
| R2-2302817vivo | Proposal 3: Introduce an additional eRedCap specific halfDuplex indication (e.g. halfDuplex-eRedCapAllowed-r18) in SIB1 to indicate whether to bar Rel-18 eRedCap UEs supporting only half-duplex FDD operation. Proposal 4: Send LS to inform RAN1 about RAN2 agreements on the eRedCap specific cell bar indication and halfDuplex indication to check whether there is any issue to differentiate Rx number and halfDuplex from RAN1 point of view.  |
| R2-2303069Huawei | Proposal 6: There is no need to introduce a new eRedCap UE specific “HD-FDD only” broadcasting indication (i.e. just reuse the legacy halfDuplexRedCapAllowed-r17). |
| R2-2303562 Qualcomm | Proposal 3: No additional fullDuplexRedCapAllowed indication for eRedCap UE is introduced. The legacy halfDuplexRedCapAllowed-r17 is reused to indicate Rel-18 eRedCap UE.  |

One of the argument not introducing R18 specific *halfDuplexRedCapAllowed* indication is that: it is not typical cell barring indication, while it is actually the NW capability indication. So, one cell having the capability of supporting HD-FDD-only RedCap UE can normally/naturally support eRedCap UE with HD-FDD-only capability (i.e. HD-FDD-only capability is same for RedCap and eRedCap from NW side).

**Question 5: Do you agree which option?**

* + - **Option 1: eRedCap UE reuses the legacy halfDuplexRedCapAllowed-r17**
		- **Option 2: introduce a new eRedCap UE specific “HD-FDD only” broadcasting indication**

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| **Companies** | **Option?** | **Comments** |
| OPPO | Option 1 |  |
| Xiaomi | Option2 | For a cell not supporting R17 eRedCap, halfDuplexRedCapAllowed-r17 may be absent, so it can not be used by R18 eRedCap UE. |
| Spreadtrum | Option 1 |  |
| MediaTek | Option 1 | Same approach as Question 4.We see no reason to add R18 eRedCap specific HD-FDD indications unless a usecase is found to motivate its introduction. Why would a NW not be ok to support HD-FDD Rel-17 UEs while supporting HD-FDD Rel-18 UEs (or vice-versa)? |
| Nokia | Option 1 |  |
| Huawei, HiSilicon | Option 1 | halfDuplexRedCapAllowed is about the NW capability. One cell supporting HD-FDD should always indicate its supporting, regardless to RedCap or eRedCap UE. |
| Samsung | Option 2 | We support Option 2, and LS seems needed for RAN1 confirmation. |

**2.6 interFreqCarrierFreqList about eRedCap**

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| **Tdoc** | **Related proposals** |
| R2-2302817vivo | Proposal 9: Similar to Rel-17 RedCap, system information can provide eRedCap specific indication (e.g. eRedCapAccessAllowed-r18) to inform which frequencies accept Rel-18 eRedCap UE access.  |
| R2-2303069Huawei | Proposal 7: Similar to R17, introduce eRedcapAccessAllowed-r18 in interFreqCarrierFreqList in SIB4, about the frequency of neighbour cell supporting eRedCap. |
| R2-2303149Sharp | Proposal 2: Introduce a separate AccessAllowed indication for eRedCap UEs in SIB4. |
| R2-2303323Samsung | Proposal 3. eRedCap specific inter-frequency barring indication (e.g., eRedCapAccessAllowed) is introduced in SIB4. |
| R2-2303562 Qualcomm | Proposal 6: A separate eRedCap specific indication is advertised in system information to indicate which frequencies the Rel-18 eRedCap UE is allowed to access. |
| R2-2304064Ericsson | Proposal 3 Discuss if there is a need to have an indication for neighbor cells on whether Rel-18 eRedCap UEs can access the cell. |

Above companies propose to do the similar indication as R17.

**Question 6: Do you agree to introduce eRedcapAccessAllowed-r18 in interFreqCarrierFreqList in SIB4, about the frequency of neighbour cell supporting eRedCap, similar to R17?**

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Yes |  |
| Xiaomi | - | No strong view. Can accept to introduce eRedcapAccessAllowed-r18 |
| Spreadtrum | - | No strong view. We follow the majority views. |
| MediaTek | Yes | This makes sense as not all frequencies in the neighbour list would be upgraded to support eRedCap operation. |
| Nokia | no need to introduce new list | R17 list can be used for R18[Rapp]: RedCap and eRedCap may have different deployment on different frequency. So, it cannot be reused. |
| Huawei, HiSilicon | Yes | No strong view |
| Samsung | Yes |  |

**2.7 initial BWP for eRedCap**

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| **Tdoc** | **Related proposals** |
| R2-2302705Xiaomi | Proposal 5 There is no need to introduce the new IEs for separate initial/active BWP specific to Rel-18 RedCap UEs and the IE of Rel-17 separate initial DL/UL BWPs can be reused. |
| R2-2302736Intel | Proposal 3. Discuss whether network needs to be able to configure the usage of RedCap specific initial BWP between (1) only Rel-17 RedCap (as specified in Rel-17), (2) only Rel-18 eRedCap and/or (3) both Rel-17 and Rel-18 eRedCap UEs. |
| R2-2303069Huawei | Proposal 8: RAN2 confirm there is no need to introduce the eRedCap UE specific initial BWP configuration.Proposal 9: If the R17 RedCap specific initial BWP is configured, eRedCap UEs use that as its specific initial BWP (to be confirmed by RAN1). |
| R2-2303562 Qualcomm | Proposal 7: Rel-18 eRedCap can share the RedCap-specific initial BWP defined in Rel-17 and no additional separate eRedCap-specific initial BWP is introduced in Rel-18. |
| R2-2303568 Spreadtrum | Proposal 1: For a cell supporting Rel-17 and/or Rel-18 RedCap UEs, up to one separate (RedCap-specific) initial DL/UL BWP can be configured. |
| R2-2303689Nokia | Proposal 1: Do not support the separate initial BWP configured only for Rel-18 RedCap UEs. |
| R2-2304190NTT DOCOMO | Proposal 1. RAN2 start discussing following cases;Case 1a: For a cell supporting both Rel-17 and Rel-18 eRedCap UEs, non-RedCap, Rel-17 and Rel-18 RedCap UEs share the initial BWP.Case 1b: For a cell supporting both Rel-17 and Rel-18 eRedCap UEs, Rel-17 and Rel-18 eRedCap UEs share the separate initial BWP.- UE capability of the minimum separation timeCase 1c: For a cell supporting both Rel-17 and Rel-18 RedCap UEs, non-RedCap and Rel-17 RedCap UEs share the initial BWP and separate initial BWP specific to Rel-18 eRedCap UE is configured.Case 1d: For a cell supporting both Rel-17 and Rel-18 RedCap UEs, a separate initial BWP is configured for Rel-17 and another separate initial BWP is configured for Rel-18 eRedCap UE.Case 2: For a cell supporting only Rel-18 eRedCap UE and not supporting Rel-17 RedCap UE, separate initial BWP specific to Rel-18 eRedCap UE is configured.Proposal 2. RAN2 should be discussed to select one of the six options listed above. |

In the last RAN1 meeting chair minutes: “*There is no consensus to continue discussion on “whether additional separate initial DL/UL BWP specific to Rel-18 RedCap UEs is allowed to be configured by the SIB in the cell”.*”

So, it is asked whether RAN2 can confirm this RAN1 understanding. If not, please clarify the critical technical argument against this RAN1 conclusion.

**Question 7a: do you agree/accept that RAN2 can confirm there is no need to introduce the eRedCap UE specific initial BWP configuration?**

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Yes |  |
| Xiaomi | Yes | Since RAN1 did not reach consensus, RAN2 do not need to come up with something new. |
| Spreadtrum | Yes |  |
| MediaTek | Yes | In Rel-17, a separate initial BWP was introduced at R1’s request as they identified a use case for it.If R1 have not identified a usecase for another initial BWP for eRedCap, there is no need for R2 to debate this further. We should confirm that there is no need to introduce a eRedCap specific initial BWP. |
| Nokia | yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |

On the usage of R17 RedCap specific initial BWP by eRedCap UE, it is proposed to discuss on the need to control whether R18 eRedCap UE to use the legacy initial BWP or the RedCap specific initial BWP.

**Question 7b: do you agree that, if the R17 RedCap specific initial BWP is configured, eRedCap UEs always use it as its specific initial BWP?**

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| **Companies** | **Yes or No?** | **Comments** |
| OPPO | Yes |  |
| Xiaomi | Yes | Since the RF BW of eRedcap is kept as 20MHz, and signals/channels other than data channels are allowed to use a BWP up to 20MHz, there is no problem for the eRdcap UEs to receive the signals/channels in the legacy separate initial BWP for R17. |
| Spreadtrum | Yes | Both R17 and R18 redcap UEs have 20MHz RF BW, and the R17 RedCap specific initial BWP is suitable for eRedCap UEs. |
| MediaTek | Yes |  |
| Nokia | yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |

**2.8 Msg3 early identification**

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| **Tdoc** | **Related proposals** |
| R2-2302532OPPO | 1. For Msg3/MsgA PUSCH based early indication, new LCIDs are used for CCCH and CCCH1 for Rel-18 eRedCap.
 |
| R2-2302566CATT  | Proposal 1：For Msg3/MsgA PUSCH based early indication for Rel-18 eRedCap, the following agreements in Rel-17 can be reused/revised: Two reserved LCIDs are used for CCCH and CCCH1 cases respectively for Msg3 early identification At least the dedicated LCID (i.e. the Msg3 early identification solution) can be supported for MsgA early identification. In MAC perspective, RedCap UE uses the dedicated LCID for Msg3 early identification, when the Msg3 includes the CCCH data (no other precondition) Dedicated LCID for RedCap is always indicated when CCCH is sent in MsgA by a RedCap UE (i.e. no other precondition). Msg3 early identification is mandatorily supported by RedCap UE |
| R2-2302640ChinaTelecom | Proposal 1: Rel-18 eRedCap UE can be identified by the network via MSG3/MSGA from an eRedCap specific LCID(s). |
| XiaomiR2-2302704 | Proposal 3 If early indication of Redcap UE capabilities during the initial access by Msg3 is confirmed by RAN1, RAN2 need to consider how to convey the LCHID. |
| R2-2302817vivo | Proposal 10: RAN2 to discuss how to implement Msg3/MsgA PUSCH based early indication for Rel-18 eRedCap,Option 1: Two separate reserved LCIDs are used for CCCH and CCCH1 cases respectively.Option 2: R18 eRedCap reuses the R17 RedCap’s LCIDs and a reserved bit of the MAC subheader for CCCH and CCCH1 is used to differentiate R18 eRedCap from R17 RedCap. |
| R2-2302825ZTE | Proposal 3: Msg3 based early indication should also be supported.Proposal 4: Two reserved LCIDs of LCID for UL-SCH can be introduced as Msg3 based early indication for Rel-18 eRedCap UEs. The eRedCap UEs can use these new LCIDs to indicate CCCH and CCCH1 respectively for Msg3 transmission.  |
| R2-2302949NEC | Proposal 1 RAN2 agree to assign two reserved codepoint/index to CCCH of size 48bits and CCCH of size 64 bits for Rel-18 eRedCap UE, respectively. |
| R2-2303069Huawei | Proposal 10: It can be the working assumption that two new LCID are used for Msg3 based eRedCap early identification. |
| R2-2303305MediaTek  | Proposal 1: The reserved bit of the MAC subheader is used to differentiate between RedCap and eRedCap devices during Msg3/MsgA based early identification.Proposal 2: If Proposal 1 is accepted, Msg3/MsgA based early identification is always enabled for eRedCap UEs. |
| R2-2303323Samsung | Proposal 1. Two reserved LCIDs are used to support Msg3/MsgA early indication for Rel-18 eRedCap. |
| R2-2303543CMCC  | Proposal 1: the R18 eRedcap UE could reuse the method on Msg3 early identification for R17 Redcap UE as baseline, e.g. introducing two reserved LCIDs for CCCH and CCCH1 cases respectively for Msg3 early identification. |
| R2-2303562 Qualcomm | Proposal 1: The Rel-18 eRedCap UE uses two new/dedicated LCIDs for their UL CCCH/1 message separately to support early indication in Msg3 or MSGA PUSCH. |
| R2-2303657Sierra Wireless | Separate Msg3/MsgA early indication for BW3+PR1 devices and PR1 only devices should be supported |
| R2-2303689Nokia | Proposal 2: Further LCID values are not reserved for R18 RedCap early indication but the LCID values reserved for R17 RedCap UE are exploited with an additional indication to differentiate between R17 and R18 RedCap UE. |
| R2- 2304010 LG Electronics | Proposal 1. Define two eLCID values to support Msg3-based early indication. |
| R2-2304062Ericsson | Proposal 1 Introduce Msg3/MsgA PUSCH based early indication for Rel-18 eRedCap UEs using reserved LCID values.Proposal 2 Msg3/MsgA PUSCH based early indication for Rel-18 eRedCap UEs is not introduced separately to indicate whether the UE supports BB bandwidth reduction or peak rate reduction. |

It is quite majority (13 vs 2) preferring to use new LCID values for Msg3 identification, just like R17. Please note there are still 7 LCID values reserved while only 2 R bits left. Also, the reserved eLCID values are also sufficient just in case of any more LCIDs to be used in the future.

**Question 8: Do you agree which option to support Msg3 early identification for eRedCap UE?**

**- Option 1: use two new LCID values**

**- Option 2: use one R bit in the MAC sub-header** (please clarify the technical reason if not to compromise to option 1)

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| **Companies** | **Option?** | **Comments** |
| OPPO | Option 1 |  |
| Xiaomi | Option2 | Currently XR is discussing using more new LCID values. It is better to reuse the R17 LCID to save more LCID values for other usage.[Rapp]: Any R17/R18 newly introduced MAC CE should use eLCID rather than LCID. |
| Spreadtrum | Option 1 |  |
| MediaTek | Option 2 | While there are 7 LCIDs remaining, there are valid usecases in other WIs such as XR and LTM where new MAC CEs are to be introduced that cannot use eLCID. If we use another 2 LCIDs for eRedCap, it is highly likely that we reach the end of Rel-18 to find that we do not have sufficient LCIDs to address the needs of all Rel-18 WIs when merging MAC CRs. The use of R bits in this case is therefore justified and bearing in mind that the R bit will only be used in conjunction with R17 RedCap LCIDs (35 and 36), the R bits remain available for use with other LCIDs.[Rapp]: Any R17/R18 newly introduced MAC CE should use eLCID rather than LCID. |
| Nokia | Option 2 |  |
| Huawei, HiSilicon | Option 1 | LCID for CCCH is different with the (e)LCID for new MAC CE. It is the R17 common understanding that newly introduced MAC CE should use eLCID (which is sufficient) rather than the precious LCID. See Table 6.2.1-2b Values of one-octet eLCID for UL-SCH in 38.321. |
| Samsung | Option 1 |  |

**2.9 Msg1 early identification**

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| **Tdoc** | **Related proposals** |
| R2-2302640ChinaTelecom | Proposal 2: It is optional to configured early indication via Msg1/MsgA PRACH for Rel-18 eRedCap. |
| XiaomiR2-2302704 | Proposal 1 Early indication of eRedcap UE capabilities during the initial access by Msg1 depends more on RAN1 output.Proposal 2 If Early indication of eRedcap UE by Msg1 is confirmed by RAN1, it should be optionally configured by NW.Proposal 4 RAN2 need to consider the impact on UE selecting the set(s) of applicable RACH resources based on RAN1’s discussion on msgA PUSCH design.Proposal 5 RAN2 do not need to consider separate EI for Rel-18 eRedCap UE capable of 20MHz + PR1 and Rel-18 eRedCap UE capable of BW3/PR3 + PR1 during initial access.Proposal 6 Rel-18 eRedCap UE capable of 20MHz + PR1 can be further identified by existing UE capability or by msg5.  |
| R2-2302825ZTE | Proposal 1: Msg1/MSGA based early indication could be supported in order that NW can differentiate the R18 eRedCap UE and meet its 5MHz bandwidth restriction for scheduling Msg3 PUSCH resources.Proposal 2a: RAN2 to optionally define a new feature of eRedCap with the reserved spare bit in FeatureCombination-r17. This is used as Msg1/MSGA based early indication for indicating Rel-18 eRedCap UE.Proposal 2b: If the eRadCap RACH resource is not configured but the redCap RACH resource is configured, the eRadCap UE use the redCap RACH resource. |
| R2- 2304010 LG Electronics | Proposal 2. Wait for RAN1 to decide whether to support separated Msg1-based early indication.Proposal 3. The set of RA resource for Rel-17 RedCap early indication should be available for Rel-18 RedCap UE. |
| R2-2304062Ericsson | Proposal 3 For UE BB bandwidth reduction, support additional separate early indication in Msg1 for 4-step RACH.Proposal 4 For UE BB bandwidth reduction, support additional separate early indication in MsgA PRACH for 2-step RACH.Proposal 5 Support at least one of the following options to ensure that gNB knows whether to expect access by UEs supporting UE BB bandwidth reduction:• Option 1: Additional separate early indication in Msg1 only concerns UEs that support UE BB bandwidth reduction.• Option 2: Access control/barring is separate for UEs that support UE BB bandwidth reduction and UEs that only support UE peak data rate reduction. |

Note, RAN2 had the following agreement last meeting and RAN1 had no new progress on this issue: “*We will wait for RAN1 progress to see if there is a need for a Msg1 early indication for eRedCap.*”

**Question 9: This box is only used if you have any critical argument of “not waiting for RAN1”; otherwise, you can skip this question.**

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| **Companies** | **Comments** |
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# Conclusion and proposals

Based on the above summary, following proposals are given.

**TBD.**

# Reference

1. R2-2302528 Discussion on access restriction for eRedCap Futurewei
2. R2-2302532 Discussion on early indication for eRedCap UE OPPO
3. R2-2302544 Discussion on cellbarring for eRedCap UEs OPPO
4. R2-2302566 Discussion on further UE complexity reduction CATT
5. R2-2302640 Discussion on access restriction and capability related for eREDCAP China Telecommunications
6. R2-2302641 Discussion on Early Indication for eREDCAP China Telecommunications
7. R2-2302704 Discussion on early indication for eRedcap devices Xiaomi
8. R2-2302705 Discussion on UE access restrictions and other impacts for eRedcap devices Xiaomi
9. R2-2302736 RAN2 impacts to support Rel-18 RedCap UEs Intel Corporation
10. R2-2302737 Capability impacts to support Rel-18 RedCap UEs Intel Corporation
11. R2-2302802 On access restrictions for enhanced RedCap Nokia, Nokia Shanghai Bell
12. R2-2302817 Discussion on access restriction and capability for eRedCap vivo, Guangdong Genius
13. R2-2302825 Early indication and access restriction for eRedCap UE ZTE Corporation, Sanechips
14. R2-2302826 Capability definition and report for eRedCap UE ZTE Corporation, Sanechips
15. R2-2302949 Discussion on early indication and access restriction for eRedCap NEC
16. R2-2303069 Early identification and access restriction for eRedCap UEs Huawei, HiSilicon
17. R2-2303070 Discussion on how to define and capture the capability of eRedCap UEs Huawei, HiSilicon
18. R2-2303149 Discussion on access restriction for eRedCap Sharp discussion
19. R2-2303305 Early identification for eRedCap devices MediaTek Inc.
20. R2-2303306 Access restrictions for eRedCap devices MediaTek Inc.
21. R2-2303323 Discussion on early indication and access restriction Samsung
22. R2-2303543 Discussion on further reduced UE complexity CMCC
23. R2-2303562 Discussion on further complexity reduction for eRedCap UE Qualcomm Incorporated
24. R2-2303563 Discussion on optional UE capability filter for eRedCap UE Qualcomm Incorporated, Ericsson, Intel
25. R2-2303568 Discussion on further reduced UE complexity in FR1 for Rel-18 RedCap UE Spreadtrum Communications
26. R2-2303657 Early indication and access restrictions for eRedCap UE Sierra Wireless. S.A.
27. R2-2303689 On early indication for enhanced RedCap Nokia, Nokia Shanghai Bell
28. R2-2304010 Further discussion on early indication for Rel-18 RedCap UE LG Electronics Inc.
29. R2-2304062 Early indication for eRedCap UEs Ericsson
30. R2-2304064 Discussion on cell barring for eRedCap UEs Ericsson
31. R2-2304190 Discussion on further UE complexity reduction for eRedCap NTT DOCOMO INC.
32. R2-2304171 Considerations on Further reduced UE complexity for eRedcap Sequans Communications