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:

|  |
| --- |
| * 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). |

RAN1 related agreements:

|  |
| --- |
| Conclusion  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”. |

RAN #99 related 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**  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 |

**Contact information**

|  |  |
| --- | --- |
| **Company** | **Name (Email)** |
| OPPO | Haitao Li (lihaitao@oppo.com) |
| Xiaomi | Liyanhua1@xiaomi.com |
| Spreadtrum | Ellen.xu@unisoc.com |
| MediaTek | Pradeep Jose (pradeep dot jose at mediatek dot com) |
| Nokia | jussi-pekka.koskinen@nokia.com |
| Huawei, HiSilicon | Yulong (shiyulong5@huawei.com) |
| Samsung | Seung-Beom (s90.jeong@samsung.com) |
| LGE | Hanseul Hong (hanseul.hong@lge.com) |
| Apple | Naveen Palle (naveen.palle@apple.com) |
| Intel | Marta Martinez Tarradell (marta.m.tarradell@intel.com) |
| Qualcomm | Ruiming Zheng (rzheng@qti.qualcomm.com) |
| Futurewei | Yunsong Yang (yyang1@futurewei.com) |
| NEC | Satoaki Hayashi (satoaki-hayashi@nec.com) |
| Sequans | Olivier Marco (omarco@sequans.com) |
| Vivo | Chenli (Chenli5g@vivo.com) |
| ZTE | Lu Ting (lu.ting@zte.com.cn) |
| Sharp | LIU Lei (lei.liu@cn.sharp-world.com) |
| CATT | Xiangdong Zhang(zhangxiangdong@catt.cn) |
| CMCC | Wu Min(wumin@chinamobile.com) |

# Discussion

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

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302528  Futurewei | 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. |
| R2-2303069  Huawei | 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). |
| R2-2303306  MediaTek | 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. |
| R2-2303543  CMCC | 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. |
| R2-2304064  Ericsson | 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)?**

|  |  |  |
| --- | --- | --- |
| **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 |
| LGE | Yes |  |
| Apple | Yes |  |
| Intel | Partially | We share the view that network can indicate whether eRedCap are or not supported in a cell but by indicating whether the cell is or not barred for Rel-18 eRedCap UEs via a new information included as part of cell baring information in SIB1 (as explained in proposal 1 of Intel R2-2302736). However, we understand that different companies have slightly different views on the corresponding details. Maybe an agreeable/initial proposal is the second part of the statement included in Q1a - “SIB1 indicates whether a eRedCap UE is or not allowed to access to a cell”.  [Rapp]: The comment seems to say this indication can be the combined meaning of {support and allowed} vs {not support or not allowed}. Then, the UE does not need to know whether it is due to not supporting or not allowed, if NW indicate UE not to access.  Please clarify if the above is the correct intterpetation? |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| NEC | Yes | Prefer to follow Rel-17 RedCap mechanism for simplicity. |
| Sequans | Yes |  |
| vivo | Yes | Similar as R17 RedCap, an eRedCap is not allowed to access a cell does not supporting eRedCap. It is straightforward that SIB1 indicates whether a cell supports eRedCap UE or not. |
| ZTE | Yes | It is necessary to restrict the eRedCap UE from accessing a legacy cell or a cell not supporting eRedCap. |
| Sharp | Yes |  |
| CATT | Yes | Follow the majority. |
| CMCC | Yes |  |

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.**

|  |  |  |
| --- | --- | --- |
| **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.. |
| LGE | Valid | With the clarification in the Xiaomi’s comment, it seems valid and it is up to network implementation. |
| Apple | Invalid | We do not want to complicate the spec, and want many of eRedCap features to re-use R17 redcap, and so NW signaling as well.. it is useful to consider that NW also need to support R17 redcap. |
| Intel | valid | We can leave the decision up to network implementation whether it supports one or both. If RAN2 finds that there is any specific signaling/procedure with concerns (as it is explained above), we could discuss this topic again in relation to that specific topic. |
| Qualcomm | valid |  |
| Futurewei | valid | NW implementation should be allowed to do so. |
| NEC | valid | Both “supporting eRedCap UE but not supporting RedCap UE” and “supporting RedCap UE but not supporting eRedCap UE” should be considered, therefore, we prefer to separate following parameters in SIB1 for R17 Redcap and R18 eRedCap.  ・IFRI (e.g., intraFreqReselectionERedCap)  ・halfDuplexRedCapAllowed  ・cellBarredRedCap1Rx  ・cellBarredRedCap2Rx |
| Sequans | Valid | Use cases are different, so it should be a possible NW configuration.  “can still use some R17 RedCap parameters in SIB1”  Yes, for instance the initial BWP. |
| vivo | Valid  Can't use R17 parameters | In our understanding, one cell doesn’t support Rel-17 RedCap may support Rel-18 eRedCap. For example, a cell covering an unmanned factory area supports Rel-18 eRedCap for automated manufacturing, but it does not support Rel-17 RedCap.  In this example, the R17 RedCap parameters in SIB1 will not be broadcasted. Then, how can a Rel-18 eRedCap UE determines whether it is barred or not based on the IEs which are not present in SIB1? One straightforward solution is to introduce additional Rel-18 eRedCap specific parameter(s) in SIB1. |
| ZTE | Valid | NW implementation should be allowed to do so.  We are also fine with Xiaomi’s clarification. |
| Sharp | Valid | Whether there is any dependency on Rel-17 parameters can be further discussed. |
| CATT | Invalid | eRedcap UE has the same RF capability, the difference on baseband can be treated by reasonable scheduling. There is no need to deploy eRedcap specific cell. |
| CATT | Invalid | eRedcap UE has the same RF capability, the difference on baseband can be treated by reasonable scheduling. There is no need to deploy eRedcap specific cell. |

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

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302566  CATT | 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 |
| R2-2302640  ChinaTelecom | Proposal 2: Introduce a new UE type indicator in the capability signaling for Rel-18 eRedCap UE. |
| R2-2302705  Xiaomi | Proposal 3 A new UE capability parameter (e.g. supportOfRedCap-r18) is introduced to indicate Rel-18 eRedCap UE type. |
| R2-2302826  ZTE | 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). |
| R2-2303070  Huawei | 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. |
| R2-2304171  Sequans | Proposal 1: The eRedcap PRB processing capability (limited/full) is indicated by a new capability  Proposal 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 |
| R2-2302737  Intel | Proposal 1. [To confirm the following understanding from RAN1/RAN plenary agreements] Rel-18 eRedCap UE is supported only in FR1, reduces UE’s peak data rate to 10 Mbps and can operate with normal maximum UE bandwidth (i.e. 20 MHz) or with Baseband Bandwidth Reduction (i.e. reduction to 25 PRBs for 15 kHz SCS and 12 PRBs for 30 kHz SCS for unicast PDSCH/PUSCH).  Proposal 2. [To confirm the following understanding from WID/RAN plenary agreements] Any Rel-18 eRedCap UEs share the same characteristics as a Rel-17 RedCap UE except explicitly capture:  Proposal 2.1. A Rel-18 eRedCap UE also supports all RAN2-centric Rel-17 RedCap UE capabilities in the same manner (i.e., supportOf16DRB-RedCap-r17, longSN-RedCap-r17, am-WithLongSN-RedCap-r17, rrm-RelaxationRRC-ConnectedRedCap-r17).  Proposal 2.2. A Rel-18 eRedCap UE supports all RAN1-centric features (which include bwp-WithoutCD-SSB-OrNCD-SSB-RedCap-r17, halfDuplexFDD-TypeA-RedCap-r17) except for BB Bandwidth information defined as part of 28-1 feature (i.e., supportOfRedCap-r17). Send an LS to RAN1 informing on RAN2 agreement based on WID and asking for input, if any, on applicable features for Rel-18 eRedCap UE.  Proposal 3. New capability (i.e., supportOfERedCap-r18) is defined to identify Rel-18 eRedCap UEs defined as follows: (A) operates only in FR1, (B) supports reduced peak data rate to 10 Mbps by setting ‘x’ value of “vLayers·Qm·f ≥ x” to [0.8] by default, or [3 or 3.2] if UE also supports reducedBB-BW-r18, and (C) supports the same features as a Rel-17 RedCap UE except for BB Bandwidth information defined as part of 28-1 feature (i.e., supportOfRedCap-r17).  Proposal 4. New capability (i.e., reducedBB-BW-r18) is defined to identify UEs supporting baseband bandwidth reduction, i.e., 25 PRBs for 15 kHz SCS and 12 PRBs for 30 kHz SCS for unicast in PUSCH and PDSCH. Absent of this capability means that if UE indicates supportOfERedCap-18, this UE supports 20MHz (i.e. x value of [0.8]). This reducedBB-BW-r18 is an optional capability only if UE also supports supportOfERedCap-r18 with x value of [3 or 3.2].  Proposal 5. To discuss whether Rel-18 eRedCap are defined option (a) as part of legacy RedCap definition in §4.2.21.1 of TS 38.306 or option (b) as a new type/definition e.g, referred as eRedCap.  Proposal 6. Section 4 on “Supported max data rate for DL/UL” in TS 38.306 needs to be updated to include RAN1 final agreement on the new value(s) of X for which the legacy constraint “vLayers·Qm·f ≥ 4” is relaxed (i.e., vLayers·Qm·f ≥ X) to get 10 Mbps peak data rate. Wait for RAN1 conclusion before RAN2 drafts corresponding TP. |
| R2-2302817  vivo | Proposal 11: Following components can be considered to be included in the basic FG for Rel-18 eRedCap UEs and Rel-18 eRedCap UE shall indicate support for the FG.                    Maximum RF bandwidth in FR1 is 20 MHz for UL and DL                    Peak data rate is around 10 Mbps                    Rel-18 early indication of Msg3/MSGA for random access                    Rel-17 configuration of separate initial UL BWP for RedCap UEs, FFS details up to RAN1                    Rel-17 configuration of separate initial DL BWP for RedCap UEs, FFS details up to RAN1 |

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)

|  |  |  |
| --- | --- | --- |
| **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 |  |
| LGE | Yes |  |
| Apple | Maybe | Need to wait for further RAN1 progress |
| Intel | See comment | We suggest focusing first the discussion on the new UE capabilities needed for Rel-18 eRedCap which is a topic currently proposed by several companies (before entering into discussion on whether it is mandatory/dedicated). In our understanding, the following are potential points proposed for agreement and discussion by RAN2 (keeping in mind that RAN2 would also need to check for inputs and/or confirmation with RAN1):   1. **A Rel-18 eRedCap UE should be able to indicate its support via new UE capability signaling specific to Rel-18 eRedCap** 2. **A new UE capability is defined to identify Rel-18 eRedCap UEs supporting reduced peak data rate to 10 Mbps (by setting different ‘x’ value of “vLayers·Qm·f ≥ x”). It may be reflected by (1), it means reduced peak date rate to 10Mbps is mandatory for Rel-18 eRedCap UEs.** 3. **A new UE capability is defined to identify reduced baseband Bandwidth Rel-18 eRedCap UEs. This new capability of BB BW reduction can be optional dependent to the support of the other new capability of data rate reduction** 4. **FFS relation between Rel-18 eRedCap and Rel-17 RedCap (e.g. whether eRedCap UE supports the same features as a Rel-17 RedCap UE except for BB Bandwidth information defined as part of 28-1 feature (i.e., supportOfRedCap-r17))** |
| Qualcomm | See comment | Unclear on what does ‘dedicated and mandatory’ mean. It is better for RAN2 to first discuss what new UE capabilities are needed for Rel-18 eRedCap, and input from RAN1 may be required.  [Rapp]: The point is we anyway need one IE to indicate this new UE type. We for sure should wait for RAN1 to understand how to indicate this. |
| Futurewei | Yes |  |
| NEC | Yes |  |
| Sequans | Yes |  |
| vivo | Yes | Rel-18 eRedCap UE has reduced capabilities compared with non-RedCap and Rel-17 RedCap UEs, such as lower BB bandwidth. To ensure better system performance, an explicit IE in the capability signaling should be introduced to enable the network can provide suitable configuration/scheduling for R18 eRedCap UE. |
| ZTE | Yes | Simply to say, similar as the *supportOfRedCap-r17* capability, It is necessary for UE to report the eRedCap capability to RAN for assisting RAN to configure the radio resource (e.g. during HO procedure). |
| Sharp | Yes |  |
| CATT | Yes |  |
| CMCC | 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.**

|  |  |  |
| --- | --- | --- |
| **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.  [Rapp]: Somehow agree. But the question wants to leave your point as FFS. First R18 eRedCap UE “does not have to” then FFS on whether “can/should”. |
| LGE | Yes | Yes for separated initial BWP for Rel-17 RedCap UE, and we can further discuss for other configurations. |
| Apple | Yes |  |
| Intel | Wait | Suggest to post-pone this discussion of the configuration until further stage-2 details are clearer on how eRedCap is defined and modeled. In our understanding, majority of the companies have not addressed this topic |
| Futurewei | Yes |  |
| NEC | Yes |  |
| Sequans | Yes | As indicated in the WID, “The WI targets enhancements applicable to the RedCap framework defined in Rel-17”. |
| vivo | Yes | Rel-17 configuration of separate initial DL/UL BWP for RedCap UEs can be also supported by R18 eRedCap UE. This is also being discussed in RAN1. They might introduce this separate initial BWP to identify Rel-18 eRedCap UE. Besides, in case Rel-17 separate initial BWP is configured for Rel-17 RedCap UEs, from system point of view, there is no additional effort for Rel-18 eRedCap UEs to use it.  Anyway, we could wait for further progress from RAN1. |
| ZTE | Yes | RAN1 has already agreed that the current initial DL/UL BWP configuration mechanism for Rel-17 RedCap UEs can be fully reused to Rel-18 RedCap UEs. |
| Sharp | Yes |  |
| CATT | Yes |  |
| CATT | Yes |  |

**2.3 IFRI (intraFreqReselection indicator)**

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302528  Futurewei | 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. |
| R2-2302544  OPPO | Proposal 2 Separate IFRI is introduced in SIB1 for eRedCap UEs. |
| R2-2302566  CATT | Proposal 2: Rel-18 RedCap UE specific cellBar, intraFreqReselection or Half-duplex FDD indication in SIB1 is not needed. |
| R2-2302640  ChinaTelecom | Proposal 1: Introduce a eRedcap specific intraFreqReselection in SIB1. |
| R2-2302705  Xiaomi | Proposal 2 To introduce a eRedcap specific intraFreqReselection in SIB1. |
| R2-2302736  Intel | 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). |
| R2-2302817  vivo | 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. |
| R2-2302949  NEC | 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. |
| R2-2303069  Huawei | Proposal 5: Introduce eRedCap UE specific IFRI in SIB1. |
| R2-2303149 Sharp | 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. |
| R2-2303306  MediaTek | 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. |
| R2-2303323  Samsung | Proposal 2. eRedCap specific IFRI (e.g., intraFreqReselectionEnhancedRedCap) is introduced in SIB1. |
| R2-2303543  CMCC | 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?**

|  |  |  |
| --- | --- | --- |
| **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 |  |
| LGE | Yes | In Rel-17, RedCap specific IFRI serves two indication purposes (three code points): 1) absence of the IFRI indicates the cell is barred to all RedCap UEs (in case cellBarred in MIB is not barred), and 2) presence of the IFRI indicates whether intra frequency reselection is allowed if RedCap UE is barred due to 1RX/2RX/halfDuplex barring.  We think the same logic can be applied to eRedCap as well. |
| Apple | Yes |  |
| Intel | Yes | During R17 ASN.1 review, it was identified that R17 RedCap specific IFRI is not aligned to how legacy IFRI behaviour is usually defined in previous releases. IFRI bit for R17 RedCap combined the functionality of cell barring and intra-freq cell reselection. This could lead to confusion. Specifically, the question here is not clear to us – whether the question is referring to both functionalities or not. We suggest focusing on the functionality first and discuss signalling later.  In terms of functionality, we agree that both R18 eRedCap cell barring and intra-frequency cell selection functionalities should be supported.  In terms of signalling, please see our response to Q3b. |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| NEC | Yes |  |
| Sequans | Yes |  |
| vivo | Yes | Same as our reason in Section 2.1 above, the existing intraFreqReselectionRedCap-r17 cannot be reused directly for Rel-18 eRedCap UE, because some cell doesn’t support Rel-17 RedCap but may support Rel-18 eRedCap, so intraFreqReselectionRedCap-r17 will not be broadcasted in SIB1. Then, how can a Rel-18 eRedCap UE perform cell re-selection without IFRI indication when it is barred in this case? One straightforward solution is to introduce an additional Rel-18 eRedCap specific IFRI indication in SIB1. |
| ZTE | Yes, but | We have sympathy with Intel’s concern about confusion caused by R17 RedCap specific IFRI. We also think the meaning of the new R18 IFRI should be further clarified.  Based on our understanding, the IFRI is usually used to indicate whether cell selection/reselection to intra-frequency cells is allowed when the highest ranked cell is barred, or treated as barred by the UE, it should not be used to control whether the UE is allowed to access the current cell.  Whether the eRedCap UE is allowed to access the current cell should depend on the *cellBarred-eRedCap* IE. E.g. if the *cellBarred-eRedCap* IE is absent in SIB1, the eRedCap UE shall consider the cell as barred. |
| Sharp | Yes |  |
| CMCC | 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)*

|  |  |  |
| --- | --- | --- |
| **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 |  |
| LGE | Yes |  |
| Apple | Yes |  |
| Intel | No (see comment) | Please see our comments to Q3a.  We understand that R18 eRedCap could be defined similarly to R17 RedCap for the IFRI modeling. However, during R17 ASN.1 review, it was identified that R17 RedCap specific IFRI is not aligned to how legacy IFRI behaviour is usually defined in previous releases and we think it could lead to confusion. In summary, we have slightly preference to correct this definition for R18 eRedCap by not using IFRI to indicate whether eRedCap UEs are or not allowed in a cell (and instead only using cell barring indication to know whether R18 eRedCap is or not allowed in the cell). |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| NEC | Yes |  |
| Sequans | Yes |  |
| vivo | Yes | We think the same logic and design for R17 IFRI can be reused for R18 IFRI. |
| ZTE | No (see comment) | Agree with Intel. See our comments in Question 3a. |
| Sharp | Yes |  |
| CMCC | Yes |  |

**2.4 cellBarredRedCap**

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302544  OPPO | Proposal 1 Separate cellBarred indications are introduced in SIB1 for eRedCap UEs. |
| R2-2302566  CATT | Proposal 2: Rel-18 RedCap UE specific cellBar, intraFreqReselection or Half-duplex FDD indication in SIB1 is not needed. |
| R2-2302705  Xiaomi | 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. |
| R2-2302736  Intel | 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. |
| R2-2302802  Nokia | Proposal 1: NW can control whether cell is barred Rel-18 RedCap devices  Proposal 2: NW can allow Rel-17 RedCap devices, but bar Rel-18 RedCap devices  Proposal 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 |
| R2-2302817  vivo | 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. |
| R2-2302825  ZTE | 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. |
| R2-2302949  NEC | 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. |
| R2-2303069  Huawei | 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. |
| R2-2303149 Sharp | 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. |
| R2-2303306  MediaTek | Proposal 3: Existing Rel-17 barring indications for 1Rx, 2Rx and half-duplex FDD UEs can be reused for eRedCap operation. |
| R2-2303323  Samsung | 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. |
| R2-2303657  Sierra Wireless | Separate SIB Cell barring indications for BW3+PR1 devices and PR1 only devices should be supported |
| R2-2304064  Ericsson | Proposal 1 Cell barring parameters, i.e., cellBarredRedCap1Rx, cellBarredRedCap2Rx, and halfDuplexRedCapAllowed, introduced for Rel-17 RedCap UEs are used for Rel-18 RedCap UEs. |
| R2-2304190  NTT DOCOMO | Proposal 3. RedCapUE and eRedCapUE may have different use cases and should be able to be controlled at a finer granularity |
| R2-2304171  Sequans | 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);**

|  |  |  |
| --- | --- | --- |
| **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. |
| LGE | Option 2, not strong | We do not see a strong need to have different barring control between RedCap UEs and eRedCap UEs for 1RX, 2RX, halfduplex, but we can follow operators’ desire. |
| Apple | Op2 | Re-use the same as R17 cell barring based on support of features |
| Intel | Yes (with comment) | Network should be able to indicate whether R18 eRedCap is or not barred, and for this, at least a new barring indication is needed. |
| Qualcomm | Option 1 |  |
| Futurewei | Option 1 |  |
| NEC | Option 1 |  |
| Sequans | Option 1 | Use cases are different, so it’s better to use separate indications. |
| vivo | Option 1 | With separate cell bar indications, a cell has the flexibility to bar only R17 RedCap UE but allow R18 eRedCap UE. |
| ZTE | Option 1 | eRedCap UE should not access a legacy cell or a cell not supporting eRedCap. Therefore, a new R18 eRedCap UE specific cell barring indication (e.g. *cellBarred-eRedCap*) should be introduced. |
| Sharp | Option 1 | eRedCap UEs are a kind of UEs with further reduced complexity compared with RedCap UEs. Whether there is any dependency between R18 eRedCap cell barring and R17 RedCap cell barring can be further discussed. |
| CATT | Option 2 |  |
| CMCC | Option 1 | One new IE in SIB1 may be introduced to control the R18 eRedCap UE access the cell. |

**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?**

|  |  |  |
| --- | --- | --- |
| **Companies** | **Option(s)?** | **Comments** |
| OPPO | Option 1 | Similar as Rel-17 RedCap |
| Xiaomi | Option1 | Use the same way as R17. |
| Huawei, HiSilicon | Option 1 |  |
| Samsung | Option 1 | We support Option 1, and LS seems needed for RAN1 confirmation. |
| Intel | See comment | Both options are feasible from signaling point of view (just with some implications). We suggest focusing on the functionality first and discuss later signaling. On summary, we suggest proposing that eRedCap should be able to be barred differently if they have 1 Rx or 2 Rx. FFS on the signaling (re-use r17 vs new one) |
| Qualcomm | Option 1 | Option 2 is different from Rel-17 and should consult with RAN1. |
| Futurewei | Option 1 | Similar to R17 RedCap. |
| NEC | Option 1 | Prefer to follow Rel-17 RedCap mechanism for simplicity. |
| Sequans | Option 1 | Similar as for R17. |
| Vivo | Option 1 | Similar as Rel-17 RedCap.  Actually, it depends on the operator requirements on whether there is motivation to bar partially Rel-18 eRedCap Ues. |
| ZTE | Option 2 | A new R18 eRedCap UE specific cell barring indication (e.g. cellBarred-eRedCap) can be combined with *halfDuplexRedCapAllowed-r17, cellBarredRedCap1Rx-r17* and *cellBarredRedCap2Rx-r17* to indicate all Rel-18 eRedCap UE feature separately, e.g. UE BB bandwidth reduction/UE peak data rate reduction, half-Duplex, 1Rx or 2Rx. |
| Sharp | Option 1 | Similar as Rel-17. |
| CATT | Option 2 |  |
| CMCC | Option 1 | Similar as Rel-17. |

**2.5 HD-FDD indication**

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302566  CATT | Proposal 2: Rel-18 RedCap UE specific cellBar, intraFreqReselection or Half-duplex FDD indication in SIB1 is not needed. |
| R2-2302817  vivo | 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. |
| R2-2303069  Huawei | 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**

|  |  |  |
| --- | --- | --- |
| **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. |
| LGE | Option 1 |  |
| Apple | Op 1 |  |
| Intel | See comment | Similar to previous question; we suggest proposing that eRedCap should be able to be barred differently if they are HD-FDD. FFS on the signaling (re-use r17 vs new one) |
| Qualcomm | Option 1 |  |
| Futurewei | Option 1 |  |
| NEC | Option 2 | Prefer to follow Rel-17 RedCap mechanism for simplicity. |
| Sequans | Option 2 | In general we prefer separate indication for flexibility. |
| Vivo | Option 2 | Same as our reason in Section 2.1 above, one cell doesn’t support Rel-17 RedCap but may support Rel-18 eRedCap. In this example, the existing halfDuplexRedCapAllowed-r17 will not be broadcasted in SIB1. Then, how can a Rel-18 eRedCap UE supporting only half-duplex FDD operation confirm whether it is barred or not? One straightforward solution is to introduce an additional Rel-18 eRedCap specific halfDuplex indication in SIB1.  [Rapp] The comment is related to the understanding in Question 1b |
| ZTE | Option 1 | Similar view as Huawei. It is enough to use *halfDuplexRedCapAllowed-r17* to indicate whether the cell allows half-duplex FDD operation. |
| Sharp | Option 2 | Slightly prefer separate control, but also fine to follow the majority’s view. |
| CATT | Option 1 | Agree with Huawei. |

**2.6 interFreqCarrierFreqList about eRedCap**

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302817  vivo | 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. |
| R2-2303069  Huawei | Proposal 7: Similar to R17, introduce eRedcapAccessAllowed-r18 in interFreqCarrierFreqList in SIB4, about the frequency of neighbour cell supporting eRedCap. |
| R2-2303149 Sharp | Proposal 2: Introduce a separate AccessAllowed indication for eRedCap UEs in SIB4. |
| R2-2303323  Samsung | 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. |
| R2-2304064  Ericsson | 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?**

|  |  |  |
| --- | --- | --- |
| **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 |  |
| LGE | Yes |  |
| Apple | Yes |  |
| Intel | Yes |  |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| NEC | Yes |  |
| Sequans | Yes |  |
| vivo | Yes | Reusing the redCapAccessAllowed-r17 to Rel-18 eRedCap will lead to the huge restriction on network deployment, i.e. Rel-17 RedCap and Rel-18 eRedCap should be deployed on the same frequency. To avoid such restriction, a separate indication (e.g. eRedCap-AccessAllowed-r18) is better. |
| ZTE | Yes | Similar as the *redcapAccessAllowed-r17,* it is useful to indicate whether eRedCap UEs are allowed to access some certain frequencies.  We tend to agree with Rapp that RedCap and eRedCap may have different deployment on different frequencies, so different lists may be needed. |
| Sharp | Yes |  |
|  |  |  |

**2.7 initial BWP for eRedCap**

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302705  Xiaomi | 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. |
| R2-2302736  Intel | 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. |
| R2-2303069  Huawei | 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. |
| R2-2303689  Nokia | Proposal 1: Do not support the separate initial BWP configured only for Rel-18 RedCap UEs. |
| R2-2304190  NTT 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 time  Case 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?**

|  |  |  |
| --- | --- | --- |
| **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 |  |
| LGE | Yes |  |
| Apple | Yes |  |
| Intel | Yes |  |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| NEC | Yes |  |
| vivo | See comments | We think this issue is more related to RAN1. It is better up to RAN1. There is no need and motivation for RAN2 to confirm some RAN1 understanding. We could just wait for RAN1 conclusion. |
| ZTE | Yes | RAN1 has already agreed that the current initial DL/UL BWP configuration mechanism for Rel-17 RedCap UEs can be fully reused to Rel-18 RedCap UEs. |
| Sharp | Yes |  |
| CATT | Yes |  |
| CMCC | 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?**

|  |  |  |
| --- | --- | --- |
| **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 |  |
| LGE | Yes | It is similar operation defined to Rel-17 RedCap. |
| Apple | Yes |  |
| Intel | Yes |  |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| NEC | Yes |  |
| Sequans | Yes |  |
| vivo | See comments | We have some sympathy on the proposal from Rapporteur. If Rel-18 eRedCap specific initial BWP is not introduced/configured, while Rel-17 RedCap specific initial BWP is configured, Rel-18 eRedCap UE can always use Rel-17 RedCap specific initial BWP.  But considering this is also being discussed in RAN1. We prefer to wait for RAN1 progress. |
| ZTE | Yes |  |
| Sharp | Yes |  |
| CATT | Yes |  |
| CMCC | Yes |  |

**2.8 Msg3 early identification**

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302532  OPPO | 1. For Msg3/MsgA PUSCH based early indication, new LCIDs are used for CCCH and CCCH1 for Rel-18 eRedCap. |
| R2-2302566  CATT | 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 |
| R2-2302640  ChinaTelecom | Proposal 1: Rel-18 eRedCap UE can be identified by the network via MSG3/MSGA from an eRedCap specific LCID(s). |
| Xiaomi  R2-2302704 | 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. |
| R2-2302817  vivo | 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. |
| R2-2302825  ZTE | 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. |
| R2-2302949  NEC | 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. |
| R2-2303069  Huawei | Proposal 10: It can be the working assumption that two new LCID are used for Msg3 based eRedCap early identification. |
| R2-2303305  MediaTek | 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. |
| R2-2303323  Samsung | Proposal 1. Two reserved LCIDs are used to support Msg3/MsgA early indication for Rel-18 eRedCap. |
| R2-2303543  CMCC | 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. |
| R2-2303657  Sierra Wireless | Separate Msg3/MsgA early indication for BW3+PR1 devices and PR1 only devices should be supported |
| R2-2303689  Nokia | 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. |
| R2-2304062  Ericsson | 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)

|  |  |  |
| --- | --- | --- |
| **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.  [Rapp]: Better companies to check if any other WI wants to introduce new MAC CE which cannot use eLCID. |
| 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 |  |
| LGE | Option 1 | Our first preference is to use eLCID considering the limited number of LCID space (i.e., only 7 values left) and only one more octet is needed to support eLCID, which is a marginal issue.  If eLCID is not agreed, our second preference is Option 1(LCID), since there are still 7 LCID values left, as rapporteur commented. Given that the additional feature (which can be defined in future release) can be applied to Rel-18 eRedCap UE, using R field seems more risky, since there only 2 field left. |
| Apple | Op1 | eLCID is also ok. |
| Intel | Option 1 |  |
| Qualcomm | Option 1 |  |
| Futurewei | Option 1 |  |
| NEC | Option 1 |  |
| Sequans | Option 1 |  |
| vivo | Option 1, but option 2 is also acceptable | Following the same logic as R17 RedCap, two separate reserved LCIDs are used for CCCH and CCCH1 cases respectively. RedCap and eRedCap UEs have no risk of being unable to support non-RedCap features in future due to insufficient extension fields in MAC subheader.  But we think option 2 is also acceptable for us, considering there is only limited number of reserved LCIDs. |
| ZTE | Option 1 | Similar as RedCap UE identification, using new LC IDs is a usual way to identify the UE type in Msg3. |
| Sharp | Option 1 |  |
| CATT | Option 1 |  |
| CMCC | Option 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. |

**2.9 Msg1 early identification**

|  |  |
| --- | --- |
| **Tdoc** | **Related proposals** |
| R2-2302640  ChinaTelecom | Proposal 2: It is optional to configured early indication via Msg1/MsgA PRACH for Rel-18 eRedCap. |
| Xiaomi  R2-2302704 | 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. |
| R2-2302825  ZTE | 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. |
| R2-2304062  Ericsson | 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.**

|  |  |
| --- | --- |
| **Companies** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |

# 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