**3GPP TSG-RAN WG1 #108-e R1-220xxxx**

**e-Meeting, February 21st - March 3rd, 2022**

**Agenda Item: 8.6.2**

**Title: FL summary #2 on RAN1 aspects for RAN2-led features for RedCap**

**Source: Moderator (Apple)**

**Document for: Discussion, Decision**

# Introduction

This feature lead (FL) summary (FLS) concerns the Rel-17 work item (WI) for support of reduced capability (RedCap) NR devices [1]. Earlier RAN1 agreements for this WI are summarized in [2].

This document summarizes contributions [4] – [16] submitted to agenda item 8.6.2 and captures this email discussion on RAN1 aspects for RAN2-led features for RedCap:

|  |
| --- |
| [108-e-R17-RedCap-03] Email discussion for maintenance on RAN1 aspects for RAN2-led features – Hong (Apple)   * 1st check point: February 25 * Final check point: March 3 |

In this round of the email discussion, please comment on the issues tagged ‘FL2’ before Feb, 23rd, Wednesday, UTC 21:59.

# Early indication of RedCap UEs in Two-Step RACH

### Issue 1: Early indication for Redcap by Dedicated PUSCH in 2-Step RACH

The following was agreed in RAN1 107 e-meeting for 2-step RACH [2]:

|  |
| --- |
| Agreement:   * For 2-step RACH, support the early indication of RedCap UEs at least in MsgA PRACH.   + The early indication in MsgA PRACH can be configured to be enabled/disabled via SIB.   + From RAN1 perspective, the following methods can be used for early indication both for shared initial UL BWP and separate initial UL BWP     - separate MsgA PRACH resource     - MsgA PRACH preamble partitioning |

In addition, the following was agreed in RAN2 116-e meeting for 2-step RACH procedure early identification [3]:

|  |
| --- |
| Agreements:   * […] * At least the dedicated LCID (i.e. the Msg3 early identification solution) can be supported for MsgA early identification. It is up to RAN1 on the need of dedicated preamble and/or dedicated PUSCH resource configuration. * [...] |

Contribution [6, 7, 9, 10, 12] discussed the need of dedicated resource configuration for the MsgA PUSCH to early identification. Companies’ proposals on this issue are briefly summarized in Table 1 below:

**Table 1: Views on dedicated MsgA PUSCH resource of 2-step RACH for early identification**

|  |  |
| --- | --- |
| Company | Proposals |
| OPPO [6] | * Proposal 1: For early indication of RedCap UE in MsgA PRACH, dedicated MsgA PUSCH resource is configured and mapped to dedicated MsgA PRACH preamble for RedCap UE. * Proposal 2: For early indication of RedCap UE in MsgA PUSCH, neither dedicated MsgA PUSCH resource nor dedicated MsgA PRACH configuration is needed for RedCap UE. |
| CATT [7] | * Proposal 4: For 2-step RACH, support the early indication of RedCap UEs in MsgA PUSCH. * Reuse the same mechanism of Msg3 early indication of 4-step RACH. |
| Ericsson [9] | * Observation 1 It is enough to support early RedCap UE indication in MsgA PRACH part and in MsgA PUSCH part using the RedCap-specific LCID. * Proposal 1 Do not support early RedCap UE indication in MsgA PUSCH part using dedicated resource configuration. |
| CMCC [10] | * Observation: A separate MsgA PUSCH resource configuration only without dedicated MsgA PRACH resource and MsgA PRACH preamble partitioning can not realized early indication of RedCap UEs. * Proposal 1: For 2-step RACH, support separate MsgA PRACH resource and MsgA PRACH preamble partitioning with associated MsgA PUSCH resource for early indication of RedCap UEs. * Proposal 2: For 2-step RACH, dedicated PUSCH resource configuration but shared RACH resource or PRACH preamble for early indication of RedCap UEs is not supported. * Proposal 3: 2 step RACH only configuration on uplink UL BWP is not allowed, if configured, it is always on the same BWP as four-step RACH. |
| Lenovo, Motorola Mobility [12] | * Proposal 1: The POs and/or PRUs for RedCap UEs 2-step RACH can be separately configured, or shared with non-RedCap UEs. * Proposal 2: The MsgA preambles for RedCap UEs can be separately ordered or unified ordered with those for non-RedCap UEs. |

For 2-step RACH procedure, as defined in Rel-16, a UE determines time resources and frequency resources for PUSCH occasions in an active UL BWP based on the msgA-PUSCH-Config. Two cases exist, one is dedicated MsgA preamble reserved for Redcap early identification (Case 1) and the other is shared MsgA preambles for Redcap and non-Redcap UEs (Case 2). For Case 1, the MsgA PUSCH resources associated with the dedicated preamble resource are determined based on the existing Rel-16 association rule and used for 2-step RACH procedure by Redcap UE [6,7].

For Case 2, different views were observed based on the proposal listed above:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Justification | Companies | Num. of Companies |
| Opt.1 | Do not support early RedCap UE indication in MsgA PUSCH part using dedicated resource configuration | * Using the RedCap-specific LCID in Msg3 is sufficient for Redcap early identification. | * OPPO [6] * CATT [7] * Ericsson [9] * CMCC [10] | 4 |
| Opt.2 | Separate MsgA PUSCH resource can be configured for Redcap UE for early indication. |  | -Lenovo [12] | 1 |

# Case 2

# <1st Round Comments>

**FL1 High Priority Question 1-1: For Case 2 (i.e., no dedicated MsgA preamble and MsgA PRACH resource is configured for early indication**, **which one of the proposals (i.e., Opt.1, Opt.2) do you support for MsgA PUSCH resource used for early indication:**

* Opt.1: Do not support early RedCap UE indication in MsgA PUSCH part using dedicated resource configuration.
* Opt.2: Separate MsgA PUSCH resource can be configured for Redcap UE for early indication.

|  |  |  |
| --- | --- | --- |
| **Company** | **Which Opt.?** | **Comments** |
| Lenovo, Motorola Mobility | Opt.1 | We’d like to clarify that we do NOT support opt.2 of using separate MsgA PUSCH resource for early identification of RedCap UEs.  Proposal 1 in our contribution is regarding **when separate MsgA RACH preamble is configured for 2-step RACH for RedCap UEs**, separate POs or PRUs for MsgA PUSCH can be configured for RedCap UEs, or they are shared with non-Redcap UEs. |
| OPPO | Opt.1 | As raised in our contribution, for shared MsgA preamble and MsgA PRACH resource, it is not necessary to support separate MsgA PUSCH resource configuration for early indication, since dedicated LCID has already been agreed for the same purpose. |
| vivo | Opt.1 | Since dedicated LCID (i.e. the Msg3 early identification solution) is supported for MsgA early identification, there is no need to configure or use dedicated MsgA PUSCH resource for Redcap UE early indication. |
| Spreadtrum | Option 1 | According to RAN2’s agreement, Msg3 early indication is always ‘enabled’ for the case of CBRA via LCID, there is no need to introduce a redundant function. In addition, separate MsgA PUSCH resource for early indication may increase the complexity, we don’t see the benefit for separate MsgA PUSCH resource used for early indication. |
| CATT | Opt. 1 | We only have concern in the case when MsgA PRACH preamble and RO are totally shared but MsgA PUSCH is separated. If one of dedicated MsgA PRACH preamble or dedicated MsgA PRACH occasion is configured for early indication, it seems no harm (and natual) if separate PUSCH resource can be configured for RedCap. |
| Noridc | Option 1 |  |
| ZTE, Sanechips |  | If 2-step RACH is configured in separate initial DL/UL BWP, seems it is nature to have separate MsgA PUSCH resource. However, whether it is only used for early indication can be further discussed, since the early indication by LCID is realized by RAN2 and the separate MsgA PUSCH resource also can be used to extend the capacity and avoid resource collision. |
| Nokia, NSB | Opt. 1 | Opt. 1, because dedicated LCID has already been agreed for the same purpose. |
| Intel | Opt. 1 | As cited by others above in support of Opt. 1, use of dedicated LCID has been introduced for this purpose and always available. |
| FUTUREWEI | Opt. 1 |  |
| Qualcomm | Option 1 |  |
| LG Electronics | Opt.1 | If MsgA preambles are shared for Redcap and non-Redcap UEs, early indication in MSGA PUSCH part can be supported by LCID field of PUSCH part. |
| DOCOMO | Opt.1 |  |
| Sharp | Opt.1 |  |
| CMCC | Opt.1 | For 2-step RACH, RAN1 has agreed early indication of RedCap UEs through MsgA PRACH by separate MsgA PRACH resource and MsgA PRACH preamble partitioning, which is aligned with the Msg.1 solutions of 4-step RACH. And also RAN2 has agreed to support dedicated LCID for MsgA early identification, which is aligned with Msg3 early identification solution for 4-step RACH. With such agreements, the early indication has been well realized for 2-step RACH, either by PRACH part or PUSCH part.  We also wonder how dedicated PUSCH resource configuration only can realize early identification. |
| Xiaomi | Opt.1 |  |
| China Telecom | Opt.1 |  |
| Ericsson | Opt. 1 | Since RedCap UE indication in the MsgA PUSCH part using RedCap-specific LCID (as well as in the MsgA PRACH part), we do not see a need for yet another mechanism for early indication in the MsgA PUSCH part. |
| Samsung |  | OK with Opt1. RAN2 has not agreed that early indication by LCID is mandatory, but they have a WA. |

# <1st Round Summary>

All of companies prefer to go with Opt.1 for Case 1. Therefore, Option.1 was proposed for GTW session as a conclusion as it has no spec impact.

# <2nd Round Comments>

**FL2 High Priority Proposal 1-1:**

|  |
| --- |
| **Conclusion:**  -     For Case 2 of 2-step RACH procedure (i.e., no dedicated MsgA preamble and no MsgA PRACH resource is configured for early indication of Redcap UEs), do not support early RedCap UE indication in MsgA PUSCH part using dedicated resource configuration. |

Please comment only if you have concern on the proposed conclusion.

If commenting on the exact wording above, please provide modified version with reasoning.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or NO?** | **Comments** |
| Ericsson | Y |  |
|  |  |  |

# Case 1

# <1st Round Comments>

**FL1 High Priority Question 1-2: For Case 1 (i.e., there is dedicated MsgA preamble and MsgA PRACH resource is configured for early indication**, **do you think anything needs to be discussed or concluded for MsgA PUSCH?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Lenovo, Motorola Mobility | For case 1, it needs to discuss how MsgA PUSCH resource is determined, e.g., separate configured or shared with non-RedCap UEs, see also our reply for Q1-1. |
| OPPO | For case 1, the RedCap and non-RedCap UE may share the same PO and PRU, which will have interference with each other. It needs to discuss the MsgA PUSCH configuration in this case. |
| Vivo | No |
| Spreadtrum | No |
| CATT | For case 1, it should be allowed to configure separate MsgA PUSCH resource dedicated for RedCap UE. But if MsgA PUSCH resource dedicated for RedCap is not configured, then they share the MsgA PUSCH. |
| Nordic | No |
| ZTE, Sanechips | FFS: dedicated MsgA PRACH resource vs shared MsgA PUSCH, in my initial understanding, it may bring the MsgA PUSCH resource collision issue. |
| Nokia, NSB | No |
| Intel | No. |
| Qualcomm | No |
| LG Electronics | If dedicated MsgA preambles are reserved for Redcap early identification, MsgA PUSCH part can be based on dedicated resource configuration. |
| DOCOMO | No. If RAN2 needs RAN1 decision, it can be communicated via LS. |
| Sharp | No. |
| CMCC | No |
| Xiaomi | No |
| China Telecom | We see no need to make conclusion for MsgA PUSCH. |
| Ericsson | No. The scenario highlighted by ZTE can be considered in RAN2, e.g., under the AI on RA partitioning. |
| Samsung | For Case 1, further RAN1 discussion is not necessary. |

# <1st Round Summary>

Table below listed the preferences of companies on this issue for Case 1.

|  |  |
| --- | --- |
| Description | Companies |
| Yes, need to discuss the configuration of MsgA PUSCH resource | **Supported by**: **(4)**   * Lenovo, OPPO, [CATT], [LGe] |
| No need of further discussion (Reuse the existing 2-step configuration) | **Supported by: (12)**   * Vivo, Spreadtrum, Nordic, Nokia, Intel, Qualcomm, Sharp, CMCC, Xiaomi, China Telecom, Ericsson, Samsung |
| FFS | **Supported by: (1)**   * ZTE |

12 companies prefer to reuse the Rel-16 mapping rule between the MsgA PRACH and the corresponding MsgA PUSCH. As a consequence, depending on the configuration of dedicated MsgA PRACH for early indication and the MsgA PUSCH configuration, there may or may not have dedicated MsgA PUSCH resource associated with the dedicated PRACH resource. In any case, it was preferred by majority that the Rel-16 MsgA PUSCH configuration for 2-step RACH is reused and no need to introduce new signaling to allow dedicated MsgA PUSCH configuration for Case 1.

Therefere, FL formulate a conclusion below to close the discussion for Case 1.

# <2nd Round Comments>

**FL2 High Priority Proposal 1-1:**

|  |
| --- |
| **Conclusion:**  -     For Case 1 of 2-step RACH procedure (i.e., either dedicated MsgA preamble or MsgA PRACH resource is configured for early indication of Redcap UEs), do not support dedicated MsgA PUSCH resource configuration and reuse the Rel-16 MsgA PUSCH resource configuration. |

Please comment only if you have concern on the proposed conclusion.

If commenting on the exact wording, please provide modified version with reasoning.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or NO?** | **Comments** |
| CATT | Y, probably | Only ask for one small clarification, does ‘*do not support dedicated MsgA PUSCH resource configuration*’ mean ‘forcing the RedCap UEs to share exactly the same MsgA PUSCH resource with normal UEs’? |
| LG Electronics |  | It can be up to gNB configuration whether to support dedicated MsgA PUSCH resource configuration. The dedicated MsgA PUSCH resource configuration can be constructed based on Rel-16 MsgA PUSCH resource configuration. |
| Ericsson | Y, probably | Perhaps the conclusion can be phrased similarly as the proposed conclusion for Case 2 so that it talks about support of “early RedCap UE indication in MsgA PUSCH part using dedicated resource configuration” rather than about the PUSCH resource configuration itself. Case 1 and Case 2 proposals can even be combined to simply say “Early RedCap UE indication in MsgA PUSCH part using dedicated resource configuration is not supported”. |

### Issue 2: Cell Access Control for HD-FDD UEs

Contribution [14] states that HD-FDD and FD-FDD are both optional feature for Redcap UE based on the UE features and WID. As a consequence, if a cell allows a HD-FDD RedCap UE to access, the cell needs to indicate such access information explicitly in SI. Therefore, the following was proposed in [14]:

* Proposal: For a cell with paired spectrum, it needs to explicitly indicate whether or not it allows a HD-FDD RedCap UE to access in SI.

# <1st Round Comments>

**FL1 High Priority Question 2-1: Can we agree the following proposal for cell access of HD-FDD Redcap device?**

* For a cell with paired spectrum, it needs to explicitly indicate whether or not it allows a HD-FDD RedCap UE to access in SI.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No,**  **if ‘no’, please provide brief reasoning in ‘Comment’ column** | **Comments** |
| Lenovo, Motorola Mobility | No | Cell barring configuration is applicable for both HD-FDD and FD-FDD UEs. |
| OPPO | No | Cell barring is applicable for RedCap UEs. Further cell barring configuration is not necessary. |
| Vivo | No | This proposal is out of the WID scope (WID only requires to specify access barring specific to the UE Rx number, nothing else). For HD-FDD UE, the collision handling behavior is clearly specified, there is no strong reason to restrict the HD-FDD RedCap UE to access. |
| Spreadtrum | No strong view | In our understanding, for now, if a cell does not support HD-FDD operation, the cell needs to release the HD-FDD UE after the UE report its capability. The result is a waste of resource and power used in the random access process. Maybe it can be an optimization. |
| CATT | N | Agree on the companies above.  We also concern this will lead to some ‘unfairness’ among HD and FD RedCap UEs. |
| Nordic | No |  |
| ZTE, Sanechips | No |  |
| Nokia, NSB | No |  |
| Intel | No |  |
| FUTUREWEI | No | The network can drop the UE after capability exchange in such a case |
| Qualcomm |  | For a cell with paired spectrum and allowing RedCap UE to access, if it ALWAYS supports both FD and HD RedCap UE, we agree there is no need for such a proposal. |
| LG Electronics | No | gNB could assume HD-FDD operation for idle/inactive RedCap UEs before and during initial access, i.e. before acquiring actual UE capability. |
| DOCOMO | No |  |
| Sharp | No |  |
| CMCC | No |  |
| Xiaomi | No |  |
| China Telecom | No |  |
| Ericsson |  | We see some benefits with the proposal from IODT point of view, but we are also fine with leaving this issue to RAN2. |
| Samsung |  | RAN2 may discuss this if they so decide. |
| Qualcomm2 |  | We are fine to close the discussion for Issue 2 in RAN1 and leave it to RAN2. Since the WID does not explicitly mention that both FD-HDD and Type-A HD-FDD are supported by a cell that allows RedCap UE to access, shall we have a conclusion in RAN1 ? For example:  *For a cell with paired spectrum and allowing RedCap UEs to access, RAN1 thinks both FD-FDD RedCap UE and Type-A HD-FDD RedCap UE are supported.* |

# <1st Round Summary>

Companies’s positions on the listed issue (i.e., indicating cell access information for the HD-FDD Redcap UE) are pretty clear, which was briefly summarized in the Table below:

|  |  |  |  |
| --- | --- | --- | --- |
| Description | Companies | Num. of Companies | Reasoning |
| Disagree with the proposal. | Lenovo, OPPO, CATT, Nordic, ZTE, Nokia, Intel, FUTUREWEI, QCM, LG Eletronics, DCM, Sharp, CMCC, Xiaomi, China Telecom | 15 | * Cell barring is applied for both FD-FDD and HD-FDD Redcap UEs. No need to define new barring mechanism for HD-FDD UE. * Out of WID scope. |
| No strong view | Spreadtrum | 1 |  |
| May discuss in RAN2, if needed. | Ericsson, Samsung | 2 |  |

Based on the inputs above, FL proposed not to continue discussing this proposal anymore.

# <Closed>

### Issue 3: Clarification on the WID objective

Contribution [CATT, 7] observed that the following was agreed in RAN2 agreed

* Msg3 early indication is always ‘enabled’ for the case of CBRA, i.e., when Msg3 carries CCCH, regardless of whether Msg1 early indication is configured or not.
* A working assumption in RAN2 was also suggesting that Msg3 early indication shall be mandatorily supported by RedCap UE. That is to say, the gNB will always be able to acknowledge the RedCap UE type no later than Msg3 reception in 4-step RACH.

Nevertheless, the WID clearly requests that ‘early indication should be configurable’ by the network.

|  |
| --- |
| * Specify functionality that will enable RedCap UEs to be explicitly identifiable to networks through an early indication in Msg1 and/or Msg3, and Msg A if supported, including the ability for the early indication to be configurable by the network. [RAN2, RAN1] |

Thus, contribution [7] views the current design on early indication seems not completely align with the WID objective. It was further proposed two alternatives in [7] to be concluded in RAN1:

* Alt.1: ‘Early indication to be configurable’ in the WID is interpreted as the description dedicated for Msg1 only.
* Alt2: ‘Early indication to be configurable’ in the WID is interpreted as the description for both Msg1 and Msg3.

It is FL’s view that the need of making new conclusion above is not well justified since the situation is clear based on the agreement made in RAN2, i.e., Alt.1 and there is no other interpretation. The concern of potential WID discrepancy is expected to be raised in RAN2 when they made conclusion to make Msg3 based approach to be mandatory.

Nevertheless, the following question was formulated to collect inputs on this:

# <1st Round Comments>

**FL1 High Priority Question 3-1: Do you think any clarification below is needed in RAN1 for Msg1 and Msg3 based early indication?**

* Alt.1: ‘Early indication to be configurable’ in the WID is interpreted as the description dedicated for Msg1 only.
* Alt2: ‘Early indication to be configurable’ in the WID is interpreted as the description for both Msg1 and Msg3.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No, if yes, please state which Alt?** | **Comments** |
| Lenovo, Motorola Mobility | Yes, Atl.1 |  |
| OPPO | Yes, Alt.1 |  |
| vivo | No | Based on current progress in RAN1 and RAN2, without further debate, Alt.1 should be the interpretation. |
| Spreadtrum | No | The objective for early indication is led by RAN2, and the design for Msg3 early indication is also led by RAN2. Therefore, we suggest to leave this issue to RAN2. |
| CATT | Yes | As we are approaching to the end of Rel-17, we are fine to converge to Alt.1 to avoid additional work. |
| Nordic | Yes, Alt 2 | as WID is written it clearly includes both MSG3 and MSG1 |
| ZTE, Sanechips |  | Maybe we can wait for the conclusion for separate MsgA PUSCH. It also would impact the interpretation for this issue. |
| Nokia, NSB | Yes, Alt 2 | Same view as NORDIC wrt to the specific FL question.  However, moving forward, we are happy for RAN2 to handle the potential WID discrepancy. |
| Intel | No | As explained by the FL, Alt1 is the current status and if companies see a serious discrepancy against WID objectives (we do not think so), this should be discussed in RAN2. |
| FUTUREWEI | Alt 2 | The WID spplies to both Msg1 and Msg3 |
| Qualcomm | Alt2 |  |
| LG Electronics | No | We are fine with the RAN2 agreement. Whether to revise the WID could be up to RAN plenary. |
| DOCOMO | No | This should be discussed in RAN2 |
| Sharp | No | We share same view with Spreadtrum and Intel. |
| CMCC | No | We share the same view as FL that alt1 is the current situation. And we also think it is better for RAN2 to make conclusion since Msg3 indication is defined by RAN2. |
| Xiaomi | No | Prefer leaving this issue to RAN2 |
| China Telecom | No | We think it is up to RAN2 to make the conclusion on early identification via Msg1 or/and Msg3. |
| Ericsson | No | The WI objective is RAN2-led, so any discussion on this is better handled in RAN2.  It can be noted that if a RedCap-specific LCID is reserved for the purpose of early indication of RedCap UEs in Msg3, it doesn’t make sense to not use it for RedCap UEs. Furthermore, based on the following agreements/WA in RAN2, it clear that RedCap-specific LCID is always used (i.e., not configurable).  Agreements online:   * In MAC perspective, RedCap UE uses the dedicated LCID for Msg3 early identification, when the Msg3 includes the CCCH data (no other precondition) * Also when msg1 early identification is configured, new dedicated LCID is used for CCCH identification   Working assumption:   * Msg3 early identification is mandatorily supported by RedCap UE   In our view, RAN1 doesn’t need to discuss this issue further. The need for clarification on configurability of Msg3 indication can be up to RAN2. |
| Samsung |  | The WID does not differentiate, hence it should apply to both. |

# <1st Round Summary>

Views from companies are diverged. Table below intends to summarize the status and preferences:

|  |  |
| --- | --- |
| Description | Summary |
| * Alt.1: ‘Early indication to be configurable’ in the WID is interpreted as the description dedicated for Msg1 only. | **Supported by: (3)**  Lenovo, OPPO, CATT, |
| * Alt2: ‘Early indication to be configurable’ in the WID is interpreted as the description for both Msg1 and Msg3. | **Supported by: (5)**  Nordic, Nokia, FUTUREWEI, Qualcomm, Samsung |
| * No clarificaiton is needed in RAN1 | **Supported by: (11)**  vivo, Spreadtrum, Intel, LG Electronics, DOCOMO, Sharp, CMCC, Xiaomi, China Telecom, Ericsson |
| * Wait for conclusion of Issue 1 | **Supported by: (1)**  ZTE |

As indicated by the Table, majority of companies (11 companies) prefer not to continue discussing this in RAN1 as the discrepancy is caused by agreement made in RAN2. If any clarification on WID is necessary (e.g., Alt.1), it should be made in RAN plenary as WID is approved by RAN plenary. If the approved WID needs to be tightlightly followed, RAN2 may need to re-consider their agreement. In any case, nothing is expected from RAN1 on this according to 3GPP working procedure.

Having said that, FL plan not to continue discussing this to go with majority views. In addition, companies were recommended to raise this issue to RAN2 directly, if still see the need to solve this discrepancy, as the issue was caused by agreement made by RAN2.

# <Closed>

### Issue 4: SIB index for separate Initial DL/UL BWP configuration and On-demand SI transmission support for Redcap UEs

There were two more proposals from [14], which were originally planned to disucss under other agenda and decided to discuss here in recent FL coordination. Hence, they were brought up in the 2nd round below for discussions:

# <1st Round Comments>

**FL2 High Priority Question 4-1: Can we agree the following proposal for separate initial DL/UL configuration and On-demand SI transmission for Redcap UEs in RAN1?**

* Proposal 1: RedCap-specific initial DL/UL BWP configurations, PRACH and PUCCH resources in the RedCap-specific initial UL BWP, and CORESET/CSS configurations for RA/paging/SI of RedCap UE are transmitted in SIB1.
* Proposal 2: RACH-based requesting for on-demand SI transmission is supported for RedCap UE.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No,**  **if ‘no’, please provide brief reasoning in ‘Comment’ column** | **Comments** |
| Qualcomm | Y | * As long as the payload size of SIB1 is no greater than 2976 bits, we think the RedCap-specific SI for random access in idle/inactive mode should be transmitted in SIB1, and SIB1 is shared by non-RedCap and RedCap UEs. * To reduce the signaling overhead for RedCap UE, we think it is beneficial to support RACH-based request for on-demand SI. * When an idle/inactive RedCap UE is performing RA in an SSB-less initial DL BWP, RedCap UE can acquire on-demand SI at least by switching from the SSB-less initial DL BWP to CORESET#0. |
| vivo |  | We prefer to discuss and decide in RAN2. In particular  On proposal 1, although we feel SIB1 is possible and beneficial, it might be necessary be checked by RAN2 for SIB1 payload limitation.  On proposal, we understand RACH-based on-demand SI request is a Rel-15 RAN2 UE feature, which can be implemented by RedCap UE unless we have explicit agreement to exclude it. |
| ZTE, Sanechips | Y for P1  FFS for P2 | From our understanding, during RACH procedure without overlapping with SSB, the UE is free to switch to CORESET#0 and SSB for measurement, whether to receive the SI information is also up to UE implementation.  If the RACH procedure is overlapping with SSB for HD-FDD RedCap UE, e.g.,msg3, seems companies are intending to prioritize receiving SSB. In this case, when the UE switching to SSB, whether to receive SI update is also up to UE.  Considering this, it is not so necessary to support RACH-based requesting for on-demand SI by sacrificing the PRACH our msg3 resource, since the UE is quite free to switch to SSB and receive the SI.  Additionally, if SSB is prioritized over msg3, the on-demand SI transmission based on msg3 also would be interrupted.  Therefore, we should take careful of the RACH related procedure, especially for HD-FDD RedCap UE, if the RACH procedure are not guaranteed. Also, the above concern also should be considered when we go to support Proposal 2. |
| Samsung |  | We are fine with both proposals, and they can be agreed in RAN1. In general, we do not want to introduce a new UE behavior (e.g. RedCap UE to switch from its BWP to non-RedCap UE BWP for SI request), and think that it is okay to allow having a separate SI request configured for Msg1 based request for Redcap-specific BWP. RAN2 can further check its feasibility. |
| CATT | Y | P1: It is a natual choice from our view. A UE does not expect to receive other SIBx than SIB1 to perform RACH. Having said this, we can ask RAN2 to confirm this, if needed.  P2: It is a legacy behavior, and should be supported by default. If needed, we can ask RAN2 to confirm this. |
| Spreadtrum |  | Acceptable, but we also think SIB configuration and on-demand SI transmission related issues should be discussed and confirmed in RAN2, RAN1 can provide some suggestions for it if triggered by RAN2. |
| LG Electronics | Y | We generally support both proposals with the following remarks:   * For Proposal 1, whether to transmit the RedCap specific configurations in SIB1 will depend on SIB1 payload size. This issue can be further discussed in RAN2. * For Proposal 2, details of on-demand SI transmission for RedCap UE can be further discussed in RAN2 as previously discussed in RAN1. |
| CMCC | Y | We are fine with the proposals, and also OK for RAN2 to confirm. |
| Xiaomi | Y for P1  FFS for P2 | For P1, configuring the initial DL/UL BWP for RedCap via SIB1 is benefical to the savine UE power and reduce the access delay  For P2, it is default bevior. Unless we find this feature is not applicable to RedCap, then we don’t think we need this proposal. But we can accept it if the majority think it is necessary. |
| IDCC | Y | We are fine with the proposals. SIB payload size can be confirmed by RAN2. |
| Ericsson | N | Both proposals can be treated in RAN2 instead of RAN1.  For Proposal 1, it is enough that RAN1 indicates what parameters are UE- and cell-specific, respectively (perhaps some clarification is needed in the RRC parameter list in some cases). The detailed signaling solutions are up to RAN2 and do not need to be discussed in RAN1. These signaling solution details include for example which SIB a parameter ends up in, and note that some cell-specific parameters will end up both in SIB and in dedicated signaling (e.g., for handover purposes). This needs to be discussed in RAN2, not RAN1.  For Proposal 2, since it is legacy functionality it will be supported automatically unless there are reasons not to support it for RedCap. If there are no L1-specific details that need to be discussed in RAN1, there is no reason to treat the proposal further in RAN1. |

# 3. Other aspects

**The configuration of 2-Step RACH and 4-Step RACH for a given UL BWP**

In the RAN1 107 e-Meeting, 2-step RACH and 4-step RACH procedure configurations for a separate UL BWP or a legacy UL BWP for Redcap UEs were discussed without conclusion. As pointed out in [7, 8], this issue was further progressed in RAN2 with the following agreement [17]:

|  |
| --- |
| ***• If a RedCap-specific initial UL BWP is configured for RACH, RedCap UEs shall use only the RedCap-specific initial UL BWP to perform RACH.***  ***• RedCap-specific two-step RACH, if configured, and four-step RACH are always configured in the same BWP.*** |

Given the above observation, there is no need for further discussion in RAN1 on this topic although it was brought up in contribution [15].

**Contributions to be handled under other Redcap agendas**

In addition, the following contributions were planned to be handled under relevant agenda of Redcap:

* To be handled in AI 8.6.1.1
  + R1-2200918 [Huawei], R1-2201138 [ZTE], R1-2202383 [Nordic]
* To be handled in AI 8.16.6
  + R1-2201957 [Xiaomi]

# 4. Conclusion

<To be updated>

# References

1. RP-211574 Revised WID on support of reduced capability NR devices Ericsson
2. R1-2112506, RAN1 agreements for Rel-17 NR RedCap Rapporteur (Ericsson)

1. [RP-212802](https://www.3gpp.org/ftp/TSG_RAN/TSG_RAN/TSGR_94e/Docs/RP-212802.zip), “Status report for WI Support of reduced capability NR devices”, RAN1, 3GPP TSG RAN #94-e, December 2021.
2. [R1-2200918](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2200918.zip) On RAN1 aspects of RAN2 led issues for RedCap Huawei, HiSilicon
3. [R1-2201138](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2201138.zip) Higher layer support of Reduced Capability NR devices ZTE, Sanechips
4. [R1-2201279](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2201279.zip) Higher layer related issues for Reduced Capability NR Devices OPPO
5. [R1-2201369](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2201369.zip) Remaining issues on higher layer support of RedCap CATT
6. [R1-2201406](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2201406.zip) Remaining Issues for Higher Layer Support of Reduced Capability NR Devices Nokia, Nokia Shanghai Bell
7. [R1-2201670](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2201670.zip) RAN1 aspects for RAN2-led features for RedCap Ericsson
8. [R1-2201863](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2201863.zip) Remaining issues for higher layer support of RedCap UE CMCC
9. [R1-2201957](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2201957.zip) Discussion on the remaining issues of RAN2-led features for RedCap Xiaomi
10. [R1-2201971](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2201971.zip) RAN1 aspects for RAN2-led features for RedCap Lenovo, Motorola Mobility
11. [R1-2202021](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2202021.zip) RAN1 aspects for RAN2-led features for RedCap Samsung
12. [R1-2202147](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2202147.zip) Remaining Issues on Cross-layer Design for RedCap Devices Qualcomm Incorporated
13. [R1-2202194](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2202194.zip) RAN1 aspects for RAN2-led features for RedCap Sharp
14. [R1-2202383](file:///D:\Documents\3GPP%20documents\RAN1\TSGR1_108-e\Docs\R1-2202383.zip) On RAN2 related aspects Nordic Semiconductor ASA
15. Draft report of 3GPP TSG RAN WG2 meeting #116bis-e, RAN2#116-e