

Views on Rel-18 eRedCap WID scope

Agenda Item: 9.3.1.7

Source: Spreadtrum Communications, H3C

Document for: Discussion/Decision

Background on standalone PR1 for FR1

Background:

- **PR1 is already supported as an add-on solution in RAN1.**
 - In order to achieve the target data rate of 10Mbps for R18 RedCap, it was agreed that PR1 can be used as add-on solution on top of BB BW reduction.
 - For add-on PR1, the constraint value will be relaxed from 4 to [3.2 or 3]^{*1}.
- **Whether PR1 is supported as a standalone solution was discussed in last RAN meeting^{*2}, but no concerns was reached.**
 - The general views from both side are:
 - The proponent companies think that 1) standalone PR1 is more simple to implement for network and UE. 2) standalone PR1 is help to NR/LTE dual mode design.
 - The opposite companies think that 1) Standalone PR1 for R18 RedCap will introduce an other UE type, which is not align with the R18 RedCap WID scope. 2) Standalone PR1 for R17 RedCap will define dual approaches to meet the same target peak data rate, and 3GPP should avoid to do so.
 - In order to solve opponent companies' concern, the moderator proposed (in the last round) to define value of X and Y in RAN1 to support R17 UE type and R18 UE type with different minimum peak rate to differentiate distinct target. For this proposal, quite a few companies persisted respective preference, some companies changed their positions a bit (two-way flow). In this sense, moderator suggested to leave more time to companies to look into it.
 - The conclusion for this issue in RAN#98e is "Revisit in RAN#99".

Note 1. To be down-select between 3 and 3.2 in the following RAN1 meeting.

Note 2. RP-223551 Moderator's summary for discussion [98e-19-R18-eRedCap], RAN#98e

Views on standalone PR1 for FR1 (1)

- **First of all, we don't think standalone PR1 should be introduced along with the solution of BB BW reduction + add-on PR1 in R18.**
 - As mentioned by many companies in the last RAN meeting, this will introduce another UE type(UE type is related to the basic implementation method), which is not align with the WID scope.
- **Secondly, for the possible way that PR1 is supported as an optional add-on for both Rel-17 Redcap and Rel-18 eRedcap, we fully agree that 3GPP should not define dual approaches to meet the same target peak data rate.**
 - Dual approaches increase the implemented complexity on both the network side and the UE side. For example, if Rel-17 Redcap + PR1 is also introduced to achieve 10Mbps target data rate. The UE vendor may select one of the implementation options unconstrained with the premise that the NW can support these two types of UEs. Otherwise, the UE may not be able to access to the NW when the NW only supports one of the option and the UE supports the other option. In addition, if the NW in different areas pick different options, and the UE is required to roam between different networks, the UE needs to support both options at the same time. Such case greatly increases the implementation complexity ,and this is what it called fragmentation and possible misalignment.
 - If the NW and UE around the world are aligned with the implementation method for 10Mbps devices, the other solution becomes a paper work, this leads to unnecessary standardization works, which should be prevented.
 - As R18 BB BW reduction and add-on PR1 is already there, and the peak data rate is already reduced to 10Mbps, there is no need to introduce another low-end implementation method to achieve 10Mbps data rate.

Views on standalone PR1 for FR1 (2)

- Thirdly, the proposal of “defining value of X and Y in RAN1 to support R17 UE type and R18 UE type with different minimum peak rate to differentiate distinct target” is relatively reasonable, however, the benefit is unclear.
 - R17 RedCap can support different peak data rate by reporting different scaling factors and modulation orders. As the constraint for R17 RedCap is 4, the possible peak data rates for 1Rx R17 RedCap (FD-FDD@30KHz) are listed in the left table below.
 - For R18 eRedCap, with ~5Mhz BB BW and add-on PR1 (e.g., constraint is 3.2), the possible peak data rates for R18 eRedCap(FD-FDD@30KHz) are listed in the right table below.

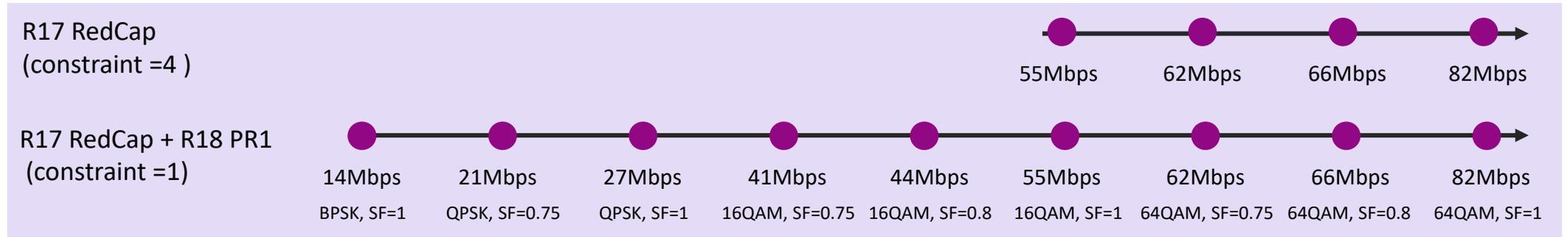
Reported modulation order and scaling factor	Peak data rate achieved by R17 RedCap (DL/UL)
64QAM, SF=1	81.9Mbps/87.6Mbps
64QAM, SF=0.8	65.6Mbps/70.1Mbps
64QAM, SF=0.75	61.5Mbps/65.7Mbps
16QAM, SF=1	54.6Mbps/58.4Mbps

Reported modulation order and scaling factor	Peak data rate achieved by R18 eRedCap (DL/UL)
64QAM, SF=1	19.3Mbps/20.6Mbps
64QAM, SF=0.8	15.4Mbps/16.5Mbps
64QAM, SF=0.75	15.0Mbps/15.5Mbps
16QAM, SF=1	12.8Mbps/13.7Mbps
16QAM, SF=0.8	10.3Mbps/10.9Mbps

- Based on the above table, we can easily found that the data rate gap between R17 RedCap and the current R18 RedCap is 35Mbps(from ~20Mbps to ~55Mbps). If the target data rate for R17 RedCap+add-on PR1 is 35Mbps, the complexity benefits would be very limited (refer to the complexity evaluation results in SI phase), thus it is unnecessary.

Views on standalone PR1 for FR1 (3)

- **Lastly, the introduction of standalone PR1 will jeopardize R17 RedCap eco-system and market development**
 - With the introduction of standalone PR1 (constraint =1), there will be a UE implementation solution that covers all of R17 RedCap's data rate ranges and additionally extended down to 10Mbps. According to the understanding of some companies, standalone PR1 can be quickly deployed and commercialized. In this way, for use cases with relatively lower data rate requirements (below 55Mbps), R17 RedCap will no longer be used and considered. So, the use cases of R17 RedCap will be completely limited (e.g., the case with data rate requirement >55Mbps) or even no any deployment considerations for R17 RedCap. Consequently, the interest and confidence in R17 RedCap will collapse from market perspective.



- It was observed that various regions are in good progress or have completed Industry Standard for R17 RedCap, the corresponding test/experiment is widely and rapidly conducting, and some UE vendors have released RedCap products. At this stage, implementations/solutions that have a huge impact on the R17 RedCap market should be avoided, otherwise, industry customers maybe confused or disappointed on R17 RedCap and 3GPP standard and its different releases.

Summary and proposal

- According to the previous discussion and analysis, we have the following views and proposal:

Views for standalone PR1

- **Views 1:** Standalone PR1 should not be introduced along with the solution of BB BW reduction + add-on PR1 in R18.
- **Views 2:** Dual approaches to meet the same target peak data rate for RedCap should be avoided.
- **Views 3:** The proposal of *“defining value of X and Y in RAN1 to support R17 UE type and R18 UE type with different minimum peak rate to differentiate distinct target”* is relatively reasonable, however, the benefit is unclear.
- **Views 4:** The introduction of standalone PR1 will jeopardize R17 RedCap eco-system and market development.

Proposal for standalone PR1

- **Proposal 1:** Standalone PR1 should not be supported for both R18 and R17.



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