China Academy of Telecommunication Technology

3GPP TSG RAN Meeting #98-e
Electronic Meeting, December 12th - 16th , 2022

RP-223128

Views on scope of Rel-18 RedCap

China Academy of Telecommunications Technology (CATT)

Background

- For Rel-18 RedCap, several remaining issues are to be addressed in RAN#98-e
  - Clarification on BB bandwidth reduction
    - Interpretation of 5 MHz UE BB reduction in the way of Option BW3 or Option PR3
  - Peak data rate reduction
    - Whether UE peak data rate reduction for UE is limited only with UE BB bandwidth reduction or standalone
    - Exact minimum peak data rate for Rel-18 RedCap UE
  - Separate early indication
    - Whether or not/how a separate early indication can be supported

On BB bandwidth reduction

- It is still debating on the interpretation of 5 MHz UE BB bandwidth reduction in the WID
  - Option BW3: 5 MHz BB bandwidth only for PDSCH and PUSCH.
  - Option PR3: Restriction of maximum number of PRBs for PDSCH and PUSCH.

- RAN1 progress on scheduling of PUSCH and PDSCH
  - RAN1 concludes UE post-FFT buffer size to be 20 MHz. Cost reduction of BW3 and PR3 is the same.
  - RAN1 agreements support **BW3 for PUSCH**, and supports **PR3 for (unicast) PDSCH**

Agreement:
For UE BB bandwidth reduction, a UE **is not expected** to receive an UL grant in a DCI with a **PUSCH** resource allocation **spanning a bandwidth of more than ~5 MHz** per slot or per hop, if applicable.

Agreement:
- For UE BB complexity reduction, a UE **is able to receive** a DL assignment in a DCI with a **unicast PDSCH** resource allocation **spanning a bandwidth of more than ~5 MHz** per slot.
- The number of PRB scheduled in DCI is not larger than the maximum number of PRB agreed in previous agreement from 110b-e

On BB bandwidth reduction

Proposal 1: Update the WID to accommodate the different interpretations of BB bandwidth reduction for PUSCH and PDSCH

- UE BB bandwidth reduction with 20 MHz RF bandwidth for UL and DL
  - 5 MHz BB bandwidth only for ~~PDSCH (for both unicast and broadcast) and~~ PUSCH~~, with 20 MHz RF bandwidth for UL and DL~~
  - Restriction of maximum number of PRBs for PDSCH
    - For 15 kHz SCS, the maximum number of RBs is 25.
    - For 30 kHz SCS, the maximum number of RBs is 11 or 12.
    - The restricted number of PRBs is a hardcoded limit.
  - The other physical channels and signals are still allowed to use a BWP up to the 20 MHz maximum UE RF+BB bandwidth.

On peak data rate reduction

- Whether peak data rate reduction must be combined with BB bandwidth reduction or standalone
  - According to the current RAN1 progress, scheduling restriction on Rel-18 RedCap with BB bandwidth reduction makes it quite different from 'Rel-17 RedCap UE + standalone peak data rate reduction'
    - E.g. frequency domain resource allocation for PUSCH, unicast PDSCH, RAR…
  - Combining peak data rate reduction on top of BB bandwidth reduction can maximize the cost reduction for Rel-18 RedCap UE
  - Standalone peak data rate reduction, if supported, is more suitable to be a TEI for Rel-17 RedCap
    - Almost everything is the same, except for maximum TBS/peak data rate

Proposal 2: For Rel-18 RedCap, UE peak data rate reduction is limited only with UE BB bandwidth reduction.

— **Standalone peak data rate reduction may be considered as a TEI for Rel-17 RedCap**

On peak data rate reduction

- Exact minimum peak data rate for Rel-18 RedCap UE
  - 10 Mbps should be supported
    - WID clearly states that 'The supported peak data rate for Rel-18 RedCap targets to 10Mbps'
  - Further peak data rate reduction, e.g. 6 Mbps, should not be supported
    - 6 Mbps is quite close to the peak data rate of LPWA UE (e.g. LTE-M)
    - 10 Mbps → 6 Mbps only brings marginal cost reduction gain

Proposal 3: For Rel-18 RedCap, the minimum DL peak rate target (for FD-FDD) is 10 Mbps based on peak data rate calculation according to TS 38.306.

On separate early indication

- Separate early indication in Msg1 (i.e. PRACH)
  - Separate early indication <u>from non-RedCap UEs is useful</u>, due to the same reason for Rel-17 RedCap UE
  - Separate early indication <u>from Rel-17 RedCap UEs is unnecessary</u>
    - Rel-18 RedCap UE is able to share the same separate initial DL/UL BWP with Rel-17 RedCap UE
    - Prevent worse RACH resource partitioning
    - Avoid worse frequency domain resource fragmentation

- Separate early indication in Msg3
  - Separate early indication from non-RedCap UE and Rel-17 RedCap UE can be supported
    - Reuse simple mechanism as Rel-17 RedCap UE, i.e. via LCID

Proposal 4: For Rel-18 RedCap UE,

- **Separate early indication in Msg1 from non-RedCap UE is supported and configurable.**
  - **Separate early indication in Msg1 from Rel-17 RedCap UE is not supported**
- **Separate early indication in Msg3 from non-RedCap UE and Rel-17 RedCap UE is supported**
  - **Reuse simple mechanism as Rel-17 RedCap UE, i.e. via LCID**

Conclusion

Proposal 1: Update the WID to accommodate the different interpretations of BB bandwidth reduction for PUSCH and PDSCH

- UE BB bandwidth reduction with 20 MHz RF bandwidth for UL and DL
  - 5 MHz BB bandwidth only for ~~PDSCH (for both unicast and broadcast) and~~ PUSCH~~, with 20 MHz RF bandwidth for UL and DL~~
  - Restriction of maximum number of PRBs for PDSCH
    - For 15 kHz SCS, the maximum number of RBs is 25.
    - For 30 kHz SCS, the maximum number of RBs is 11 or 12.
    - The restricted number of PRBs is a hardcoded limit.
  - The other physical channels and signals are still allowed to use a BWP up to the 20 MHz maximum UE RF+BB bandwidth.

Proposal 2: For Rel-18 RedCap, UE peak data rate reduction is limited only with UE BB bandwidth reduction.

- **Standalone peak data rate reduction may be considered as a TEI for Rel-17 RedCap**

Proposal 3: For Rel-18 RedCap, the minimum DL peak rate target (for FD-FDD) is 10 Mbps based on peak data rate calculation according to TS 38.306.

Proposal 4: For Rel-18 RedCap UE,

- **Separate early indication in Msg1 from non-RedCap UE is supported and configurable.**
  - **Separate early indication in Msg1 from Rel-17 RedCap UE is not supported**
- **Separate early indication in Msg3 from non-RedCap UE and Rel-17 RedCap UE is supported**
  - **Reuse simple mechanism as Rel-17 RedCap UE, i.e. via LCID**

THANK YOU