

Views on RedCap Evolution for Rel-18

Qualcomm

Background

Moderator's Summary for Email Discussion on RedCap Evolution [RAN93e-R18Prep-07]

- **Main goal**
 - ❑ further embrace new use cases, especially requiring low-cost devices and low energy consumption
- **Study low power wake-up receiver / wake-up signal (WUR/WUS)***
 - ❑ The study should target ultra-low power WUS/WUR required by RedCap use cases. The specified solutions shall not be limited to RedCap UEs only.
 - ❑ As opposed to the work on UE power savings in previous releases, this study will not require existing signals to be used as WUS. Solutions should give justifiable gains compared to the existing Rel-16/17 UE power saving enhancements.
 - ❑ Objectives:
 - Study use cases, evaluation methodology & KPIs, and compatibility with other UE power saving solutions
 - Study and evaluate low-power wake-up receiver architectures
 - Study and evaluate wake-up signal designs to support wake-up receivers
 - Study and evaluate protocol changes needed to support wake-up receivers
 - Study potential system impact, such as network and other UE's power consumption, coexistence with R17 RedCap and non-RedCap UEs, network coverage
- **Power saving/energy efficiency enhancements**
 - ❑ Enhanced DRX in RRC_INACTIVE (>10.24s) (if not completed in R17)
 - ❑ Identify use cases and study corresponding protocol enhancements to support operation on intermittently available energy harvested from the environment
 - Note that how the devices harvest and store energy is outside the scope of 3GPP
- **Complexity/cost reduction**
 - ❑ Study further reduced UE bandwidth of 5MHz, especially considering
 - expected UE complexity/cost reduction based on Rel-17 evaluation methodology
 - network impact, compatibility with Rel-17, coexistence of RedCap and non-RedCap UEs, UE impact, specification impact
 - other solutions for reducing the UE peak data rates
 - Support for lower UE power class Considering NW impact, e.g. coverage aspects

* **Moderator's notes:**

- ❖ TBD whether the WUR/WUS study is part of RedCap or of a separate SI
- ❖ TBD in which email thread the WUR/WUS discussions should continue

Qualcomm's View on Complexity Reduction of R18 eRedCap

- The platform of NR RedCap devices can be enhanced with additional features and evolved towards lower-tier NR-IoT market
- Design objectives of Rel-18 eRedCap UE (baseline: Rel-17 RedCap UE)
 - Enhanced power/energy efficiency
 - Lower peak data rates and throughputs on both DL and UL
 - Relaxed latency requirements
 - Reduced complexity
- Key Enablers for UE Complexity Reduction
 - BW reduction down to 5 MHz in both RF and BB
 - single PLL* (supporting TDD and Type-B HD-FDD operation only)
 - UE processing time relaxation*
 - Reduced number of HARQ processes*
 - Reduced power class*
 - Upper layer enhancements*

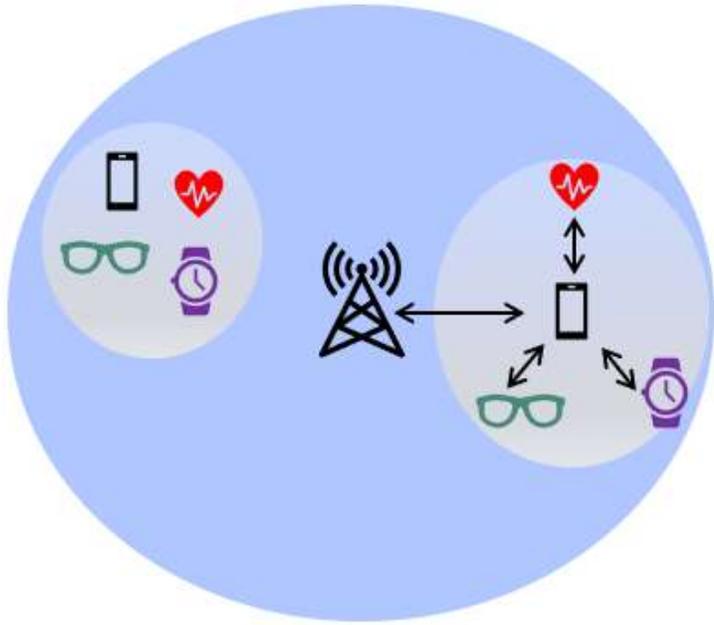
* Also supports power saving enhancement of Rel-18 eRedCap devices

Qualcomm's View on LP WUS/WUR and Energy Harvesting

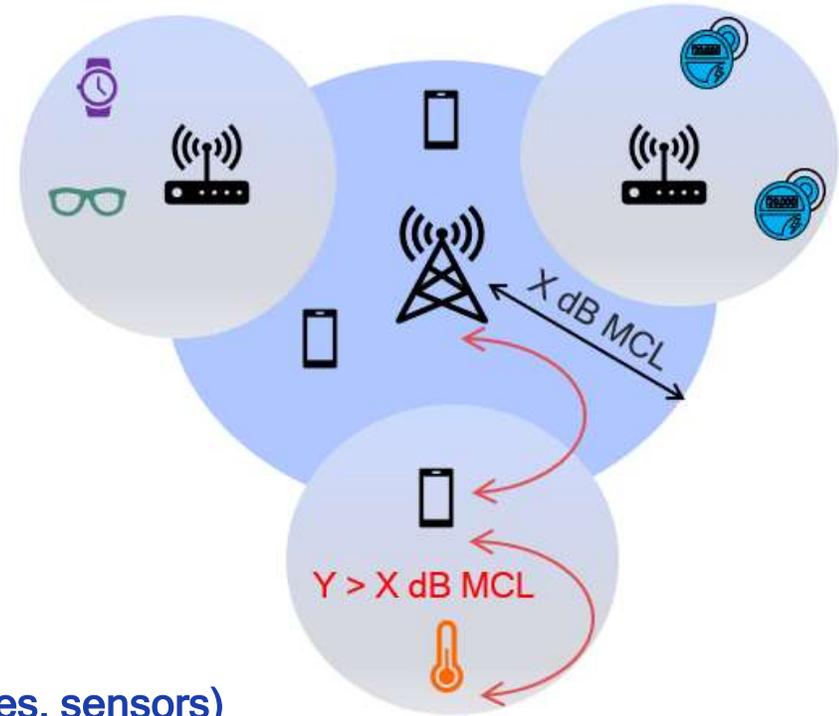
- Power saving enhancement for Rel-18 eRedCap should focus on solutions with small specification impact and reduced UE complexity
 - eDRX extension for inactive state
 - RRM measurement relaxation for serving cell
 - UE processing time relaxation*
 - Type-B HD-FDD*
 - Reduced number of HARQ processes*
 - Lower UE power class* (*support for SL relay can be merged with Rel-18 SL WI*)
 - SDT enhancement (*can be merged with Rel-18 SDT WI*)
- Low-power WUS/WUR can be studied in Rel-18 eRedCap WI, or a separate SI
 - Use cases, receiver architecture, evaluation methodology & KPIs should be identified
 - Solutions should provide justifiable gains in performance and co-exist with power saving solutions specified in NR Rel-16/17
- Operation based on energy harvesting has lower priority than other power saving solutions
 - Study for energy harvesting can be de-prioritized in NR Rel-18

* Also supports complexity reduction of Rel-18 eRedCap devices

Qualcomm's View on SL Relay for Rel-18 eRedCap

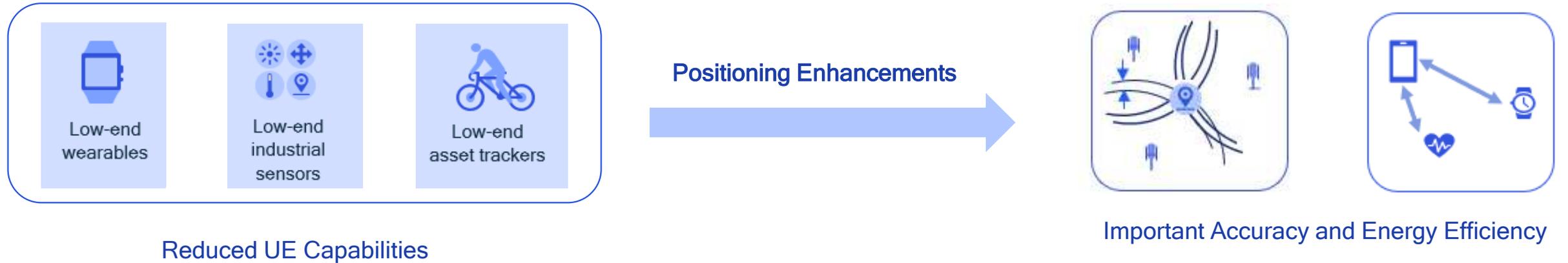


NR SL Relay for eRedCap UEs (wearables, sensors)



- SL relay can enhance the performance of eRedCap UEs
 - Extending the coverage of eRedCap UEs with lower UE power class, reduced BW and single Tx/Rx antenna
 - Enabling power saving and energy efficiency improvements by shortening the communication range
- SL relay for eRedCap UE can be studied in Rel-18 eSL WI with small specification impacts
 - Minor extensions to relay discovery, capability signaling, access control, power saving and etc.

Qualcomm's View on Positioning Support for R18 eRedCap



- Accurate and energy-efficient positioning is desirable or even critical for eRedCap UEs
- Positioning support for eRedCap UE can be studied in Rel-18 FePos WI with small specification impacts
 - Minor extensions to accommodate reduced UE capabilities
 - BW reduction down to 5 MHz in FR1
 - Lower power class
 - 1 Tx antenna and 1 Rx antenna
 - Relaxed UE processing time
 - PC5-based positioning and hybrid positioning should be specified
 - Joint consideration of power saving enhancement and accuracy improvement



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