3GPP TSG-RAN Meeting #97-e
Electronic Meeting, September 12-16, 2022

RP-222425

Agenda item: 9.2.9
Source: Apple
Document for: Approval

Motivation of SID revision for LP-WUR

Background

- The scope for SID (Study on low-power Wake-up Signal and Receiver for NR) in RP-221271:
  - The study item includes the following objectives:
    - Identify evaluation methodology (including the use cases) & KPIs [RAN1]
      - Primarily target low-power WUS/WUR for power-sensitive, small form-factor devices including IoT use cases (such as industrial sensors, controllers) and wearables
        - Other use cases are not precluded
    - Study and evaluate low-power wake-up receiver architectures [RAN1, RAN4]
    - Study and evaluate wake-up signal designs to support wake-up receivers [RAN1, RAN4]
    - Study and evaluate L1 procedures and higher layer protocol changes needed to support the wake-up signals [RAN2, RAN1]
    - Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms and their coverage availability, as well as latency impact. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1]
      - Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.

Justifications to involve RAN4 RRM

- The latency requirement for R16/17 power saving WI has been specified in RAN4, for example in TS38.133 following delay requirement for R16 PS were introduced. RAN4 has evaluated the mobility/system performance v.s. latency when determine such requirements in previous releases.

  - 4.2.2.9 Measurements of intra-frequency NR cells for UE configured with relaxed measurement criterion
    - 4.2.2.9.1 Introduction
    - 4.2.2.9.2 Measurements for UE fulfilling low mobility criterion
    - 4.2.2.9.3 Measurements for UE fulfilling not-at-cell edge criterion
    - 4.2.2.9.4 Measurements for UE fulfilling low mobility and not-at-cell edge criteria
  - 4.2.2.10 Measurements of inter-frequency NR cells for UE configured with relaxed measurement criterion
    - 4.2.2.10.1 Introduction
    - 4.2.2.10.2 Measurements for UE fulfilling low mobility criterion
    - 4.2.2.10.3 Measurements for UE fulfilling not-at-cell edge criterion
    - 4.2.2.10.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion
  - 4.2.2.11 Measurements of inter-RAT E-UTRAN cells for UE configured with relaxed measurement criterion
    - 4.2.2.11.1 Introduction
    - 4.2.2.11.2 Measurements for UE fulfilling low mobility criterion
    - 4.2.2.11.3 Measurements for UE fulfilling with not-at-cell edge criterion
    - 4.2.2.11.4 Measurements for UE fulfilling low mobility and not-at-cell edge criterion

- The earlier involvement of RAN4 RRM could help to
  - Investigate impact of LP-WUR UE on the existing RRM core and measurement accuracy requirement
  - Determine some reasonable RRM relaxations(latency) for LP-WUR UE behaviors (avoid the potential reverting in WI stage)
- ***Observation: The mobility related impact (including latency and measurement accuracy) of LP-WUR UE is strongly relevant with RAN4 RRM work.***

Proposals for SID revision

- ***Proposal: revise objective of the SID (Study on low-power Wake-up Signal and Receiver for NR) in RP-213645 as followings, and add 0.25TU (for early stage)/0.5TU (for late stage) for RAN4 RRM work from RAN4#106 meeting (Feb, 2023)***

RAN	R4RF	R4RD	RAN	R4RF	R4RD	R4RF	R4RD	RAN	R4RF	R4RD	RAN	R4RF	R4RD	R4RF	R4RD	RAN
98 Dec.22	106	106	99 March 23	106bis	106bis	107	107	100 June 23	108	108	101 Sep.23	108bis	108bis	109	109	102 Dec.23 **REL-18 freeze**
	0.25	**0.25**		0.5	**0.25**	0.5	**0.25**		0.5	**0.5**		0.25	**0.5**	0.25	**0.5**	

As opposed to the work on UE power savings in previous releases, this study will not require existing signals to be used as WUS. All WUS solutions identified shall be able to operate in a cell supporting legacy UEs. Solutions should target substantial gains compared to the existing Rel-15/16/17 UE power saving mechanisms. Other aspects such as detection performance, coverage, UE complexity, should be covered by the evaluation.

The study item includes the following objectives:

- Identify evaluation methodology (including the use cases) & KPIs [RAN1]
  - Primarily target low-power WUS/WUR for power-sensitive, small form-factor devices including IoT use cases (such as industrial sensors, controllers) and wearables
    - Other use cases are not precluded
- Study and evaluate low-power wake-up receiver architectures [RAN1, RAN4]
- Study and evaluate wake-up signal designs to support wake-up receivers [RAN1, RAN4]
- Study and evaluate L1 procedures and higher layer protocol changes needed to support the wake-up signals [RAN2, RAN1]
- Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms and their coverage availability, as well as latency impact. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1]
  - Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.
- Study and evaluate the mobility related impact of wake-up signal if necessary [RAN4]
  - Note: The need for RAN4 RRM evaluation will be triggered by RAN1

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