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# Discussion on Network Energy Saving Enhancements in Rel-19

Source: Fujitsu Limited

Agenda: 9.1.1.5

Document for discussion

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# Background

- In RAN#101 meeting, Rel-19 Network Energy Saving scope was discussed and TU estimation and potential item list were provided by RAN chair in [1].
- In this contribution, we provide our views on potential scope of the network energy saving enhancements.

## Network Energy Savings WI

- References: RWS-230488, RP-231540, RP-232615
- Potential objectives:
  - On-demand SSB transmission ~~([and possibly other DL signals])~~ for Scell for connected UEs
    - Possible triggering methods (e.g., UE uplink wake-up-signal using an existing signal/channel, cell on/off indication via backhaul, Scell activation/deactivation signaling, etc.)
    - ~~Whether to target the design of a simplified SSB~~
  - On-demand SIB1~~/[SSB]~~ transmission for idle UEs
    - Possible triggering methods (e.g., UE uplink wake-up-signal using an existing signal/channel, cell on/off indication via backhaul, Scell activation/deactivation signaling, etc.)
    - ~~Whether to target the design of a simplified SSB~~
  - Other topics?

- [SSB]/SIB1-less operation in multi-carrier scenario for (documented in TR38.864)
  - [SSB]/SIB1-less for non-anchor NES cell for UEs in IDLE/INACTIVE state, where it is assumed that another carrier (an anchor cell) is available for the UE
- Adaptation of common signal/channel transmissions (documented in TR38.864)
- Specify Cell DRX/DTX for UEs in idle/inactive modes (as an extension of Rel 18 cell DRX/DTX)
- Multi-TRP adaptation mechanisms
- UE group-common or cell-specific BWP configuration, adaptation and/or switching.
- Group cell switch
- Power domains studied in R18 (techniques D-2 ~ D-5)
- Low-power SSB/SIB1/Paging
- Extension of spatial and power domain techniques in 1) high load scenario 2) Type-II codebook types
- Semi-static beam-specific broadcast channel configuration
- Scenario 2a for SSB-less
- It was also mentioned that some proposals for multi-carrier enhancements may be beneficial for network energy savings (e.g. cross-carrier HARQ, fast DL carrier switch, multi-carrier CSI)
- Extensions to network-controlled repeaters (NCR), e.g. backhaul/control link behavior for efficient interaction between NES-capable gNB and associated NCR, to consider the case where the gNB would operate with S/P-domain adaptation or cell DTX/DRX adaptation for NW energy saving

[1] R1-232745



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# High layer view

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Rel-18 NES: Specification of techniques with high gain with less spec. impact

Rel-19 NES: To achieve more NES gain, <u>specify techniques including modification of the following topics</u>

- On-demand SSB transmission for Scell for connected UEs
- Cell DTx/DRx for idle/inactive mode UEs
- Adaptive common signals/channels (PRACH, Paging)

<u>Proposal 1</u>: Rel-19 NES should include at least the following topics:

- On-demand SSB transmission for Scell for connected UEs
- Cell DTx/DRx for idle/inactive mode UEs
- Adaptive common signals/channels (PRACH, paging)



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# On-demand SSB transmission for SCell for connected UEs

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- Background
  - In RAN1#101 meeting, this topic was discussed and there was no consensus on how it works for PCell.
    ⇒ On-demand SSB Tx for SCell for connected UEs is a baseline.
  - In case of multi-carrier environment, PCell can assist UEs to connect to on-demand SSB SCell by triggering/adapting SSB transmission
    - PCell informs UEs of resource information (e.g., periodicity) of SSB transmission for measurement. If needed, SSB transmission with shorter period can be activated by SCell upon SCell activation.
- Discussion
  - Necessary signaling to control on-demand SSB transmission
    To strive for minimum specification impact, consider full-utilization of existing specification
    - E.g., SSB activation based on Scell activation/deactivation

Proposal 2: Signaling for on-demand SSB should consider full-utilization of existing specification.



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# Cell DTx/DRx & Adaptive common signaling

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- Background
  - By applying Cell DTx/DRx to idle/inactive mode UEs, reduction of e.g., PRACH receptions and paging transmissions is expected.
  - Adaptive common signal/channel Tx is also targeting adaptation of the above channels.
- Discussion
  - With the above explanation, these two topics should be discussed with avoiding duplicated/inconsistent discussion.

Proposal 3: Cell DTx/DRx for idle/inactive mode UEs should be considered with adaptive common signaling to avoid duplicated discussions.



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# Other aspects

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- On-demand SIB1 transmission for idle mode UEs
  Application only to SIB1 transmission does not produce much NES gain based on Rel-18 study. Applied scenario needs to be clarified to have useful specification for operators.
- mTRP adaptation
  As we can't confirm that mTRP is major commercial deployment so far, we don't see urgent demand of this aspects.

Observation: For on demand SIB1 transmission, clarification of use cases is important to make it useful for real deployment.
Proposal 4: mTRP enhancement can be deprioritized as it is not major commercial deployment.



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# Summary

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- We provided our views on potential list of NES enhancements provided by RAN chairman.

- Proposal 1: Rel-19 NES should include at least the following topics:
  - On-demand SSB transmission for Scell for connected UEs
  - Cell DTx/DRx for idle/inactive mode UEs
  - Adaptive common signals/channels (PRACH, paging)
- Proposal 2: Signaling for on-demand SSB should consider full-utilization of existing specification.
- Proposal 3: Cell DTx/DRx for idle/inactive mode UEs should be considered with adaptive common signaling to avoid duplicated discussions.
- Observation: For on demand SIB1 transmission, clarification of use cases is important to make it useful for real deployment.
- Proposal 4: mTRP enhancement can be deprioritized as it is not major commercial deployment.



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# Thank you!

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