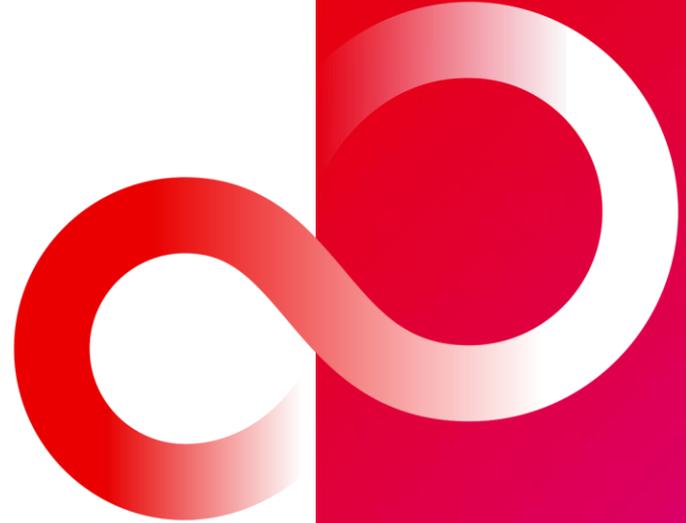


Views on Network Energy Saving WI

TDoc Type: Discussion
For: Decision
Agenda item: 9.2.5
Source: Fujitsu Limited



Conclusion of TR38.864

Based on the study and summary, from time and frequency domain,

- Technique A-4 of adaptation of DTX/DRX, including the alignment of Cell DTX/DRX with UE DRX, is beneficial for network energy savings.
- Adaptation/reduction/elimination of common channels/signals (UE WUS can also be considered) in single or multi-carrier operation are beneficial for network energy savings.

Based on the study, at least a technique based on C-1 is beneficial for network energy savings, and can be recommended. Technique C-2 also has the potential to provide large network energy saving gain.

Based on the study, at least a technique based on D-1 is beneficial for network energy savings.

For other higher layer aspects for network energy savings, from their perspective, the study can be summarized as follows.

- It is feasible to handle legacy UEs and NES-capable UEs via cell (re-)selection techniques. It is also feasible and possible to enhance the CHO framework to handover UEs faster.
- Group HO is not considered.
- Inter-node beam activation and paging enhancement need more study in normative phase, if supported.
- A means that one can prevent legacy UEs from camping on NES cells (of which definition can be left to WI phase), and/or allow NES-capable UEs to (down-)prioritize specific NES cell(s) on specific frequency, is needed, which is left to the WI phase depending on whether the existing mechanism for cell (re)selection is sufficient according to the NES techniques specified.

Even though we prefer to follow the TR conclusion for the scope of follow-up WI, the SI conclusion is too vague (i.e., the yellow parts) to determine a clear WI scope, which is not good from work management perspective

→ We share our explicit list of NES techniques to be included in the WID

Based on the study and summary, from time and frequency domain,

- Technique A-4 of adaptation of DTX/DRX, including the alignment of Cell DTX/DRX with UE DRX, is beneficial for network energy savings.
- Adaptation/reduction/elimination of common channels/signals (UE WUS can also be considered) in single or multi-carrier operation are beneficial for network energy savings.

- **A-4: Adaptation of DTX/DRX**

- Turning-off the Rx/Tx component of gNB is a key aspect for network energy saving for low load case
- **Should be included in the WI scope (i.e. aligned with the TR conclusion)**

Based on the study and summary, from time and frequency domain,

- Technique A-4 of adaptation of DTX/DRX, including the alignment of Cell DTX/DRX with UE DRX, is beneficial for network energy savings.
- **Adaptation/reduction/elimination of common channels/signals (UE WUS can also be considered) in single or multi-carrier operation are beneficial for network energy savings.**

“Adaptation/reduction/elimination of common channels/signals” is too broad, and may not be appropriate as a WID scope → Target techniques should be explicitly listed

- **A-1-1(simplified version of SSB), A-1-3(configuration/adaptation of longer periodicity of common signals and/or uplink random access opportunities)**
 - Moderate energy saving gain was revealed during SI phase
 - Less transmission opportunity of SSB/common channels/signals helps gNBs with entering deep sleep mode
 - **Should be included in the WI scope**
- **A-5-1 (non-CA) /B-1-1 (CA): SSB – and/or SIB1-less operation**
 - Similar with A-1-1, A-1-3 techniques, less frequent transmission of common signals helps gNBs with entering deep sleep mode
 - However, application to SpCell operation without SSB/SIB1 should be ruled out in Rel-18 to avoid a large spec impact
 - **Should be included in the WI scope, but SpCell operation (I.e. whole part of A-5-1 and B-1-1 with SSB/SIB1-less PCell) should be excluded**
- **A-1-4 (configuration/adaptation of transmission patterns of common signals for paging)**
 - This proposal is driven by one company, and the ES gain was not well discussed, and hence it is premature to move to normative phase.
 - **Should NOT be included in the WI scope**
- **A-5-2 on-demand SSB/SIB1**
 - On demand SSB/SIB1 triggered by neighboring cell(s) may be realized by existing signaling and gNB implementation, which is not something worthwhile spending WG discussion time in Rel-18.
 - Regarding on demand SSB/SIB1 triggered by UE WUS, the benefit was not well justified yet (please see the reason below)
 - **Should NOT be included in the WI scope**
- **A-3 UE WUS**
 - The ES gain obtain by SLS might be over optimistic with the consumption of ideal conditions, such as perfect WUS detection and no false alarm.
 - The impact to UEs such as access delay and inter-cell interference caused by the suddenly activated cell were not addressed.
 - Network decides its on-off state considering a lot of aspects, and Network should be able to ignore UE WUS even when specified. If so, the benefit to introduce UE WUS is not clear.
 - **Should NOT be included in the WI scope**

Based on the study, at least a technique based on C-1 is beneficial for network energy savings, and can be recommended.
Technique C-2 also has the potential to provide large network energy saving gain.

- **C-1: adaptation of spatial elements**

- The spatial element is a high-power consumption source in the current commercial network, and hence it is quite essential to address energy saving issues from this aspect
- **Should be included in the WI scope**

- **C-2: adaptation of TRPs in mTRP operation**

- While network energy saving is an urgent issue identified in the commercial network, mTRP has not been widely deployed yet
- The upbound value of energy saving gain of C-2 is smaller than that of C-1 while the former has higher UPT loss.
- “potential” in the conclusion means RAN1 study has not been concluded yet. Thus, it would be premature to start the normative phase
- **Should be low priority in Rel-18**

Based on the study, **at least** a technique based on D-1 is beneficial for network energy savings.

- **D-1: adaptation of transmission power of signals and channels**
 - This is a straightforward solution for network energy saving, and means to avoid performance degradation due to D-1 should be introduced in Rel-18
 - **Should be included in the WI scope**
- **Other techniques implied by “at least” (i.e. D-2, D-3, D-4, D-5)**
 - The discussion in RAN1 is not matured, and more discussion is necessary to commence the normative phase work
 - **Can be postponed in the later release**

D-2: over the air digital pre-distortion
D-3: tone reservation
D-4: PA input power bias adaptation
D-5: UE post distortion

For other higher layer aspects for network energy savings, from their perspective, the study can be summarized as follows.

- It is feasible to handle legacy UEs and NES-capable UEs via cell (re-)selection techniques. It is also feasible and possible to enhance the CHO framework to handover UEs faster.
- **Group HO is not considered.**
- Inter-node beam activation and paging enhancement need more study in normative phase, **if supported.**
- A means that one can prevent legacy UEs from camping on NES cells (of which definition can be left to WI phase), and/or allow NES-capable UEs to (down-)prioritize specific NES cell(s) on specific frequency, is needed, which is left to the WI phase depending on whether the existing mechanism for cell (re)selection is sufficient according to the NES techniques specified.

- **Handling of legacy UEs and NES-capable UEs via cell (re-)selection techniques**
 - **Should be included in WI scope** based on the RAN2 consensus
- **Enhancing the CHO framework to handover UEs faster**
 - **Should be included in WI scope** based on the RAN2 consensus
- **Group HO is not considered**
 - **Should not be included in the WI scope** because of the lack of RAN2 discussion
- **Inter-node beam activation and paging enhancement, if supported**
 - Reasonable scope, as other candidate solutions were already down-selected
 - **Should be included in WI scope**
- **Preventing legacy UEs from camping on NES cells and/or allowing NES-capable UEs to (down-)prioritize specific NES cell(s)**
 - **Should be included in WI scope** based on the RAN2 consensus

- **NES WI (follow-up of NES SI) should be approved at RAN#98e**
- **The following technology should be “explicitly” listed in the scope of the NES WI**
 - Time and frequency domain
 - A-4: adaptation of DTX/DRX
 - A-1-1: simplified version of SSB
 - A-1-3: configuration/adaptation of longer periodicity of common signals and/or uplink random access opportunities
 - B-1-1 (CA): SSB – and/or SIB1-less operation, but SpCell operation should be excluded
 - Spatial domain
 - C-1: adaptation of spatial elements
 - Power domain
 - D-1: adaptation of transmission power of signals and channels
 - Higher layer
 - Handling of legacy UEs and NES-capable UEs via cell (re-)selection techniques
 - Enhancing the CHO framework to handover UEs faster
 - Inter-node beam activation and paging enhancement
 - Preventing legacy UEs from camping on NES cells and/or allowing NES-capable UEs to (down-)prioritize specific NES cell(s)

Thank you

