3GPP TSG-RAN WG2 Meeting #112 electronic draftR2-2011166

Online, November 2nd – 13th, 2020

Source: CATT

Title: Summary of offline 114 - RedCap power saving- second round

Agenda Item: 8.12.3

Document for: Discussion and Decision

# Introduction

This contribution provides a summary of the 2nd round of the following email discussion:

* [AT112-e][114][REDCAP] Power saving (CATT)

Final Scope: Continue the discussion remaining proposals from [R2-2010787](file:///C:\Data\3GPP\RAN2\Inbox\R2-2010787.zip) considering the comments online

Final intended outcome: summary of the offline discussion in R2-2011166 with e.g.:

* + - List of proposals for online agreement (if any)

Final deadline (for companies' feedback): Thursday 2020-11-12 22:00 UTC

Final deadline (for rapporteur's summary): Friday 2020-11-13 05:00 UTC

# The following agreements were achieved during the online session [1] as a result of the first round of the above email discussion [2]:

Agreements via email - offline 114:

1. For UE in RRC IDLE/INACTIVE and eDRX cycle is less than 10.24s, paging monitoring does not use PTW and PH, if any.
2. The target REDCAP UE, considering mobility, is not limited to a fixed UE, but can also experience some low mobility, and this, during some “stationary” periods of time.
3. The RRM relaxation of REDCAP UEs is triggered based on measurements, as a baseline. Other triggering conditions for the “level-1” (still device at fixed location) UEs are not excluded, e.g. the possibility to signal their stationary property explicitly.
4. R16 NR RRM relaxation procedures are taken as a baseline to study further enhancements of neighbor cells RRM relaxation for REDCAP UEs in RRC IDLE/INACTIVE.

# This 2nd round is to progress on the leftover proposals which raised some concerns [1]:

**Proposal 1 (14/18): eDRX cycle extension in RRC\_IDLE beyond 10.24s for REDCAP UEs will be studied in this SI/WI.**

**Proposal 2 (16/18): If Proposal #1 is agreed, the eDRX cycle in RRC\_IDLE is extended up to 2621.44s for REDCAP UEs, as a baseline.**

**Proposal 3 (15/18): The lowest value of eDRX cycle is 5.12s for RRC\_IDLE and RRC\_INACTIVE REDCAP UEs, as a baseline. FFS 2.56s.**

**Proposal 5 (18/18): For UE in RRC IDLE and eDRX cycle is equal to 10.24s:**

* **If eDRX cycle > 10.24s is not supported (Proposal #1 is not agreed), paging monitoring is based on eDRX cycle (taking eDRX cycle as T in PF/PO formula);**
* **If eDRX cycle > 10.24s is supported (Proposal #1 is agreed), paging monitoring involves PTW, PH, similar to the LTE ‎eDRX mechanism beyond 10.24s**

**Proposal 7 (14/18): RAN2 will study ways and feasibility of supporting different relaxation levels for fixed UEs and slightly moving UEs.**

**Proposal 10 (13/18): Relaxation of neighbor cells RRM measurements in RRC\_CONNECTED will be studied in this SI/WI.**

# Discussion

# eDRX cycle in RRC\_IDLE

### Support > 10.24s and associated mechanism

In this section we aim at progressing two leftover issues related to eDRX in RRC\_IDLE:

* For RRC\_IDLE, should the eDRX cycle be extended beyond 10.24s and if yes, what should be the upper bound?
* What baseline mechanism should be used when NR eDRX cycle is equal to 10.24s?

From the online discussion, it appeared that one company having concerns with extending the eDRX cycle beyond 10.24s would be OK, as a compromise, if the R16 NR mechanism for monitoring POs (not using PTW, PH) would also be used when eDRX cycle equals 10.24s, while the LTE mechanism (using PTW, PH) would be used for eDRC cycles > 10.24s:

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| Proposal 1 (14/18): eDRX cycle extension in RRC\_IDLE beyond 10.24s for REDCAP UEs will be studied in this SI/WI.   * QC and Vivo still have a different view * QC can accept proposal 1 with the clarification that other eDRX features are only supported for eDRX cycles longer than 10.24s |

This would allow a UE requesting eDRX cycle always ≤ 10.24s during UE-CN negotiation to not support PTW/PH features.

This means that the proposed compromise consists in coupling P1 and P5 as follows:

**Proposal 1:**

* **eDRX cycle extension in RRC\_IDLE beyond 10.24s for REDCAP UEs will be studied in this SI/WI.**
* **For UE in RRC IDLE and eDRX cycle is equal to 10.24s, paging monitoring does not use PTW and PH, if any.**

And the original proposal 2 is unchanged:

**Proposal 2 (16/18): If Proposal #1 is agreed, the eDRX cycle in RRC\_IDLE is extended up to 2621.44s for REDCAP UEs, as a baseline.**

And proposal 5 is reformulated in proposal 3:

**Proposal 3: For UE in RRC IDLE and eDRX cycle is equal to 10.24s:**

* **If eDRX cycle > 10.24s is not supported (Proposal #1 is not agreed), paging monitoring is based on eDRX cycle (taking eDRX cycle as T in PF/PO formula);**

**Companies who do not agree with the above proposals are invited to express their concerns.**

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| Company | Proposal | Comments |
| Qualcomm | 1 | We are fine with P1~P3. We only have a minor comment that “if any” in the 2nd bullet in P1 does not seem necessary. |
| OPPO | 3 | For UE in RRC IDLE and eDRX cycle is equal to 10.24s,  if eDRX cycle > 10.24s is supported, we prefer to use the same ‎eDRX mechanism as LTE, i.e., PTW and PH are used for paging monitoring  if eDRX cycle > 10.24s is not supported, there is no need to introduce PTW and PH only for this case.  So we prefer the original proposal 3. |
| Xiaomi | 1 | It seems the difference is for the case of eDRX cycle is equal to 10.24s. We also to prefer the LTE way, i.e., if eDRX cycle > 10.24s is supported, PTW and PH are used for paging monitoring. |
| Apple |  | While the LTE way would be simpler, we understand Qualcomm’s concern. We will not object to using H-SFN/PTW for >10.24sec |
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| **Conclusion:** |

### Lower bound of eDRX cycle

If we follow the LTE principle, there is only one value lower than 10.24s, i.e. 5.12s. However few companies expressed concerns that 2.56s should also be considered:

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| Proposal 3 (15/18): The lowest value of eDRX cycle is 5.12s for RRC\_IDLE and RRC\_INACTIVE REDCAP UEs, as a baseline. FFS 2.56s.   * Apple would like to "see if RAN2 can agree to allow 2.56s into the allowable RedCap DRX range. We can have FFS on how to signal/handle this. We haven’t discussed on the emergency reception for at least some RedCap UEs (wearables) and the impact from 5.12 sec on the emergency reception, as well as the need for the operation of 2.56 DRX for some RedCap UEs. Stating 5.12sec as "the lowest value" is a bit too strong." |

This concern was also shared by Facebook and MediaTek in [2], so we can give another attempt with updating the original proposal as follows:

**Proposal 4: RAN2 will study supporting down to 2.56s eDRX cycle for RRC\_IDLE and RRC\_INACTIVE REDCAP UEs, as a baseline.**

**Companies who do not agree with the above proposal are invited to express their concerns.**

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| Company | Comments |
| OPPO | Not sure if this also opens the door for even lower values, e.g. 1.28s? We think at least we should take LTE as the baseline. |
| Xiaomi | We also think 5.12s in LTE can be the baseline while other values can be further discussed. |
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| **Conclusion:** |

# RRM relaxation for stationary devices

During the first phase of discussions [3], a consensus was reached that the below 4 different levels of mobility should be supported for REDCAP UEs:

* Level 1: still device at fixed location (e.g. fixed static sensor)
* Level 2: moving (e.g. rotary) device at a fixed location (e.g. camera, robot)
* Level 3: temporarily fixed device (e.g. smart watch at night)
* Level 4: device is moving around slowly (e.g. medical wearables)

It was then further discussed whether the above scope of mobility would be commonly addressed with only one level of relaxation (assumed considering the highest mobility of the scope) or if different relaxation levels would be studied, thus e.g. allowing different relaxation levels for fixed UEs and slightly moving UEs. A majority of companies supported studying 2 relaxation levels, allowing distinguishing fixed UEs from slightly moving UEs, thus resulting in the following proposal and comment [1]:

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| Proposal 7 (14/18): RAN2 will study ways and feasibility of supporting different relaxation levels for fixed UEs and slightly moving UEs.   * Nokia would like "to discuss p7 also online. It is not clear to us how many relaxation levels this proposal is actually proposing in the end." |

We understand the concern raised by Nokia is that the two levels of relaxation are not explicitly captured so the proposal is unclear regarding how many different levels of relaxation are to be studied. We therefore suggest clarifying the proposal as follows:

**Proposal 5: RAN2 will study ways and feasibility of supporting at most two different relaxation levels targeting fixed UEs and slightly moving UEs.**

**Companies who do not agree with the above proposal are invited to express their concerns.**

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| Company | Comments |
| OPPO | We prefer a unified solution since multiple relaxation levels would increase the UE complexity and cause more power consumption when performing criteria checking. |
| Nokia | RAN2 already agreed that the RRM relaxation of REDCAP UEs is triggered based on measurements and R16 NR RRM relaxation procedures are taken as a baseline. In R16 scheme there are already 3 “levels” for the measurements – 1. UE is allowed not to measure neighbour cells based on the measurement rules i.e. s search, 2. relaxed measurements and 3. normal measurements.  With the current proposal it seems that there would 4 (or 5?) different measurement levels. We think that 3 existing levels are already quite challenging for the network to configure and more levels would just increase the complexity. In addition it would be very challenging to define what exactly is slightly moving UE and how to configure that.  Therefore, we think that already existing 3 levels are sufficient. |
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| **Conclusion:** |

### RRM relaxation in RRC\_CONNECTED

There was no time left to discuss this issue online although studying relaxing RRM measurements of neighbor cells in RRC\_CONNECTED for REDCAP UEs gathered some support in [2]. So we will just check if the original proposal (in P10) can be agreed unchanged:

**Proposal 6: Relaxation of neighbor cells RRM measurements in RRC\_CONNECTED will be studied in this SI/WI.**

**Companies who do not agree with the above proposal are invited to express their concerns.**

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| Company | Comments |
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| **Conclusion:** |

# Conclusion

As outcome of this email discussion, we have the following proposals:

# Reference

1. RAN2 #112e Chairman’s Notes
2. R2-2010787 Summary of offline 114 - RedCap power saving; CATT
3. R2-2009364 Summary of email discussion 915 - UE power saving features; CATT