3GPP TSG-RAN WG3 #111-e R3-211173

Online, January 25th - Feburary 4th, 2021

Agenda Item: 10.2.3

Source: CMCC (moderator)

Title: Support of inter-system inter-RAT energy saving

Document for: Discussion and Decision

# Introduction

**CB: # 1008\_SONMDT\_InterSystemEnergy**

**- Minimum activation time?**

**- NG-RAN node preventing camping and handovers?**

**- Cell status information in Inter-System SON Information Report message in S1AP and NGAP?**

**- Applicability of new state for intra-system energy saving**

**- May also discuss other issues based on papers submitted**

**- Try to reach high-level agreements in the first phase, proceed to TPs in the second phase of the email discussion**

(CMCC - moderator)

Summary of offline disc [R3-210996](file:///C:\Users\cmcc\Documents\WeChat%20Files\liangzai936046\FileStorage\File\2021-01\Inbox\R3-210996.zip)

Since the views from the papers proposed in RAN3#111-e meeting are relatively consistent, we hope to reach high-level agreements in the first phase and proceed to TPs in the second phase of the email discussion.

# For the Chairman’s Notes

**Phase 2:**

To be determined.

**Phase 1:**

Propose to agree the following proposals:

**Minimum activation time for inter-system inter-RAT energy saving should be added** **in the cell activation request to avoid ping-pong effect.**

**No need to specify that re-activated NR cell shall prevent new user from camping or accessing services during the minimum activation period to avoid ping-pong switching on/off.**

Open issues:

**The low power status needs further investigation and clarification on how to define the low power status in 3GPP and what action will the neighboring gNBs take by receiving the low power status.**

**To be continued in the second phase**:

We will continue to work on Stage2 and Stage3 TPs based on the agreements.

Stage3: TP for 38.413 based on R3-210910（CMCC）

Stage2: TP for 38.300 based on R3-210569（ZTE）

# Phase 2

During the online discussion, companies reach the agreement that minimum activation time to reduce ping-pong is beneficial. However, the stage2 or stage3 details of minimum activation time need to be discussed.

So in phase 2, focus on stage 2 or stage 3 to capture minimum activation time

**Option 1: Only Stage2 change is needed.**

Some companies believe that the main issue in case of ping-pong lies on the capacity cell which is potentially switching on and off, and not on the coverage cell that could anyway just send a new switch-on request. Therefore, local configuration in the capacity cell associated with some stage 2 should be enough. But how stage 2 only text satisfies the requirement is still not clear.

**Option 2: Both Stage2 and Stage3 change are needed.**

Some companies propose the minimum activation time is carried in Inter-system SON Information Request IE in Stage3. As specified in LTE, the minimum activation time is sent from the coverage cell, during this time period, the coverage cell may request the UE to perform some measurements or other actions, so it expects the coverage cell not to switch off, which gives some time to allow UE to connect. Stage 3 could avoid interoperability issues for 4G-5G inter-vendor case.

**Question 1: Which option do you prefer? If only stage 2 is preferred, could you please provide the suggested text to let companies understand whether it satisfies the acquirement?**

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| Company | Comment/Suggested text |
| Ericsson | Option 1. There is no possibility for the coverage node to define the right timer without knowing at least the switch-on time of the capacity cell. And depending on implementation, other parameters might be needed at the coverage cell. That is why a local timer is sufficient. The capacity cell will learn the right value for this timer by monitoring the request from the coverage cells, and the UE connecting after its activation (e.g. how long does it take between the first connection attempt and the switch-on request). Signaling an arbitrary timer will not help and will probably result in lower performances. |
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# Discussion

## Minimum Activation Time

Based on the reference paper [1][3], it is proposed to add the minimum activation time IE in the cell activation request to avoid ping-pong effect. The minimum activation time is a period of time the requesting node wants the cells to be activated before switching off. For the reference, the description of inter-RAT energy saving for E-UTRA cell case in TS 36.300 is specified that

*If basic coverage is ensured by UTRAN or GERAN cells, the eNB owning the capacity booster cell may receive a re-activation request from a GERAN or UTRAN node by means of the MME Direct Information Transfer procedure over S1. The eNB owning the capacity booster cell may also receive from the sending GERAN or UTRAN node the minimum time before that cell switches off;*

*The eNB owning the concerned cell may choose to delay or not to send indication(s) if the sending GERAN or UTRAN node has included the minimum activation time in the re-activation request.*

**Question 1: Do you agree with introducing minimum activation time for inter-system inter-RAT energy saving?**

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| Company | Comment |
| China Telecom | Agreed.   1. This timer had been defined in inter-system energy saving for LTE and 2G/3G. The scenario and requirement for 5G inter-system ES are similar. 2. In inter-vendors deployment, to introduce the min activation timer can avoid the ping-pong effect. |
| ZTE | Agree. |
| China Unicom | Agree to introduce minimum activation time IE, this IE should be flexible configured for inter-RAT scenarios. |
| Ericsson | Probably not needed. The gain does not match the complexity (e.g. configuration of UE measurements, misalignment because of activation times in the capacity booster cell, etc…). New methods such as self-learning algorithm in the capacity booster (network learns suitable timer values based on the activation requests from the coverage providing cells) could be deployed, so the booster cell will know better. |
| Huawei | We see some benefits on avoidance of ping-pong activation/deactivation.  But no strong view. |
| Qualcomm | Okay to introduce minimum activation time.  Also didn’t understand the complexities involved as mentioned by Ericsson. |
| CMCC | Agree to introduce minimum activation time to avoid ping-pong effect. |
| Nokia | It seems to us that minimum activation time can be handled at stage 2 level and configuration. This should avoid ping-pong. |

**Moderator’s view: Based on the views from majority of companies,** **minimum activation time for inter-system inter-RAT energy saving should be added** **in the cell activation request to avoid ping-pong effect.**

## NG-RAN Node Preventing Camping and Handovers

[1] proposed the standard should not specify that re-activated NR cell shall prevent new user from camping or accessing services during the minimum activation period to avoid ping-pong switching on/off.

The moderator found this refers to the description in TS 36.300 which is related to minimum activation time,

*The eNB owning the capacity booster cell may also receive from the sending GERAN or UTRAN node the minimum time before that cell switches off; during this time, the same eNB may prevent idle mode UEs from camping on the cell and may prevent incoming handovers to the same cell.*

**However, there is no such kind of description in the current TS 38.300 for inter-system inter-RAT energy saving. The corresponding TP makes some changes to the intra-system energy saving part which seems Rel-16 correction, not within the scope of Rel-17.**

**Question: What’s your view on this proposal of standard should not specify that re-activated NR cell shall prevent new user from camping or accessing services during the minimum activation period to avoid ping-pong switching on/off?**

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| Company | Comment |
| China Telecom | There is no need to specify the action during the min activation period. From perspective of operator, it can be configured by OAM. |
| ZTE | There is no need to specify the action during the min activation period.  The motivation of such activation is to prevent NR cell receiving re-activation request not attracting traffic from cells other than coverage eNB and shortly switching off based on it own low cell load . However, NR cell may also provides greatly enriched services while coverage eNB can not provide, it is not certain the rejected user can be served by the coverage eNB. The operators may have different priorities for balancing energy efficiency and customer satisfaction, so we think it can be configured by OAM. |
| China Unicom | The description of inter-system inter-RAT energy saving is fine for us. But the action during the minimum activation period is no need to specify. |
| Ericsson | Agree that we shall avoid specifying the node behavior of the re-activated cell |
| Huawei | Agree. |
| Qualcomm | Agree |
| CMCC | We should not specify that re-activated NR cell shall prevent new user from camping or accessing services during the minimum activation period to avoid ping-pong switching on/off. |
| Nokia | Agree that there is no need to specify this behavior. |

**Moderator’s view: Based on the views from majority of companies,** **there is no need to specify that re-activated NR cell shall prevent new user from camping or accessing services during the minimum activation period to avoid ping-pong switching on/off.**

## Cell Status

Based on the reference paper [2], a low power consumption cell status information is introduced that the NR gNB could inform this status to 4G eNB to forbid UEs with high data rate service to be handover to 5G network for the purpose of reducing the power consumption. For idle UE or inactive UE, this status does not change any mobility strategy.

**Question: Do you agree with introducing new cell status information in Rel-17?**

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| Company | Comment |
| China Telecom | Agree |
|  | As description in [2], switching off operation is mainly used in the indoor sub-systems, especially for the typical tidal scenes of shopping malls and subways. In most cases, operators prefer to active the private solutions, , e.g., RF channel shutdown, symbol shutdown, to achieve ES. The new cell status is meant to indicate any UEs in 4G network not taking handover or redirection to 5G SA network |
| ZTE | Agree. |
| Ericsson | For this state to be useful, the meaning of “low power consumption state” needs to be defined in 3GPP. What are the actions taken by the gNB to reduce its energy consumption? And what should the eNB understand and do with this information in order to respect the “low power consumption state of its neighbor”? This is not only about restricting UEs with high data rate, or about symbol shutoffs. The possibilities are unlimited, and depends on implementation. Therefore, this is hardly interoperable. |
| Huawei | Agree to continue study if operators think its beneficial, like concerns mentioned by Ericsson.  Question for clarification, if the intention is just to avoid serving high data rate users in order to keep it in energy saving sate, it seems contradict to the basic motivation of 5G? This seems harmful from user experience pov.  If this is clarified, and the definition is clear, OK to have the third energy saving state. |
| Qualcomm | Also seek further clarification on the definition of “low power consumption state”. If we can’t clearly define the trigger to move in/out of “low power consumption state”, we can keep this implementation specific and not as part of standards |
| CMCC | The low power status seems beneficial. But need further investigation and clarification on how to define the low power status in 3GPP and what action will the neighboring gNBs taking by receiving the low power status. |
| Nokia | Not sure to see the benefit and agree with E/// that there is a risk this will not be interoperable. |

**Moderator’s view:** **The low power status needs further investigation and clarification on how to define the low power status in 3GPP and what action will the neighboring gNBs taking by receiving the low power status.**

## Applicability of Cell Status Information in NG/S1 messages

Based on the reference paper [2], if the new cell status is adopted, the cell status information is carried in the existing Inter-System SON Information Report message in S1AP and NGAP.

**Proposal: If the new cell status is adopted, the cell status information is carried in the existing Inter-System SON Information Report message in S1AP and NGAP.**

**Question: Companies are invited to give your views on the proposal 3.**

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| Company | Comment |
| China Telecom | Agree with this proposal.  In addition, in CU/DU split architecture, it is need to indicate the cell status in GNB-DU CONFIGURATION UPDATE message. |
| ZTE | Agree. |
| CMCC | Prefer first have some stage2 agreements, which is the answer for the Question 3.3 |
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**Moderator’s view:** **Some stage2 agreements should be firstly reached before stage3 details**

# Conclusion, Recommendations [if needed]

If needed

# References

1. R3-210567 Consideration on inter-system inter-RAT energy saving, ZTE.
2. R3-210839 Further Discussion on new Cell Status for Energy Saving Operation, China Telcom.
3. R3-210909 Discussion on inter-system inter-RAT energy saving, CMCC.