3GPP TSG-RAN WG2 Meeting #116 Electronic R2-21xxxxx

Elbonia, 1 – 12 November 2021

**Agenda item: 8.21.2.1**

**Source: ZTE corporation, Sanechips**

**Title: Report of [AT116-e][039][TEI17] PO determination in RRC\_INACTIVE (ZTE)**

**Document for: Discussion and Decision**

# 1 Introduction

This is the summary of the following email discussion in RAN2#116-e meeting.

* [AT116-e][039][TEI17] PO determination in RRC\_INACTIVE (ZTE)

 Scope: Treat R2-2110464, R2-2110465, Collect comments determine what is agreeable. If agreeable, make R17 CRs

 Intended outcome: Report, Agreed-in-principle CRs

 Finish Deadline: Wednesday W2 (NO CB)

The rapporteur would like to have the discussion with two phases:

**Phase 1:** Treat proposals from R2-2110464, collect comments and determine what is agreeable.

Intended outcome: Report with agreeable proposals.

**Deadline: Friday Nov 05 1200 UTC**

**Phase 2:** Make R17 CRs and let companies review and comment.

Intended outcome: Agreeable CRs.

**Deadline: Wednesday Nov 11 18:00 UTC**

# 2 Contact information

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# 3 Discussion

## 3.1 Discussion history and agreements

### **RAN2#114e**

R2-2106771 Report of [AT114-e] [013] [NR15] Idle Inactive mode (ZTE) ZTE corporation, Sanechips discussion

**=> [013] 1: RAN2 understand the index of the PO (i.e. the i\_s) calculated based on the same UE ID may be different in inactive state and idle state when the DRX cycle for inactive and idle state are different. If a UE in inactive state only monitors the PO derived for inactive state, CN paging failure would happen in both NR and eLTE .**

**=> [013] 2: For Rel-15, it is up to NW implementation to ensure RAN and CN paging occasions overlap in both NR and eLTE**

**=> [013] Whether a standard solution should be supported in later releases (Rel-16 or Rel-17) for NR and eLTE, and if so, the choice of solution, is Postponed**

### **RAN2#115e**

[R2-2109077](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_115-e%5CDocs%5CR2-2109077.zip) Report of [AT115-e] [026] [NR16] System Information and Paging (ZTE) – Phase 1 ZTE Corporation, Sanschips

* **For R16, we assume similar as R15, that the network implementation need to ensure that there are no issues.**
* **We introduce a solution, from R17, where the following is the baseline:**
	+ - **R2-2109077 Solution 2 (i.e. UE in RRC \_INACTIVE should use the same i\_s to determine PO as for RRC \_IDLE) is supported to address the RAN and CN paging PO non-overlap problem.**
		- **UE capability should be introduced to indicate support for using the same i\_s in PO determination in RRC \_INACTIVE state as in RRC \_IDLE state.**

**CR discussion is postponed to next meeting. If needed can also further discuss variants of Solutions based on raised issues.**

### **Baseline solution**

**UE in RRC \_INACTIVE should use the same i\_s to determine PO as for RRC \_IDLE.**

## 3.2 Details on the baseline solution

With the baseline solution, it is observed that only the RAN paging PO would be shifted if the i\_s in RRC\_INACTIVE is not the same as the i\_s in RRC\_IDLE. To ensure that UE and the network are aligned on how the RAN paging would be sent and received, the baseline solution works when the following requirements are met:

* UE supports the baseline solution and is aware that this solution is enabled by the NW.
* NW supports the baseline solution and is aware that UE would monitor the RAN paging in the PO determined by the i\_s as in RRC\_IDLE.

To meet the two requirements and have the baseline solution work properly,the following cases need to be considered:

* Case 1: The PO determination when UE stays in the cell where it is released from connected to inactive state.
* Case 2: The PO determination after mobility in inactive state.

### **Case 1: PO determination when UE stays in the cell where it is released to inactive state**

For case 1, it has been proposed [1] to introduce an indication, e.g. *useIdlePO*, in *RRCRelease*-> *suspendConfig* to enable the baseline solution when NW and UE both supports it:

* NW should set *useIdlePO* to “true” if NW supports the baseline solution and UE indicates support for this solution.
* UE should monitor both CN paging and RAN paging in the POs determined by i\_s of RRC\_IDLE if the *useIdlePO* is included and set to “true” in *RRCRelease*-> *suspendConfig*.

**Q1: Do companies agree that an indication, e.g. *useIdlePO* in *RRCRelease*-> *suspendConfig* should be introduced to enable the baseline solution when NW and UE both supports it?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Detailed Comments |
| Samsung | Yes |  |
| LG | Yes | We are fine with the indication, and it seems more clarification is needed about the validity of this indication. In our understanding, the UE should monitor the idle mode PO until returning to connected mode, so we proposed to clarify this in the CR:38.331:Indicates that UE should use the same i\_s to determine PO as in RRC\_IDLE state after entering RRC\_INACTIVE state until state transition to RRC\_CONNECTED as described in TS 38.304 [20].38.304:UE shall use the same i\_s as for RRC\_IDLE state until state transition to RRC\_CONNECTED.(One editorial comment – there is duplicated typo in the last paragraph of reason for change in the 38.331 CR:To solve this PO mismatch for CN paging and RAN paging, it has been proposed that UE in inactive mode use UE ~~in inactive mode~~ use the same i\_s as in idle mode to determine the PO. |
| Xiaomi | Yes | We do not agree with LG’s suggestion of adding “until state transition to RRC connected”. For connected, UE can monitor any PO every modification period, not necessarily its own PO. As such, inactive mode PO determination has no relation to connected mode PO monitoring. |
| MediaTek | Yes | Regarding to LG’s proposal on adding “until state transition to RRC\_CONNECTED” seems not really necessary.  |
| OPPO | No | We think it is sufficient to include “***useIdlePO***” in the SIB and no need to include in the RRCRelease message. NW uses IDLE PO for RAN paging if NW knows that UE supports useIdlePO. |
| CATT | Yes,but | We understand Q1 depends on conclusion on Q2It is OK to indicate useIdlePO in RRCRelease message if it is valid in the whole RNA, i.e. if answer to Q2 is option 1.But if conclusion to Q2 is option 2(i.e. *useIdlePO* valid only in the cell from which it is configured),then there is no need to indicate it in RRCRelease message, a unified solution (i.e.using ranPagingInIdlePO in SIB of all the cells) is sufficient as anyway “ranPagingInIdlePO” in SIB should be defined for the newly re-selected cell. |
| Ericsson | No | We support the overall solution based on UE capability and SIB indication (if any solution is agreed to be introduced). In our view, this is a more robust solution, from overall system view. After all we impact and change the basic “Paging in RRC\_INACTIVE” feature. Then we should leave as few open ends as possible (relying on RRCRelease indication, relying on consistent nw deployment).(We were also a bit confused by the way tis email discussion was sliced into Q1 and Q2). |
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### **Case 2: PO determination after mobility in inactive state**

After UE moves to another cell within the configured RNA, UE has to monitor both CN paging and RAN paging but has no other way to interact with the NW if no RNAU or UL/DL transmission is triggered, makes it difficult for UE and NW to have common understanding on how the RAN paging would be sent and received as the baseline solution should be enabled in a per UE manner based on UE capability.

The following options can be considered to enable the baseline solution for mobility in RRC\_INACTIVE mode.

* **Option 1: *useIdlePO* valid in the whole RNA**
	+ - Indicate *useIdlePO* also in RAN PAGING message and it is up to NW to ensure that the baseline solution is supported by all the cells configured in the RNA and the gNB/ng-eNB would send RAN paging in the PO determined by the i\_s of RRC\_IDLE.
		- UE would monitor both CN paging and RAN paging in the PO determined by the i\_s in RRC\_IDLE if it supports the baseline solution and it does not move out of the configured RNA.



* **Option 2: *useIdlePO* valid only in the cell from which it is configured**
	+ - Indicate UE capability of supporting the baseline solution also in RAN PAGING message as part of UE Radio Capability for Paging and the target node would send the RAN paging and CN paging in the PO determined by the i\_s of RRC\_IDLE and broadcast *ranPagingInIdlePO* via system information.
		- If cell reselection happens after UE get released to RRC\_INACTIVE, UE would monitor both of the CN paging and the RAN paging in the PO determined by the i\_s in RRC\_IDLE if it supports the baseline solution and the *ranPagingInIdlePO* is broadcast by this newly re-selected cell.



**Table 1: Comparison between option 1 and option 2**

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|  | **Option 1** | **Option 2** |
| **RAN2 impact** | * Per UE indication (e.g. *useIdlePO*) *RRCRelease* message to enable the baseline solution.
* It is up to NW to ensure such indication to enable the baseline solution is valid within the configured RNA, i.e. all the cells within the RNA support the baseline solution
 | * Per UE indication (e.g. *useIdlePO*) *RRCRelease* message to enable the baseline solution.
* Broadcast a *ranPagingInIdlePO*
* No requirement on the NW implementation and it is allowed for NW to include a cell who does not support the baseline solution when the RNA is configured.
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| **RAN3 impact** | Include per UE indication (e.g. *useIdlePO* ) in RAN PAGING message | Include UE capability in RAN PAGING message as part of UE Radio Capability for Paging |

**Q2: Which option do companies prefer to enable the baseline solution after mobility in RRC\_INACTIVE state?**

* **Option 1: *useIdlePO* valid in the whole RNA**
	+ - Indicate *useIdlePO* also in RAN PAGING message and it is up to NW to ensure that the baseline solution is supported by all the cells configured in the RNA and the gNB/ng-eNB would send RAN paging in the PO determined by the i\_s of RRC\_IDLE.
		- UE would monitor both CN paging and RAN paging in the PO determined by the i\_s in RRC\_IDLE if it supports the baseline solution and it does not move out of the configured RNA.
* **Option 2: *useIdlePO* valid only in the cell from which it is configured**
	+ - Indicate UE capability of supporting the baseline solution also in RAN PAGING message as part of UE Radio Capability for Paging and the target node would send the RAN paging and CN paging in the PO determined by the i\_s of RRC\_IDLE and broadcast *ranPagingInIdlePO* via system information.
		- If cell reselection happens after UE get released to RRC\_INACTIVE, UE would monitor both of the CN paging and the RAN paging in the PO determined by the i\_s in RRC\_IDLE if it supports the baseline solution and the *ranPagingInIdlePO* is broadcast by this newly re-selected cell.
	+ **Other option**

Note: The draft CRs for option 1 and option 2 have also been provided in the draft folder for reference.

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| Company | Option 1/2/other | Detailed Comments |
| Samsung | Option 1 | No strong view but this enhancement is to address a corner case anyway so we think that option 1 is sufficient/ simpler i.e. minimal specification impact.  |
| LG | Option 1 | We think option 1 is enough. As the source cell which released the UE to the inactive state should coordinate with other cells in the RNA to provide RAN paging message, we think *ranPagingInIdlePO* is not necessary. |
| Xiaomi | Option 1 | Option 1 is much simpler. For us, it seems natural that all the cells in the same RNA support the same set of features designed for inactive mode. |
| MediaTek | Option 1 | It is simpler and avoid new signaling in SI. We don’t really see big benefit to control this kind of paging reception in per cell level. |
| OPPO |  Option 1 |  |
| CATT | Option 1 | Q2 depends on Q1For details, pls see our reply to Q1. |
| Ericsson | Option 2 | See Q1 |
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# 4 Conclusion

TBD

# 5 References

1. R2-2110464 PO determination in RRC\_INACTIVE for Rel-17 and later releases ZTE corporation, Sanechips, vivo discussion Rel-17 TEI17
2. R2-2110465 Text proposals for PO determination in RRC\_INACTIVE ZTE corporation, Sanechips, vivo discussion Rel-17 TEI17