**3GPP TSG-RAN WG2 Meeting #118-e Draft R2-2206363**

**Online, 9 – 20 May 2022**

**Agenda item: 6.3.2**

**Source: Samsung**

**Title: Report of [AT118-e][234][MUSIM] UE behavior for NAS-based busy indication in RRC\_INACTIVE (Samsung)**

**Document for: Report**

# 1 Introduction

This document is the report of the following offline discussion:

* [AT118-e][234][MUSIM] UE behavior for NAS-based busy indication in RRC\_INACTIVE (Samsung)

      Scope: Discuss how to capture NOTE about INACTIVE UE behaviour if it rejects RAN paging in 38.331 and come up with CR for this.

Intended outcome: Discussion report in [R2-2206363](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2206363.zip) and agreeable CR in [R2-2206169](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2206169.zip).

* Comment deadline: Wednesday W2, 0400 UTC (for collecting views)
* Rapporteur proposals: Wednesday W2, 0800 UTC (proposed resolution of issues)
* Document deadline: Wednesday W2, 1600 UTC (report or agreed CRs)
  + No extensions to this deadline for regular discussions. Discussions handling CRs may continue to short post-meeting email (based on chair decision).

# 2 Contact information

|  |  |  |
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# 3 Discussion

RAN2 made the following agreement on INACTIVE UE behavior for NAS-based busy indication:

[R2-2205762](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205762.zip) Clarification on UE behavior for NAS-based busy indication in RRC\_INACTIVE Samsung Electronics Co., Ltd discussion Rel-17 LTE\_NR\_MUSIM-Core [R2-2202239](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2202239.zip)

*Observation 1: According to SA2 specification, IDLE UE may not send NAS-based busy indication even if it decides to reject the paging due to UE implementation constraints.*

*Observation 2: Current procedure text in the running RRC CR may mislead for UE to always resume RRC connection to accept or reject the RAN paging.*

*Proposal 1: Confirm that INACTIVE UE may not send NAS-based busy indication even if it decides to reject the RAN paging due to UE implementation constraints as in IDLE UE.*

*Proposal 2: If Proposal 1 is agreeable, RAN2 to discuss whether to capture it in the minutes or a note in the specification.*

- ZTE thinks if UE rejects RAN paging it should send Service Request, so would send busy indication. This could impact CT1 specification. QC disagrees and thinks this is up to UE implementation. This we could capture this. OPPO thinks this was not discussed before but can accept this. Nokia thinks sending busy it's still possible. MTK, LGE, Apple, Huawei, DENSO, Lenovo support P1. ZTE thinks that if NAS tells UE to go to CONNECTED, AS will follow.

- QC clarifies CT1 specs says this: " Upon being paged by the network, the Multi-USIM UE in CM-IDLE state attempts to send a Service Request message to this network including the Reject Paging Indication, unless it is unable to do so, e.g. due to UE implementation constraints." Samsung thinks INACTIVE UE is in CM-CONNECTED so this may not be sufficient. vivo thinks we could add a NOTE. Ericsson thinks NOTE is informative but procedural text would be different so would prefer procedural text. Intel agrees that strictly speaking this is correct but since AS-NAS interaction is not specified NOTE could be sufficient. Ericsson thinks we could add "as specified elsewhere" or similar. ZTE thinks for INACTIVE, CT1 specification says that if UE rejects RAN paging, it still sends Service Request.

* Capture NOTE about INACTIVE UE behaviour if it rejects RAN paging in 38.331. Can discuss exact wording for the NOTE offline. Should refer to CT1 specifications.

During the online discussion on May 10th 2022, it was pointed out [4] that according to CT1 specification [6] if MUSIM UE decides to reject the RAN paging, the UE **SHALL** initiate the service request procedure (aka NAS-based busy indication) i.e. see the relevant text below:

If the UE in 5GMM-CONNECTED mode with RRC inactive indication receives an indication from the lower layers about RAN paging and the MUSIM UE decides to reject the RAN paging, the UE shall initiate the service request procedure and set request type to "NAS signalling connection release" in the UE request type IE and service type to "signalling" in the SERVICE REQUEST message as specified in subclause 5.6.1.2 for case o of subclause 5.6.1.1. The UE may include its paging restriction preferences in the Paging restriction IE in the SERVICE REQUEST message as specified in subclause 5.6.1.2 for case o of subclause 5.6.1.1.

NOTE 3: The interworking between the NAS layer and the AS layer triggered by RAN paging is up to UE implementation.

But rapporteur's understanding is that the AS-NAS interaction for RAN paging reception is up to UE implementation as clarified in above NOTE. In other words, there seems no requirement for UE AS to always forward an indication about RAN paging to the upper layers if MUSIM UE decides to reject the RAN paging. Additionally the intent of this whole discussion is to check whether the UE SHALL always resume the RRC connection irrespective of whether it accepts or rejects the RAN paging according to the current RRC specification as mentioned in [1, 2, 3].

Thus, before discussing exact wording on the NOTE in our specification, it would be good to reach common understanding in RAN2 whether INACTIVE UE may not be able to send a Service Request message to the network including the Reject Paging indication as a response to the RAN paging due to UE implementation constraints.

**Q1: Which of the following options do you agree for INACTIVE UE behavior if it rejects RAN paging?**

* **Option 1:** **INACTIVE UE may not be able to send a Service Request message to the network including the Reject Paging indication as a response to the RAN paging due to UE implementation constraints**
* **Option 2: INACTIVE UE shall send a Service Request message to the network including the Reject Paging indication as a response to the RAN paging**

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| --- | --- | --- |
| Company | Option 1/ Option 2 | Comments (if any) |
| vivo | Option 1 | The latency of sending a NAS busy indication in RRC INACTIVE is also not negligible, it could impact the ongoing service in the other USIM. And we do not find any other reason to allow option 1 for RRC IDLE UE, but force RRC INACTIVE UE to accept the paging or send the reject paging indication even if the UE cannot do this. |
| SONY | Option 1 | The current CT specifications 24.501 state that a UE is allowed to not respond to paging is valid in 5GMM-REGISTERED state which cover both RRC\_Idle and RRC\_INACTIVE state except for limited service.  So we do not see the problem stated in this discussion  [Rapporteur]: Thanks for the comments. From other companies' responses so far, it is observed that RAN2 can't conclude Option 1 is clearly specified in current CT1 specification. As majority company prefers to send LS to CT1 (and SA2 if needed) in Q3, it is reasonable to rely on CT1 (and SA2 if needed) whether to update their specification. |
| Huawei/HiSilicon | Option 1 | Below are 3 different cases for handling RAN paging for MUSIM UE:   1. UE AS receives RAN paging and UE decides NOT to respond to the paging – this case NOT covered by either CT1 or RRC specs. 2. UE AS receives RAN paging and UE decides to send busy indication – this case covered by CT1 spec 3. UE AS receives RAN paging and UE decides to accept the paging – this case covered by the specs.   According to our CT1, “rejecting” a message always requires a response message in NAS specs. Otherwise, it is specified as “ignore”. Hence the statement “the MUSIM UE decides to reject the RAN paging” covers only the case that UE decides to reject (i.e., send busy indication) and does not cover the case when UE decides to ignore (i.e., not send busy indication).  Even though CT1 note and RAN agreement say the AS – NAS interworking is left to UE implementation, it’s good to send LS to CT1 clarifying the Case 1 mentioned above. |
| Apple | Option 1 | According to NAS specification MUSIM UE is allowed to not to respond to RAN paging due to UE implementation constraints. So we find this this option 1 is better. |
| Qualcomm | Option 1 | For Idle mode, the UE may not send the “busy indication” per 23.501. When RAN2#113-e decided to adopt NAS-based signaling for RRC Inactive, one of the main motivations was to simplify the UE/NW operation with one type of procedure and behavior. Therefore, we need to have the same flexibility of not sending the busy indication in Inactive mode. As commented by Vivo, sending the Service Request will take a long time since the UE will first move to Connected mode and wait for a response from the AMF. The UE will have to leave the Connected mode on the other USIM to do this. If the active connection on the other USIM is critical (e.g. emergency call), forcing the UE to send a bsuy indication may have serious consequences. |
| MediaTek | Option 1 | Agree with Huawei and QC, it is simply not reasonable to mandate UE to send BUSY indication in this scnario. |
| Nokia | Option 1 but | The decision on sending BUSY indication or not sending anything is upto NAS. So we don’t see change in AS specification. In any case AS layer is expected to send the paging cause to NAS layer and it cant decide on not responding.  [Rapporteur]: Thanks for the comments. Rapporteur understands that the NOTE in RRC (if agreed) does **NOT** say AS layer itself decides on not sending BUSY indication i.e. that’s why we agreed to refer to CT1 specifications during online discussion. |
| ZTE | See comments | We think it’s better to confirm CT1/SA2’s understanding on whether it’s left to the UE implementation to send the busy indication for the Inactive state Paging.  We are open to this issue, we just intend to avoid the collision between the RAN2 and CT1 spec ^\_^  Then about the wording of option 1:  In CT1 spec, for the Idle state, it says “As an implementation option, the MUSIM UE is allowed to not respond to paging based on the information available in the paging message, e.g. voice service indication.”  Maybe the similar wording can be used as below, if we want to send an LS to CT1 for the confirmation  “As an implementation option, the MUSIM UE is allowed to not respond to RAN paging based on the information available in the paging message, e.g. voice service indication.”  [Rapportuer]: Thanks for the comments. Rapporteur understands that whether/how to update CT1/SA2 specifications are up to their decision if we agree Option 1 in Q1 and informs our decision to them via LS. Whether to add the NOTE in RRC in this meeting or not, please check the response in Q2. |
| Ericsson | Option 1 | As mentioned by Vivo, sending NAS busy indication in RRC INACTIVE may cause degradation to the ongoing service. So it is up to UE to decide if the NAS busy indication can be sent or not. |
| OPPO | Option1 | The similar view with QC. |
| Sharp | Option 1 | We do not see the scenario that UE should always response the RAN paging. |
| DENSO | Option 1 | Agree with Huawei and QC. |
| LGE | Option 1 but | In our understanding, If the UE decides to reject RAN paging, RAN paging should be ignored at the AS level without NAS involvement. We agree with QC’s comment. Perhaps this is the consequence of not introducing the AS-based busy indication.  Whether the UE in CM-CONNECTED rejects RAN paging without sending busy indication may be not an issue to be decided by RAN2 only. We are fine to send an LS to ask about the UE behavior from CT1 (and SA2) point of view. |
| Samsung | Option 1 |  |

**Summary:** Out of 14 companies, only 1 company prefers to confirm CT1/SA2 understanding first about Option 1 while all other 13 companies support Option 1 with the following technical reasons:

* The latency of sending a NAS busy indication in RRC\_INACTIVE is also not negligible as in RRC\_IDLE, it could cause performance degradation to the ongoing service.
* When RAN2 decided to adopt common NAS-based signaling for RRC\_INACTIVE and RRC\_IDLE, one of the main motivations was to simplify the UE/NW operation with one type of procedure and behavior. Therefore, we need to have the same flexibility of not sending the busy indication in RRC\_IDLE and RRC\_INACTIVE

**Proposal 1: From RAN2 perspective, confirm that INACTIVE UE may not be able to send a Service Request message to the network including the Reject Paging indication as a response to the RAN paging due to UE implementation constraints.**

If the outcome of Q1 is Option 1, it seems necessary to discuss how to capture NOTE about INACTIVE UE behaviour if it rejects RAN paging in TS 38.331. Rapporteur would like to take the proposed TP in [3] as a baseline and suggest the following note in 38.331 i.e.

#### 5.3.2.3 Reception of the *Paging* *message* by the UE

Upon receiving the *Paging* message, the UE shall:

…

1> if in RRC\_INACTIVE, for each of the *PagingRecord*, if any, included in the *Paging* message:

2> if the *ue-Identity* included in the *PagingRecord* matches the UE's stored *fullI-RNTI*:

3> if the UE is configured by upper layers with Access Identity 1:

4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mps-PriorityAccess*;

3> else if the UE is configured by upper layers with Access Identity 2:

4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mcs-PriorityAccess*;

3> else if the UE is configured by upper layers with one or more Access Identities equal to 11-15:

4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *highPriorityAccess*;

3> else:

4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mt-Access*;

NOTE: If a MUSIM UE in RRC\_INACTIVE decides not to accept the *Paging* message, it may not initiate the RRC connection resumption procedure, e.g. due to UE implementation constraints as specified in TS 24.501 [23].

Note that from rappporteur's understanding similar note needs to be specified in TS 36.331 as well i.e. only difference seems the CT1 specification order.

In the email thread on the reflector, Qualcomm suggests to use 'ignore' instead of 'not to accept' in the above NOTE since the former one is more specific and aligned with CT1. ZTE also suggests to use 'not to respond' with some modifications. Considering that 'not to respond' is widely used in CT1 specification, rapporteur would like to suggest one alternative NOTE as follows:

NOTE: A MUSIM UE may not initiate the RRC connection resumption procedure, e.g. when it decides not to respond to the *Paging* message due to UE implementation constraints as specified in TS 24.501 [23].

Note that many companies already expressed their views so it is recommended that we can \*quickly\* check which NOTE is more preferable during the online meeting.**Q2: Do you agree to capture above NOTE in TS 38.331/TS 36.331? If not, please suggest detailed wording for the NOTE.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/disagree | Comments (if any) |
| vivo | Agree |  |
| SONY | disagree | This decision should be covered at NAS level, and RRC does not know the content of the Service request sent from NAS. |
| Huawei/HiSilicon | Agree |  |
| Apple | Agree |  |
| Qualcomm | Agree | 24.501 has the following Note, which implies that AS has also a say in this decision:  NOTE 3: The interworking between the NAS layer and the AS layer triggered by RAN paging is up to UE implementation |
| MediaTek | Agree |  |
| Nokia |  | RRC connection resumption is anyhow not triggered by AS on its own. It is NAS layer decision. So we don’t see above note essential. Note in 24.501 is sufficient. |
| ZTE | Agree(see comments) | We agree with this notes, but as answer in Q1, we think it’s better to confirm CT1/SA2’s understanding before adding this note in 38331 spec.  [Rapportuer]: Thanks for the comments. Based on the companies' comments so far, rapporteur understands that the intent of sending LS to CT1/SA2 seems to inform them of our agreement in Q1 (if agreed), and of our decision on adding NOTE in RRC in Q2 (if agreed), and if so to ask whether to update CT1/SA2 specifications accordingly if there is any inconsistency.  But let's quickly check whether your suggestion is acceptable to all other companies during online meeting. Hope it is acceptable to ZTE. |
| Ericsson | Agree, but | We should clarify that this if for busy indication e.g.:  If a MUSIM UE in RRC\_INACTIVE decides not to accept the Paging message, it may not initiate the RRC connection resumption procedure for sending Reject Paging Indication, e.g. due to UE implementation constraints, as specified in TS 24.501 [23].  [Rapportuer]: Thanks for the comments. No strong view but rapporteur feels that we may not need to overspecify our specification if we refer to CT1 specification and the meaning of the note is clear. But rapporteur will take your comment into account in the summary and check whether it is needed during online. |
| OPPO | Agree |  |
| Sharp | Agree |  |
| DENSO | OK, but | As SONY and Nokia mentioned, the decision should be done by NAS layer |
| LGE | Agree |  |
| Samsung | Agree |  |

**Summary:** Out of 14 companies, only 2 companies disagree with adding NOTE in TS 38.331/TS 36.331 while all other 12 companies agree with it. Main argument of the opponents is that NAS layer should decide whether to send NAS busy indication in RRC\_INACTIVE, not AS layer. But as clarified above rapporteur understands that adding NOTE does not necessarily imply that AS layer itself decides on NOT sending NAS busy indication, which is why RAN2 agreed to refer to CT1 specifications in NOTE during online meeting. Besides, CT1 specification has NOTE 3, which implies that RRC specification has also some clarification on decision of whether to send busy indication or not. Based on a clear majority view, rapporteur would like to suggest to agree with adding NOTEs in RRC specifications from RAN2 perspective. Note that Qualcomm, ZTE, Ericsson suggests some wordings on NOTE, but rapportuer suggest to pick the alternative NOTE as a baseline and it can be further polished if needed.

**Proposal 2: From RAN2 perspective, agree to add the following NOTEs in TS 38.331 and TS 36.331 respectively as follows:**

* **NOTE in TS 38.331: A MUSIM UE may not initiate the RRC connection resumption procedure, e.g. when it decides not to respond to the Paging message due to UE implementation constraints as specified in TS 24.501 [23].**
* **NOTE in TS 36.331: A MUSIM UE may not initiate the RRC connection resumption procedure, e.g. when it decides not to respond to the Paging message due to UE implementation constraints as specified in TS 24.501 [95].**

Note that 1 company prefers to add NOTEs in RRC specifications after receiving confirmation on CT1/SA2's understanding. As expressed above, rapporteur would like to discuss below proposal online quickly.

**Proposal 3: RAN2 to discuss whether to add NOTEs on P2 in this meeting or after receiving CT1/SA2's confirmation.**

For any other questions not covered above, please feel free to indicate them into the following table.

|  |  |  |
| --- | --- | --- |
| Company | Discussion points | Comments |
| vivo | LS to CT1/SA2 | As 331 refers to 24.501, RAN2 may need to ask CT1 to update their spec accordingly. SA2 may also do similar spec update if needed. |
| SONY | CT specifications | We do not think there is a problem in 24.501 for RRC\_INACTIVE state |
| Huawei/HiSilicon | LS to CT1 | Suggest to send LS to CT1 as commented in Q1 |
| Apple | LS to CT1 | Inform CT1 of our decision to add this note. |
| Qualcomm |  | Fine to send an LS to CT1 and SA2 so that all groups are aligned. |
| MediaTek |  | Fine to send LS to CT1/SA2 |
| Nokia | No Strong view |  |
| ZTE | LS to CT1 | As commented in Q1, about the wording of option 1:  In CT1 spec, for the Idle state, it says “As an implementation option, the MUSIM UE is allowed to not respond to paging based on the information available in the paging message, e.g. voice service indication.”  Maybe the similar wording can be used as below, if we want to send an LS to CT1 for the confirmation  “As an implementation option, the MUSIM UE is allowed to not respond to RAN paging based on the information available in the paging message, e.g. voice service indication.” |
| Ericsson |  | Fine to send LS to CT1/SA2. |
| OPPO | No Strong view |  |
| Samsung | LS to CT1/SA2 | Fine to send LS to CT1/SA2 |
| LGE | LS to CT1/SA2 | For a solution of upper layer, SA2 also may be better to involve. |

**Summary:** Out of 12 companies, 10 companies support to send LS to CT1 while 2 companies have no strong view on this. Among 10 companies, 6 companies also support to send LS to SA2 as well. Rapporteur understands that there is no harm to send LS to SA2 as well considering that SA2 has also similar notes on the UE behavior.

**Proposal 4: Send LS to CT1/SA2 to inform them of our decision and to ask them to update their specifications accordingly if needed.**

# 4 Conclusion

Proposals for easy agreements:

**Proposal 1: From RAN2 perspective, confirm that INACTIVE UE may not be able to send a Service Request message to the network including the Reject Paging indication as a response to the RAN paging due to UE implementation constraints.**

**Proposal 2: From RAN2 perspective, agree to add the following NOTEs in TS 38.331 and TS 36.331 respectively as follows:**

* **NOTE in TS 38.331: A MUSIM UE may not initiate the RRC connection resumption procedure, e.g. when it decides not to respond to the Paging message due to UE implementation constraints as specified in TS 24.501 [23].**
* **NOTE in TS 36.331: A MUSIM UE may not initiate the RRC connection resumption procedure, e.g. when it decides not to respond to the Paging message due to UE implementation constraints as specified in TS 24.501 [95].**

**Proposal 4: Send LS to CT1/SA2 to inform them of our decision and to ask them to update their specifications accordingly if needed.**

Proposals needed to be discussed online:

**Proposal 3: RAN2 to discuss whether to add NOTEs on P2 in this meeting or after receiving CT1/SA2's confirmation.**

# 5 Reference

[1] R2-2205762 Clarification on UE behavior for NAS-based busy indication in RRC\_INACTIVE Samsung Electronics Co., Ltd discussion Rel-17 LTE\_NR\_MUSIM-Core R2-2202239

[2] R2-2205542 Specifying UE behaviour for Paging cause for RAN based Paging Intel Corporation discussion Rel-17 LTE\_NR\_MUSIM-Core

[3] R2-2205173 UE behaviour for NAS busy indication in RRC\_INACTIVE Huawei, HiSilicon discussion Rel-17

[4] R2-2205336 Further Consideration on the Inactive State Busy Indication ZTE Corporation, Sanechips discussion Rel-17 LTE\_NR\_MUSIM-Core

[5] R2-2204617 Paging cause handling for RRC-INACTIVE Nokia, Nokia Shanghai Bells discussion Rel-17

[6] 3GPP TS 24.501 Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3; Release 17