3GPP TSG-RAN WG2 Meeting #117 Electronic R2-220xxxx

Online, Feb 21st– Mar 3rd, 2022

**Agenda item: 5.4.1**

**Source: Apple**

**Title: [Draft]Summary of [AT117-e][026][NR15] NAS procedure not subject to UAC (Apple)**

**Document for: Discussion and Decision**

# 1 Introduction

This document is a report on the following email discussion:

* [AT117-e][026][NR15] NAS procedure not subject to UAC (Apple)

Scope: Treat R2-2202104, R2-2202535, R2-2202536, R2-2202537, R2-2202538, R2-2203487. Ph1 Determine agreeable parts, Ph2 For agreeable parts, progress CRs, and reply LS out

Intended outcome: Report, Agreed CRs, Approved LS out.

Deadline: Schedule 1

The deadline Schedule 1 for this email discussion is copied from Chair notes:

* A **first round** with **Deadline for comments W1 Thur Feb 24th 1200 UTC** to settle scope what is agreeable etc
* A **Final round** with **Final deadline W2 Wed March 2nd 1200 UTC** to settle details / agree CRs etc.
* Additional deadlines check points etc if needed are defined by the Rapporteur of each discussion respectively. In case some parts of an email discussion need more time, doesn’t converge, need not yet planned on-line treatment, then Rapporteur please contact chair.

The documents under the scope of this discussion are summarized as below:

[1] R2-2202104 LS on NAS procedure not subject to UAC (C1-217227; contact: Apple) CT1 LS in Rel-15 To:RAN2

Moved from 5.1

[2] R2-2202535 Discussion on RRC handling of NAS triggers not subject to UAC Apple discussion Rel-15 NR\_newRAT-Core

[3] R2-2202536 Correction on RRC resume of NAS triggers without access category Apple CR Rel-15 38.331 15.16.0 2895 - F NR\_newRAT-Core

[4] R2-2202537 Correction on RRC resume of NAS triggers without access category Apple CR Rel-16 38.331 16.7.0 2896 - A NR\_newRAT-Core

[5] R2-2202538 [Draft] Reply LS on NAS procedure not subject to UAC Apple LS out NR\_newRAT-Core To:CT1

[6] R2-2203487 Discussion on NAS-triggered resume procedure without UAC Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
| Apple(rapporteur) | Zhibin Wu | zhibin\_wu@apple.com |
| Ericsson | Antonino Orsino | antonino.orsino@ericsson.com |
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| Huawei, HiSilicon | Tong Sha | shatong3@hisilicon.com |
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# 3 Discussion (1st round)

RAN2 has received reply LS from CT1 (R2-2202104 [1]) about the NAS procedures which are not subject to UAC. Here is the CT1 response:

*CT1 would like to give the following answer to RAN2's question:*

***Question:*** *RAN2 want to ask CT1 whether there is any NAS procedure may trigger RRC resume without providing Access Category/Access Identity (i.e., not requesting access barring check).*

***Answer:*** *Regarding UAC, the requirements for a UE in 5GMM-CONNECTED mode with RRC inactive indication are similar to those for a UE in 5GMM-CONNECTED mode. This means that:*

*- generally, NAS procedures are subject to access barring checks and NAS provides Access Category/ Access Identity to AS,*

*- but there are 3 NAS procedures, specifically: mobility registration update, deregistration and PDU session release, for which the NAS may trigger RRC resume without requesting access barring checks and for which there is no requirement in TS 24.501 to provide the Access Category/Access Identity to AS.*

According to CT1, there are three NAS procedures (i.e., mobility registration update, deregistration and PDU session release) for which the NAS may trigger RRC resume without requesting access barring checks and for which there is no requirement in TS 24.501 to provide the Access Category/Access Identity to AS.

Based on the analysis provided in R2-2102535 [2] and R2-2203487[6], the current Rel-15 UE behaviour is to initiate the AS layer access attempt in RRC\_INACTIVE state when the condition of “providing access category and access identity” is not satisfied. This will happen even when T302 timer is running because this back-off timer is only checked along with T390 timer within UAC procedure. As a result, UE will request for resume directly without UAC check.

First, let us confirm whether this is the common understanding of the Rel-15 RRC spec for all companies.

**Question 1: Do companies agree “according to Rel-15 RRC specification, when T302 timer is running, UE will not block the RRC resume request triggered by NAS procedure(s) without AC/AI”.**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| Ericsson | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
| QCOM | Yes |  |
| Intel | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |
| OPPO | Yes |  |
| MediaTek | Yes |  |

It has been observed in R2-2202535 [2] and R2-2203487 [6] that such access attempt from RRC\_INACTIVE UE will probably make things worse by wasting more radio resources and aggravating the congestion in gNB, when T302 timer is running. Hence, it is reasonable to block/bar those access attempts. In other words, UE shall not trigger RRC resume by those NAS procedures when T302 timer is running.

**Question 2: Do companies agree “when T302 timer is running, RRC resume procedure shall not be triggered by the three NAS procedures which do not require access barring checks” ?**

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| Company | Yes or No | Comments |
| Ericsson | See comment | In principle, we agree that the correct behaviour should be for the UE to not trigger the three NAS procedures. However, from a procedural point of view, we think that nothing is broken, and the system can work normally, even if not in an efficient way.  Given that this poses a new behaviour for the UE, we are a bit reluctant to optimize this case for Rel-15 and Rel-16, but we are open to have the necessary changes from Rel-17. |
| vivo | No | Based on the below highlighted part from CT1’s LS response, we understand that the 3 NAS procedures do not require access barring check once triggered. And the requirement is independent from T302 timer running or not.    ***Answer:*** *Regarding UAC, the requirements for a UE in 5GMM-CONNECTED mode with RRC inactive indication are similar to those for a UE in 5GMM-CONNECTED mode. This means that:*  *- generally, NAS procedures are subject to access barring checks and NAS provides Access Category/ Access Identity to AS,*  *- but there are 3 NAS procedures, specifically: mobility registration update, deregistration and PDU session release, for which the NAS may trigger RRC resume without requesting access barring checks and for which there is no requirement in TS 24.501 to provide the Access Category/Access Identity to AS.*  [Apple] We agree the procedure is triggered by NAS layer in regardless of T302 timer running or not. However, when AS layer trigger access when T302 timer is running, it will be rejected by NW because gNB is busy. So, it is better for UE to not trigger such attempts in the first place. |
| Huawei, HiSilicon | No | We understand the issue in Q1 exists but this issue may not be fully considered by CT1 when they did a correction on skipping UAC for some NAS-triggered resume procedures.  From AS perspective, we think it is weird to ask AS to do the access control check when UAC is required to skip from NAS. Any new behaviour could have been avoided if there is a right decision in NAS.  Therefore we suggest to correct NAS spec since Rel-15 and not change the AS spec. If companies think that this can be left to UE implementation, this should also be informed to CT1 and let them capture somewhere that in such cases Resume is not triggered and details are left by UE implementation.  [Apple] It we change NAS spec, then more discussion will be needed to decide which AC/AI is assigned to those NAS procedures. I am afraid that this will bring more UE behaviour change for Rel-15/Rel-16 UEs in NAS layer, when compared to simply barring this in AS layer. |
| Nokia | No, see comment | We echo the comments from the companies above. To further add we think it should be up to CT1 to decide and design additionally for those three procedures if they want to perform access barring. In RAN2 it seems illogical for us to consider doing something without clear system level guidance from the WG concerning NAS.  [Apple] T302 timer is a back-off timer introduced in AS layer and it is up to RAN2 to decide the effects of this timer. If gNB is too busy to handle any access, then lower layer need inform NAS layer properly. The current procedure to “inform upper layers that access barring is applicable for all access categories except categories '0' and '2'” does not cover the case for those three NAS procedures, so we can improve the spec by fix this loophole. |
| QCOM | No | Per the current spec this scenario can be handled gracefully by the UE/NW, therefore no change should be introduced to Rel.15/16.  In case further optimization is needed, it has to come from CT1, Rel.18 onward.  [Apple] According to Q1, the current spec will let UE to trigger RRC resume request. I guess it is not very graceful to allow RRC\_INACTIVE UE implementation to trigger such access and then get rejected by NW. |
| Intel | No, with comments | We also share the view that the current specification does not address this as one would expect but the consequences of this is not severe to merit a change in Rel-15/16. |
| Apple | Yes | T302 timer is an indication of NW wants UE to back off. Then, the correct UE behaviour is to follow NW instruction and not trigger the access attempts when T302 is running. The current UE behaviour is inconsistent with the design intentions. It is not graceful to allow RRC\_INACTIVE UE implementation to trigger such access and get rejected by NW. |
| Samsung |  | Share with Ericsson. If we see no critical trouble due to the current UE behaviour, no optimization is reasonable for previous releases. |
| OPPO | No | We understand the intention, but this is something new from RAN2 perspective, whether the three NAS procedures without associated AC/AI should be subjected to T302 may also have impact for CT1 spec. Usually NAS procedure related UAC should get the clear requirement from CT1, but for now we cannot get any new requirement based on CT1 reply LS, so it’s better to trigger the discussion in CT1 first.  More addition, strictly speaking, this is not a correction, without this enhancement, the system can still work, at least, network can reject the undesirable resume request if necessary. If the benefits for this enhancement are identified, new WID can be considered in future release. |
| MediaTek | No | We do not really there will be IOT issue if the UE trigger resume again. There is no requirement in NW side to always reject the Resume Request while T302 is running. Even if it rejected, it seems not a critical issue. The proposal is clear NBS and it is unacceptable for us to change R15/R16 legacy UE behavior. |

Then, regarding how to block the access attempts under such circumstances, there are two different views.

1. Given that UE has mixed the handling of *RRCReject* with back-off with UAC into a single procedure in Rel-15 RRC specification, it has been proposed to amend RRC procedure to bar those access attempts in AS layer [2], e.g., adding additional check in UE procedure to identify this case and bar the access attempts specifically.
2. Alternatively, it has been proposed to let upper layers to provide AC/AI for those three NAS procedures [6] so that lower layers can always trigger UAC.

In rapporteur’s view, the second approach is in contradictory to the information given in reply LS [1]. To support the 2nd approach, it will require the SA2 or CT1 to reverse the earlier Rel-15 agreements and update NAS spec. It is also worth noting that in the earlier discussion for Rel-15 NR work for 5GS\_Ph1-CT, SA1 (as text shown below in LS form SA1 to CT1 in S1-183623) concluded that NAS does not perform UAC for mobility registration update, deregistration and PDU session release if RRC is in state RRC\_INACTIVE.

*CT1 asked the following question to SA1 in the context of the application of UAC in RRC\_Inactive state:*

*CT1 would like to ask SA1 whether the UE is expected to perform unified access control for such access attempts [mobility registration update procedure, deregistration procedure, PDU session release] when the UE attempts to perform the access attempt in RRC\_Inactive.*

*SA1 would like to reply that there are no service requirements for these procedures to be subject to UAC in RRC\_Inactive state.*

Therefore, it might be challenging for CT1 to add AC/AI for those NAS procedures, as that would result in direct violation of the SA1 conclusion.

Given all things considered, we solicit company views of what is the right way forward to address this issue:

**Question 3: If Answer to Q2 is yes, which approach do you prefer to prevent access attempts triggered by the three NAS procedures, when T302 timer is running?**

***Option 1: Fixed in AS layer: block the access attempt(s) when T302 is running.***

***Option 2: Fixed in NAS layer: AC/AI are always provided by NAS so that UAC cannot be skipped***

***Option 3: Leave this to UE implementation in Rel-15 and Rel-16***

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| Company | Choice | Comments |
| Ericsson | Option 3 | Given that what we are trying to fix is not a critical problem that compromise the normal functioning of the system, we would like to leave this to UE implementation at least for Rel-15 and Rel-16.  We are open to have the necessary changes for Rel-17. |
| vivo | Option 3 with comments | According to current TS 38.331, both the RRC layer and the NAS layer within the UE are aware of whether the T302 timer is running or not. Therefore, we don’t see big issue to leave it to UE implementation.  For example, if the UE want to avoid access attempt when T302 timer is running, the NAS layer can postpone to trigger the above 3 NAS procedures. This would result in the same effect as access barring in RRC layer. On the other hand, if the UE want to trigger access attempt when T302 timer is running, the NAS layer can trigger the above 3 NAS procedures immediately, further access barring check is also skipped in the RRC layer for the NO AC/AIcase.  [Apple] T302 timer is an AS timer not known by NAS layer. Even if NAS layer knows that T302 is running and NAS layer trigger those procedure based on the assumption that they are not subject to UAC, the RRCResumeRequest will still be rejected by gNB. This is still not efficient and need UE implementation to clean up. A better UE implementation is to prevent this from access. |
| Huawei, HiSilicon | Option2 | We understand in the last LS sent to CT1/SA2, the problem we found in AS when UAC was not invoked in resume procedure was not mentioned in the LS. This information is much important if we do see the problem in AS layer, which may help CT1 have an overall understanding on this issue.  In our view, whether a NAS-initiated access attempt should be triggered or not is within UAC scope, and the service type is only visible to NAS. If to change the spec, we think option 2 is the right way forward.  Besides, according to the email discussion at 3GPP CT1 reflector, we think companies understand that technically SA1 has no idea on the issue in RAN, and even option 2 is adopted there is no conflicting withSA1’s understanding.  [Apple] It is true that the earlier LS did not mention the RRC layer issues because companies were mainly having confusion about whether there is such NAS procedures not subject to UAC at that time. But T302 timer is a gNB-dictated “wait time” and it is not controlled by NAS layer UAC design. If the problem is originated from gNB congestion, it is not clear to us that this has to be solved by NAS layer changes. |
| Nokia | FFS | We would like to ask first if there is a real issue in the field to address. We also agree no impact to Rel-15 and Rel-16 UE behavior. |
| QCOM | Option-3 with comment | As mentioned earlier, any changes to the spec has to be Rel.18 onward, as we don’t see the urgency of changing the current spec. |
| Intel | Option 3 | This can be addressed by UE implementation for legacy releases. Proper solution can be addressed in Rel-17 or later. |
| Apple | Option 1 | For the Option 3 suggested by other companies, we think RAN2 at least need to clarify the intended behaviour for UE implementation in the spec.  The root problem of this issue is that RRC has mixed the handling of gNB-dictated back-off timer and UAC in the same procedure. RRC has not considered the case that AC/AI may not always be provided. So, we think a proper solution for this is to amend the barring based on T302 timer in RRC spec. This will also make the RRC spec more robust and future-proof. |
| Samsung | Option 3  (second preference is option 2) | If we need a solution to solve this problem based on majority view, the option 2 is preferable, rather the option 1, e.g. option 1 may result in more coordination between NAS and AS. |
| OPPO | Option 3 | At least the change is not critical for legacy UEs, If the benefits for this enhancement are identified, new WID can be considered in future release. |
| MediaTek | Option 3 | If something is needed, we prefer option 2 in R17. |

If Option 1 is supported by majority view, CRs [3][4] could be used as a baseline for further discussion of agreeable changed in RRC specification. Thus, it is also beneficial to solicit preliminary company views on those CRs.

In TS 38.331, subclause 5.3.13.2, UE neither invokes UAC nor checks the T302 timer “if the upper layers DO NOT provide an Access Category and one or more Access Identities”. Hence, this is to be fixed so that the access will not be triggered directly. Also, in 5.3.8.3, 5.3.15,2 and 5.3.14.4, when T302 timer is started/stopped or expires, the current procedure only let UE “inform upper layers that access barring is applicable for all access categories except categories '0' and '2'”. A NOTE is better to be added to explain that “access attempts for which the access catgory is not provided are also to be included (for barring)” so that UE implementation could take this into account for implementing cross-layer interactions.

Hence, the CR [3][4] has covered the following two aspects of change:

1. In subclause 5.3.13.2, if AC/AI is not provided and T302 timer is running, UE bar access attempts except emergency case and notify the upper layers about the barring
2. In subclause 5.3.8.3, 5.3.15,2 and 5.3.14.4, adding notes to inform upper layer the barring and barring alleviation for the case which AC not provided when T302 starts/stops/expires.

**Question 4-1: If Answer to Q3 is Option 1, do you agree the change in RRC to “if AC/AI is not provided and T302 timer is running, bar the access attempts except emergency case and notify the upper layers about barring”?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| Ericsson |  | See Reply in Q3 |
| vivo | See comments | As replied in Q3, a note to clarify this by UE implementation is enough, e.g., leave it to UE implementation for the NO AC/AIcase by upper layers on how to prevent access attempts, when T302 timer is running. |
| Apple | Yes | Even with Option 3 as suggested by Ericsson and vivo, we think a NOTE is needed to be added in this section to clear any confusion about this. |
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**Question 4-2: If Answer to Q3 is Option 1, do you agree the change in RRC to “adding NOTEs to inform upper layer the barring and barring alleviation for the case which AC not provided when T302 starts/stops/expires”?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| Ericsson |  | See Reply in Q3 |
| vivo | See comments | As replied in Q3, a note to clarify this by UE implementation is enough, e.g., leave it to UE implementation for the NO AC/AIcase by upper layers on how to prevent access attempts, when T302 timer is running. |
| Apple | Yes | Even with Option 3 as suggested by Ericsson and vivo, we think a NOTE is needed to be added when the T302 starts/stops/expires to clear any confusion about the “AC/AI not provided” case. |
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# 4 Summary of 1st Round Discussion

TBD.

# 5 Discussion (2nd round)

After collecting the views of above questions in the 1st round, we can further progress the details of the CRs and contents of reply LS to CT1 in 2nd round discussion and the draft LS provided in [5] and [6].

TBD.

# 6 Conclusion

TBD.

# 7 References

[1] R2-2202104 LS on NAS procedure not subject to UAC (C1-217227; contact: Apple) CT1 LS in Rel-15 To:RAN2

Moved from 5.1

[2] R2-2202535 Discussion on RRC handling of NAS triggers not subject to UAC Apple discussion Rel-15 NR\_newRAT-Core

[3] R2-2202536 Correction on RRC resume of NAS triggers without access category Apple CR Rel-15 38.331 15.16.0 2895 - F NR\_newRAT-Core

[4] R2-2202537 Correction on RRC resume of NAS triggers without access category Apple CR Rel-16 38.331 16.7.0 2896 - A NR\_newRAT-Core

[5] R2-2202538 [Draft] Reply LS on NAS procedure not subject to UAC Apple LS out NR\_newRAT-Core To:CT1

[6] R2-2203487 Discussion on NAS-triggered resume procedure without UAC Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core