3GPP RAN WG2 Meeting #117-e R2-2203424

eMeeting February 21st – March 3rd, 2022

Agenda Item: 8.10.2.1.1

Source: InterDigital

Title: Report of [Pre117-e][NTN][103] MAC open issues

Document for: Discussion, Decision

# Introduction

This document is intended address a subset of remaining open issues as per the following email discussion:

**[Pre117-e][NTN][103] MAC open issues (InterDigital)**

* **Issues 1-3, 5-11 and 13 from R2-2201900 will be handled in offline discussion**
* Issues 4, 12 and additional details of K\_Offset MAC CE will be handled by CR rapporteur directly in the running CR
* Issues 14-18 can be handled via company contributions in AI 8.10.2.1.1
* The following aspect of Issue 3: “*RAN2 to confirm support of UE location information for purposes of TA reporting*” can be handled via company contributions in AI 8.10.2.1.1
* Other MAC issues can be handled via company contributions in AI 8.10.2.1.2 and AI 8.10.2.1.3

Please note the following deadlines:

* Deadline (for companies' feedback): **Monday 2022-02-14 23:59 UTC**

# TA reporting and RACH aspects

## UE-specific TA reporting

### Enable/disable TA reporting during RACH in connected mode

In the second phase of offline [AT116bis][101], there was near consensus (18 of 19) that in general, TA reporting during RACH in connected mode is not controlled by the enable/disable indication configured in SI but depends on whether a TA update event is triggered or not.

Considering very large majority, Rapporteur suggests this proposal be agreed, and implementation details be discussed during stage-3.

**Question 1: Do you agree with the following proposal?:**

***Proposal: TA reporting during RACH in connected mode is not controlled by the enable/disable indication configured in SI, but depends on whether a TA update event is triggered or not. Specification impact, if any, can be discussed in Stage 3.***

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments**  |
| CATT | Agree |  |
| OPPO | See comments | We think the proposal can be applied to connected mode RACH except RACH triggered by RRC re-establishment and handover.During re-establishment procedure, the UE will read SIB from the target cell before initiating re-establishment request message and target cell’s SIB may include the enable/disable indication. If broadcasted and enabled, it seems reasonable for the UE to follow the indication in SI to trigger TA report during RACH in the re-establishment procedure. With this, network can configure the UE-specific K\_Offset at its earliest time.In the current handover procedure, handover command will include part of target cell’s essential system information for UE to perform handover access. In NTN, it can be assumed that some NTN specific system information would need to be provided in handover command, e.g. ephemeris, common TA, etc, for UE to do TA pre-compensation. Enable/disable indication could also be carried in handover command. Similar to initial access and re-establishment, it seems reasonable for the UE to follow that indication to trigger TA report or not during RACH. If enabled and TA report is triggered, target cell can provide the UE-specific K\_Offset at its earliest time.Based on above, we suggest to update the proposal as follows:***Proposal: TA reporting during RACH in connected mode except RACH triggered RRC connection re-establishment and handover is not controlled by the enable/disable indication configured in SI, but depends on whether a TA update event is triggered or not.*** |
| Samsung | Agree with comment | We think this proposal is only specifying the TA reporting to the serving cell. If to report TA to target cell or any cell other than the serving cell, it does not make sense to use the previous report value to trigger a new TA report since the old TA value and new TA value are associated with different cells. Suggest to update the wording of the proposal, e.g. “TA reporting to the serving cell during RACH in connected mode is not controlled by the enable/disable indication configured in SI, but depends on whether a TA update event is triggered or not.” |
| Nokia | See comments | The same topic is in discussion at [Pre117-e][011] for IoT NTN. RAN2 need to further discuss RACH in re-establishment procedure where UE re-establish in a new cell and RACH in handover procedure. The same solution should be applied to both IoT NTN and NR NTN. |
| Intel |  | agree with Samsung |
| Apple | Agree | Agree with OPPO and Samsung |
| vivo | Yes | We can go with the majority’s view that TA reporting during RACH in connected mode depends on whether a TA update event is triggered or not. |
| Lenovo, Motorola Mobility | Agree with comments | OPPO’s update seems fine. |
| Huawei, HiSilicon | Agree with comments | Agree with OPPO’s suggestion. Handover case and re-establishment case should be discussed separately.Besides, we see no specs impact on other cases. If RACH happens to be triggered for some reason while TA reporting has been triggered and not cancelled, the TA report may be sent duing RACH on the condition that MSG3 size allows. This is exactly the same with legacy behaviour of any kind of UL data. No need to specify extra restriction on enabling/disabling TA reporting during RACH.  |
| ASUSTeK | Comment | The “TA report during RA procedure” triggered due to initial access, RRC resume, RRC re-establishment and handover could be controlled by SI. And event-triggered TA report in connected mode is not controlled by the SI. |
| ZTE | Agree with comments | HO is an exception since we have agreed previously such indication applies also for HO case. As for re-establishment, after selecting a suitable cell UE will read the essential system information for RRC connection reestablishment, it is beneficial to report the TA based on the indication so that NW can know UE’s TA ASAP. |
| Qualcomm | Agree |  |
| Xiaomi | Agree with comments | Agree with OPPO’s update. But no spec change is needed for the HO and reestablishment case.  |
| China Telecom | Agree with oppo |  |
| Spreadtrum | Agree with OPPO |  |
| LG | Agree |  |
| Thales | Agree |  |
| NEC | Agree |  |
| MediaTek | Agree | In Connected mode, the TA reporting configuration provided by the network per UE is enough to control the TA reporting. There is no need to additionally check the enable/disable indication in SI. |
| Ericsson | Disagree | RAN2 already agreed in RAN2#115:1. Information about UE specific TA pre-compensation is not reported in RA procedures triggered due to “Request for Other SI”

These are the reasons for RA listed in 38.300:The random access procedure is triggered by a number of events:- Initial access from RRC\_IDLE;- RRC Connection Re-establishment procedure;- DL or UL data arrival during RRC\_CONNECTED when UL synchronisation status is "non-synchronised";- UL data arrival during RRC\_CONNECTED when there are no PUCCH resources for SR available;- SR failure;- Request by RRC upon synchronous reconfiguration (e.g. handover);- RRC Connection Resume procedure from RRC\_INACTIVE;- To establish time alignment for a secondary TAG;- Request for Other SI (see clause 7.3);- Beam failure recovery;- Consistent UL LBT failure on SpCell.For these it is fine to use the TA update event to triggering to decide if to include a TA report or not: * For UL/DL data arrival,
* Lack of PUCCH SR resources,
* SR failure,
* BFR, and
* Consistent LBT failure

And for these the SIB of the target cell shall be used to decide if a TA report shall be included* For RA during RRC reconfig with sync (e.g., at HO or CHO)
* For RA during RRC reestablishment,
* For establishing a secondary TAG

The events that lead to RA procedures are not very frequent in a well designed system, and therefore the overhead from always reporting the TA for all RA procedures (when SI indicates that it is wanted) is not large. Further, as the gNB do not kn ow which UE that is doing RA procedure, it can not reply with a smaller Msg3 (or configure a smaller MsgA), thus there is no coverage gain from allowing some UEs to not report TA in Msg3/MsgA.It will be complicated to differentiate all the cases for RA (that are specified at different locations in the spec). It is simpler to have the UE always report the TA for all different RA reasons, if it is requested in SIB for the cell where RA procedure is initialized except for “Request for Other SI”.***Proposal: TA reporting during RA procedure in connected mode is controlled by the enable/disable indication configured in SI for the target cell, except for RA procedures due to “Request for Other SI” where no TA report is sent.***  |
| Sequans | Agree with comments | Agree that HO and reestablishment can be discussed separately. |
| InterDigital | Agree with Comments | Agree with others that handover case and re-establishment case should be discussed separately. |

***Rapporteur Summary:***

*Out of 22 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***Support the above proposal?*** |
| *Agree/Agree with Comment* | *Disagree* |
| *17* | *1* |

*An additional* ***4*** *companies did not explicitly provide an Agree/Disagree response, however provided comments which are captured below:*

* *(many companies) There should be an exception for RACH triggered by RRC re-establishment and handover*
	+ *Same discussion is occurring in IoT NTN, same solution should be applied*
	+ *There is no spec impact on other cases*
	+ *Also applies to initial access and RRC resume*
* *(3) Proposal is only specifying the TA reporting to serving cell.*
* *It is complicated to differentiate all cases for RA. It would be simpler to always have UE report TA except for “Request for other SI”*

*As commented by many companies, there are exceptions (e.g., RRC re-establishment and handover) which may require differentiated behaviour from the above proposal. Rapporteur notes that this topic has been well addressed in [Pre117-e][011] for IoT NTN, where a number of proposals have consensus or near consensus support. It is suggested that those proposals be considered for NR NTN as well.*

***Proposal 1: During RA procedure for RRC re-establishment procedure, the UE should trigger TA report if an indication is broadcasted by the target cell’s SI. (consensus in IoT NTN discussion)***

***Proposal 2: During RA procedure for handover, the UE should trigger TA report if the target cell indicates this in the handover command. (consensus in IoT NTN discussion)***

***Proposal 3: Other than re-establishment and handover procedure, TA reporting in connected mode is not controlled by enabling/disabling indication in SI. (16/17 in IoT NTN discussion)***

### TA reporting triggered and no UL-SCH resources

In the final phase of offline [AT116bis][101], the following proposal was discussed and supported by 12 of 16 companies:

***Proposal: SR can be triggered if there is a TA reporting triggered and no UL-SCH resources for TA reporting. When SR is triggered but there are no available PUCCH resources, UE will trigger RACH.***

During discussion, it was noted that the drawback of SR/RACH triggering from UE is that the UE will send periodically TA report when it exceeds the threshold even when there is no data to send, which will cause much overhead especially given that all UEs within the cell will be sending this. For example, all connected UEs in an area the size of the UK (i.e. a cell size of 1000km) will end up always reporting TA (periodically). Relying on existing mechanisms will ensure that TA report is only sent when required, i.e. only when there is DL or UL data (i.e. when TA is actually needed).

Companies supportive of this proposal counter this concern by noting that the reporting interval is up to NW implementation e.g., by setting the offset threshold/UE-specific K\_Offset. Proper NW configuration, for example, configuration of a relatively large UE-specific K\_Offset, would result in less frequent TA report, thus less overhead.

**Question 2a: Should** **connected UE send TA report (if triggered) only if there is UL/DL data?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Additional comments**  |
| CATT | See the comments | Different scenarios can be considered as following: * If there is UL-SCH resources, connected UE should send TA report (if triggered), regardless whether there is UL/DL data or not
* Otherwise (if there is no UL-SCH resources),
	+ if there is UL/DL data, connected UE should send TA report (if triggered)
	+ otherwise (if there is no UL/DL data), connected UE need not send TA report (if triggered)
 |
| OPPO | No | TA reporting is important for NW to adjust UE-specific K-offset. If it has no chance to report, it may impact the subsequent UL/DL transmission by using the old K-offset.Some companies may think that TA report is only necessary if there is data for the UE, since if the UE has UL data, UE would trigger BSR, and may further trigger a SR if there is no available UL-SCH resources. If the UE has no UL data but there is DL data for the UE, NW may schedule the UE with larger K1 if the UE-specific Koffset has been out-of-date or NW sends PDCCH order to trigger RACH. In our understanding, there are issues for both UL and DL. In NTN, we have UE pre-compensation of TA which is open-loop. Without timely TA report, network does not know whether and when UE-specific Koffset starts to become unusable due to Koffset below UE’s TA. In this case, even if UL data can trigger BSR and then SR, the subsequent UL grant may still be risky not to be usable if using small K2 value as K\_offset has not been updated, or NW has to always use large K2 value which is not efficient. Similarly, as K\_offset can be obsolete, NW may have to always schedule the UE with a relatively large K1 value to make ACK/NACK timing work. This would make the whole Koffset mechanism useless. Also K2 and K1 have upper limit in RAN1 spec and cannot be any arbitrarily large. It could be possible that even the maximum K2/K1 value cannot cover the gap between the current TA and the configured K\_offset, in which case RAN2 has to discuss how to handle this kind of failure.Relying on loss of synchronization and triggering RACH has many drawbacks, e.g. RACH may suffer collisions and multiple attempts, which increases the latency for UL/DL scheduling.To facilitate network’s implementation, to ease RAN2’s job not to handle various failure cases, and to reduce scheduling delay, we think triggering SR/RACH for TA reporting is the simplest way.Therefore, we see no need to introduce the limitation that connected UE should send TA report (if triggered) only if there is UL/DL data. |
| Samsung | No | If there is no UL-SCH resource but UL data, BSR and then SR will be triggered as legacy. If there is no UL-SCH resource, no UL data, and SR is not triggered, then issues with ACK/NACK for DL data could happen as mentioned by OPPO that large K1/K2 may not always work. But we also think triggering SR/RACH whenever there is no UL-SCH resource and no UL data can cause much overhead. If majority think this works, we are fine to agree with the proposal. |
| Nokia | Yes | See our comments on question2b. The signalling overhead should be considered if SR should be triggered by all UE under the satellite coverage to report TA even it has no UL/DL data. |
| Intel | Yes | agree with Nokia’s concern, it’s quite likely to lead to a RACH signalling storm by simultaneous TA report triggerring. |
| Apple | No | We think it is unlikely that all UEs will trigger TA report simultaneously, so don’t think signalling storm is a real issue. |
| vivo | No | We understand the intention of Q2a is to delay the TA MAC CE reporting and avoid TA reporting impacting the legacy SR/RACH trigger. But this will cause additional delay of UL/DL transmission or scheduling issue. For example, during RACH procedure, NW may schedule grant for msg3 based on the old TA, which may cause the scheduled grant is already outdated and thus unable to be used when UE receives it. If NW schedules grant for msg3 based on the maximum TA, it will cause additional delay of data transmission. As the TA MAC CE is inherently introduced to reduce the scheduling delay, it is reasonable that UE and NW should always maintain the latest TA value. Thus, TA MAC CE should be reported as soon as possible, once TA reporting is triggered.Regarding the frequency of TA reporting, we agree with the view pointed by Rapporteur that it can be controlled by NW implementation e.g., by setting the offset threshold/UE-specific K\_Offset. This can address the concern on over-frequent TA reporting from some companies. |
| Lenovo, Motorola Mobility | No | Agree with Rapporteur that NW implementation can handle. |
| Huawei, HiSilicon | No | We don’t see a severe overhead issue considering the size of MAC CE in comparison with UL data. Besides, it is expected NW implementation can handle this.However, if UE waits until data arrival to send TA report, the configured UL resource may already be unable to use. Then the potential transmission failure and interruption will decrease the system performance. |
| ASUSTeK | No | The TA report could be triggered and sent even if there is no UL/DL data. |
| ZTE | No | We tends to agree with Oppo’s comments that delay the report of TA to only when there is UL or DL data could lead to the case koffset scheduled previously will be smaller than current TA used thus lead to collision of transmission and introduce extra delays. This can be dealt with assigning a large Koffset but this might mitigate the gains of introducing UE specific koffset. But we also agree with rapporteur that additional overhead will be introduced for this enhancement, therefore if majority consider the gain is not worth the overhead we can accept majority’s view. |
| Qualcomm | No | It is needed for scheduling any UL transmission including PUCCH like HARQ feedback where UE specific Koffset has to be used. |
| Xiaomi | No | Agree with OPPO’s comment. If not report in time, network doesn’t know whether Koffset is outdated or not, then for DL data, K1 will always use larger value; For UL data, if we wait until UL data trigger SR, Koffset will be outdated, network has to use large K2 for UL grant. |
| China Telecom | No | NW implementation can reduce the frequency of TA reporting. |
| Spreadtrum | No | Agree with OPPO’s comments. Smart gNB could schedule the uplink resource with a large Koffset, if TA value is not available. |
| LG | No | Considering that the alignment of TA should be guaranteed in order to transmit the UL feedback, i.e., HARQ ACK/NACK, for the DL data, the alignment of TA is important not only for UL but also for DL. If the TA is not aligned due to the change of the UE-specific TA, the network would not successfully receive UL feedback for the DL data. Then, the network may retransmit the DL data again. In summary, if BSR and then SR will be triggered as in legacy and the TA is not aligned, it would lead to the waste of radio resources. Thus, SR/RACH procedure should be triggered when TA reporting has been triggered and there is no available UL-SCH resources for TA reporting.In addition, if there is a concern on signalling overhead, we may introduce the prohibit timer for TA reporting.  |
| Thales | Yes |  |
| NEC | No | We agree with Oppo, a lack of TA will have an impact on subsequent UL/DL transmissions. |
| MediaTek | Yes | TA report will only be useful to the network when there is UL/DL data. There is no scenario where the network will need a TA report without UL/DL data. |
| Ericsson | Yes | Not well formulated question. The UE should never trigger an SR if the UE do have UL-SCH resources. Futher there is standard procedure to trigger RA procedure when an SR fails or there are no SR PUCCH resource configured – thus no need to agree what is in legacy already. When there is a grant available, then the UE should include a TA report if a TA report have been triggered. If UE has no UL data and gNB has DL data, the gNB can send an UL grant if gNB suspects the UE need to report the TA or gNB can send a DL MAC CE to update the UE-specific-Koffset (for example set it to the cell specific Koffset). If there have been no communication with the UE for a while and data arrives (either DL data or UL data resulting in an SR), and Alternatively gNB can send an PDCCH order and the UE will reply with a TA report in the Msg3/MsgA (RAN1 have agreed that for PDCCH order, the UE shall always apply the cell-specific Koffset). We propose ***Proposal: A triggered TA report does not trigger an SR.***  |
| Sequans | No with comment | We don't get this proposal as it does not mention UL-SCH resources availability.Assume a TA report is triggered, and there is no UL/DL data: at least if there is UL-SCH resource we think TA report should be sent, even if there is no UL/DL data. Regarding the case where there is no UL-SCH resource, we think this should be handled in a similar way as for BSR, i.e. by adding a SR-DelayTimer. The NW would then have full control on potential signaling overhead. The NW can set the delay timer so that the TA delta is within the margin used for setting Koffset so we don't see a problem with "TA outdate issue".  |
| InterDigital | No | If offset threshold is properly configured, then if a TA report is triggered it is necessary for alignment between UE and gNB and may risk synchronization and subsequent transfer of data (even if there is nothing currently pending). We agree that proper network configuration should address any issues with signalling overhead |

***Rapporteur Summary:***

*Out of 22 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***Should connected UE send TA report (if triggered) only if there is UL/DL data?*** |
| *Yes* | *No/No with comment* |
| *5* | *16* |

*An additional* ***1*** *company did not explicitly provide a Yes/No response, however provided comments which are captured below:*

* *(7) TA reporting is important for NW to adjust K-Offset, and may impact subsequent UL/DL transmission if not reported.*
	+ *(3) Would introduce delay*
	+ *Relying on loss of synchronization and triggering RACH has many drawbacks*
	+ *If the gNB is not sure if the UE has a UE-speciffic Koffset that is sufficiently large, the gNB can send a DL MAC CE to update the UE-specific Koffset (for example set it to the cell specific Koffset).*
* *Simpler to trigger SR/RACH for TA reporting if no UL-SCH resources.*
	+ *(6) Signalling overhead can be controlled by NW implementation*
	+ *(4) This may cause additional overhead, which should be considered*
	+ *(2) May introduce a prohibit timer/SR delay timer to further mitigate signalling overhead.*
	+ *Unlikely all UEs will trigger TA report simultaneously, and don’t think signalling storm is an issue.*
	+ *Severe overhead considering size of MAC CE compared to UL data.*
* *There are different scenarios based on whether there is UL-SCH resources:*
	+ *(2) If no UL-SCH resources, do not send TA report.*
	+ *(2) If there are UL-SCH resources, send TA report*
* *There is already a standard procedure to trigger RA when SR fails or there are no SR PUCCH resource when configured, so no need to agree what is in legacy already*

*This question is jointly considered with Question 2b.*

**Question 2b: If the above proposal is agreed, can NW configuration address any possible excessive TA reporting? If “No” please describe system impact(s) which preclude this option.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Additional comments**  |
| CATT |  | If UE reports the TA according to different scenario show in Question 2a, maybe there is no excessive TA report issue.  |
| Nokia | No | For the proposal, it may cause all the connected UEs under the satellite coverage of a cell may need to update its TA simultaneously due to the movement of the satellite even when UE has no DL or UL data in buffer, which may cause signalling storms.If there is some kind of prohibition timer introduced to avoid frequent reporting, it means the TA update cannot happen in time which cannot address the TA outdate issue for PUCCH feedback. Furthermore, if NW configures a relatively large UE-specific K\_offset (and large TA reporting threshold), it cannot solve the issue but only mitigate the issue. There are still many UEs which maintain the TA reports but it is useless since UE has no data to send/receive. However, the large TA reporting threshold will also reduce the gain of reporting UE-specific TA (to reduce scheduling delay via proper K\_offset + K2 configuration) which is not the intention of TA reporting. |
| MediaTek | No | There will be less TA reporting with the option in Q.2a (connected UE sends TA report (if triggered) only if there is UL/DL data) than the alternative option (trigger SR if TA report is triggered and there are no UL-SCH resources). The alternative option requires every UE to send a TA report when the TA report is triggered, even if there is no UL/DL data. Network can control the intensity of the TA reporting by properly selecting the threshold value. An improper network configuration (e.g. low threshold) would cause even more excessive TA reporting with the alternative option (trigger SR). |
| Ericsson | No | Using a larger offset and large steps of UE-specific-Koffset goes against the idea of minimizing the Koffset to minimize the delay. Alternatively, it will require higher overhead to reconfigure the offset for UEs that empties the buffer and where new data arrives (and similar for DL data emptying/arrival). |
| Thales | Yes |  |
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***Rapporteur Summary:***

*Out of 5 responding companies, the following table presents a summary of responses to the above question:*

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| --- |
| ***Can NW configuration address any possible excessive TA reporting?*** |
| *Yes* | *No* |
| *1* | *3* |

*An additional* ***1*** *company did not explicitly provide a Yes/No response, however provided comments which are captured below:*

* *(2) Previous proposal may cause all connected UEs under the sateille coverage to update TA simultaneously due to satellite movement, which may cause signalling storm.*
* *(2) NW configuration can only mitigate issue, and will reduce gain of reporting UE-specific TA (i.e., large steps of K-Offset goes against idea of minimizing K-offset to minimize delay)*
* *Prohibition timer will not address issue and means TA update cannot happen in time.*

*Based on input to Question 2a/2b, in general companies seem to think that connected UE should send TA report (if triggered) regardless if there is UL/DL. However, opinions diverge whether this should always be the case, or conditional on the availability of UL-SCH resources. Considering split opinion, Rapporteur suggests that this be further discussed in a subsequent [AT117e] email discussion.*

***Proposal 4: RAN2 to further discuss if SR can be triggered when a TA report is triggered and no UL-SCH resources are available, or if RACH can be triggered if SR is triggered but there are no available PUCCH resources.***

### UE location information for TA reporting purposes

During offline [AT116bis][101], UE location information for TA reporting purposes was discussed over several rounds. Based on final round outcome, company opinion was split:

* **8** do not support UE location information for TA reporting purpose in connected mode;
* **6** do support; and
* 1 suggests to postpone.

However, several aspects of UE location information for TA reporting purpose have more consensus. Considering limited time remaining Rapporteur suggests the topics below be addressed in this email discussion with the condition “*If UE reporting location information for TA reporting purpose in connected mode is supported*” which shall be addressed via contribution to RAN2#117e (as captured in the Appendix via Open issue 19).

#### **Topic 1:** Whether both UE location and/or UE specific TA information are needed in parallel for the purposes of TA reporting

In final round of offline [AT116bis][101], the following proposal was discussed and supported by 6 of 8 responding companies:

***Proposal: UE can be configured to report only the UE location or the UE specific TA information IF*** ***reporting UE location information for TA reporting purpose in connected mode can be agreed.***

Companies which do not agree have raised the following technical issue:

**Technical issue 1)** Limit to NW configuration

Two companies note that this proposal would limit NW configuration possibilities for the network, and that if both TA report and UE location can be reported, let the network decide if it shall configure one of them or both or none (allowing optimization based on resource situation, services, subscriptions etc.).

To counter this argument, It is noted by other companies that there is no need to report both the UE specific pre-compensation and the UE location information to NW in parallel since they are derived from the same inputs.

**Question 3: Companies are invited to comment on the above technical issue or provide additional comments regarding the above proposal.**

|  |  |
| --- | --- |
| **Company** | **Additional comments**  |
| CATT | We think it is not efficient to discuss this issue without any agreement on ***reporting UE location information for TA reporting purpose,***and we also think there is no need support UE location information for TA reporing purpose, it is not a essential issue.  |
| OPPO | Share the same view as CATT.We think using UE specific TA pre-compensation for TA reporting purpose is sufficient in Rel-17. We need to make sure NTN can work in this release and should not introduce too many optimizations which are simply duplicated functions and not essential to have. So we prefer not to support UE location information for purpose of TA reporting. |
| Samsung | We can leave this issue for now. We are fine not to support UE location report for TA purpose.  |
| Nokia | RAN2 agreed in 116bis meeting that, if NTN-specific user consent will be available in Rel-17, the UE location can be requested by NW for any reason which of course including for TA reporting purpose. We can see the proposal above is clearly stated with the pre-condition that “*IF reporting UE location information for TA reporting purpose in connected mode can be agreed*.” which is aligned with below RAN2 agreement. With the pre-condition, the details on how to support UE location reporting should be discussed in Rel-17.

|  |
| --- |
| 3. If SA3 will confirm that NTN-specific user consent will the available in Rel-17, **the network could at least ask the UE to report its UE location for any reason at any time.** FFS if we define an event-triggered reporting of UE location for TA reporting purposes. |

For the proposal, we agree with rapporteur that there is no need to report both the UE specific pre-compensation and the UE location information to NW in parallel since they are derived from the same inputs.  |
| Intel  | agree with Nokia. This question is actually re-worded as the FFS part in agreement above. |
| Apple  | Agree with CATT, OPPO, and Samsung. We do not think UE location report for TA purposes need to be supported. In any case, configuring both TA report and UE location report at the same time is not justified.  |
| vivo | Our view is that the UE specific TA information for TA reporting purpose is enough. There is no need to introduce additional UE location information for the same purpose (even if the location reporting can be agreed finally). Thus, the above technical issue does not exist. |
| Lenovo, Motorola Mobility | Agree with vivo that UE specific TA information for TA reporting purpose is enough. |
| Huawei, HiSilicon | We don’t think this “technical issue” is valid. In fact, the proper NW implemetation should be that the NW cofnigures one of the two reporting mechanisms.  |
| Qualcomm | We think location report should be discussed independently. The trigger for location report can be different from that of the TA report. |
| Xiaomi | As we have not decided on whether there will be trigger event for location report for TA purpose and LCS support purpose, and if so, whether a common trigger event is applied for both purposes or not. If so, the trigger event design may be different from MAC-CE based TA report trigger event.Thus, we suggest to postpone this discussion until we have clear conclusion on trigger events for location report. |
| China Telecom | We think there is no need to report both the UE specific pre-compensation and the UE location information to NW in parallel. |
| Spreadtrum | Both location and TA report are configured by gNB independently. |
| LG | Agree with CATT, OPPO, Samsung, and Apple. The UE location reporting for TA would not be needed. Since TA reporting using MAC CE is introduced for NTN, two solutions for the same purpose would not be needed. In addition, we do not see the benefit on that TA reporting using MAC CE and UE location reporting for TA are simultaneously configured in a UE even if the UE location reporting for TA is agreed  |
| Thales | Ok with the proposal |
| NEC | We do not support UE location information for TA reporting purpose in connected mode.Applications requiring location report may have different requirements compared to the TA report:* More precision so more signalling load
* Triggers that could be either periodic reporting or location triggers (i.e. UE is in range of specified location)

Therefore, we are concerned that location reporting triggers may serve an entirely different purpose and not suitably replace TA reporting and we think both should be available in parallel, subject to NW implementation. |
| MediaTek | We think that there is no need for an additional mechanism e.g. location reporting. TA reporting mechanism is enough. However, if location information were also to be supported, we would suggest that, if required, the network selects one of the two reporting options: TA or location. The reason is to reduce duplicate and redundant reports from the UE, which reduces signalling overhead. |
| Ericsson | RAN2 do not specify network behaviour. We disagree with the proposal. There is no need to limit the configuration possibilities of the NW even if it is unlikely that the NW would configure both at the same time. Further, there is no gain for the UE to know that gNB will only configure one of the reporting mechanisms.  |
| Sequans | No strong view, but in general even if both are not needed simultaneously, it seems better to keep them independent and let the NW configures properly. |
| InterDigital | We see the use of location reporting, and support letting the network configure between location vs. TA for purposes of TA reporting. However, it seems redundant to report both simultaneously since they ultimately enable NW to determine TA. |

***Rapporteur Summary:***

*Out of 20 responding companies, the following comments are noted regarding the below technical issue:*

***Technical issue 1)*** *Limit to NW configuration*

* *(6) Should postpone/wait for outcome of agreement on “reporting UE location information for TA reporting purpose”*
	+ *(2) RAN2 has agreed in 116bis meetin that if NTN-specific user consent will be available in Rel-17, the UE location can be requested by NW for any reason which of course including for TA reporting purpose.*
* *(5) No reason to report both in parallel*
	+ *Proper NW configuration should be that NW configures one of two mechanisms.*
* *(5) UE-specific TA for TA-reporting purposes is sufficient.*
* *(2) Both should be supported in parallel and subject to NW implementation*
	+ *(2) Both location and TA report are configured independently by gNB*
	+ *Location reporting may serve an entirely different prupose and not suitably replace TA reporting*
	+ *No need to limit configuration possibilities*
* *Location report should be discussed independently*

*Rapporteur suggests that since there is no consensus, and proposal is dependant on confirmation UE location is supported for the purposes of TA reporting (which is addressed via contribution), this topic be postponed to an [AT117e] email discussion and jointly considered with contribution input.*

***Proposal 5: “Whether both UE location and/or UE specific TA information are needed in parallel for the purposes of TA reporting” is postponed.***

#### **Topic 2:** Definition of event trigger for location reporting (e.g. if it re-uses the same event trigger or different trigger)

In final round of offline [AT116bis][101] there was consensus that if reporting UE location information for TA reporting purpose in connected mode can be agreed, it shall reuse the TA-based trigger event. Rapporteur suggests that the same proposal be agreed.

**Question 4: Do you agree with the following proposal?:**

***Proposal: Reuse the TA-based trigger event if reporting*** ***UE location information for TA reporting purpose in connected mode can be agreed.***

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments**  |
| CATT | Agree | It is suffecient to reuse the TA-based trigger, event if UE location information for TA reporting purpose in connected mode can be agreed. |
| OPPO | Agree, but  | See our comment to Q3. |
| Samsung | Agree |  |
| Nokia | Agree | The UE movement distance (UE location change) doesn’t mean the TA change since the trajectory of UE movement is unknown. The TA change threshold should be used in both mechanisms, whether the UE’s TA or UE location information is used to perform that update shouldn’t matter. |
| Intel | Agree |  |
| Apple | Agree |  |
| vivo | Disagree | Same reason with Q3. |
| Lenovo, Motorola Mobility | Agree |  |
| Huawei, HiSilicon | Agree | No need for other trigger. |
| Qualcomm |  | See our comment in Q3. |
| Xiaomi | No | Both TA report and LCS support requires location information. A common trigger event would be preferable, and trigger event based on TA change is not applicable to LCS support. And the event should be defined in RRC. The MAC CE based trigger event is defined in MAC. There is fundamental difference in MAC event and RRC event. For MAC event, only threshold needs to be defined, but for RRC event, TTT and hysteris may be needed to align with other trigger events defined in RRC so as to reduce spec impact. |
| China Telecom | Agree |  |
| Spreadtrum | Agree |  |
| LG | Agree |  |
| Thales | Agree |  |
| NEC | Agree |  |
| MediaTek | Agree | We think that there is no need for an additional mechanism e.g. location reporting. TA reporting mechanism is enough. However, if location information were also to be supported, the same TA-based trigger can be re-used. |
| Ericsson | Disagree | The UE calculates the TA from the UEs location, thus a change in the TA is due to satellite moving, or UE location changing, or feeder link switching. The gNB knows of the feeder link and satellite movements, but do not know the UEs movements. A change in TA above an offset does not mean the UEs location has changed, instead the offset should be if the UEs location have changed more than an offset from last successful reported UE location. The Event D1 defined in the running RRC CR session for UE location reporting can be reused for this purpose but for UEs that moves fast it means ean overhead for reconfiguring the referenceLocation1 after a UE report. Therefore, the Event D1 can be enhaced with a flag that uses the referenceLocation1 equal to last successful reported UE location. ***Proposal: The Event D1 is modified with a flag “useLastLocation”, and if enabled, the UE shall use last successful reported UE location instead of referenceLocation1 when evaluating the event.******Proposal: The resolution of the reported location shall be in 3D.*** |
| Sequans | Agree |  |
| InterDigital | Agree |  |

***Rapporteur Summary:***

*Out of 20 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***Support the above proposal?*** |
| *Agree/Agree with comment* | *Disagree* |
| *16* | *3* |

*An additional* ***1*** *company did not explicitly provide an Agree/Disagree response, however provided comments which are captured below:*

* *(3) Similar comments to Q3*
* *(2) TA-based trigger is sufficient*
* *UE location change doesn’t mean the TA changes as the trajectory of UE movement is unknown.*
	+ *UE calculates TA from UE’s location, thus a change in TA can also be due to UE location change. Offset should be if UE’s location have changed more than offset from last successful reported UL location.*
* *TA change is not applicable to LCS support. Trigger event for location reporting should be defined in RRC.*
	+ *Event D1 is defined in RRC CR and can be reused for this prupose, but can be enhanced with a flag that uses the referenceLocation1 equal to last reported UE location.*

*Rapporteur suggests that since there is no consensus and proposal is dependant on confirmation UE location is supported for the purposes of TA reporting (which is addressed via contribution), this topic be postponed to an [AT117e] email discussion and jointly considered with contribution input.*

***Proposal 6: “Reuse the TA-based trigger event if reporting UE location information for TA reporting purpose in connected mode can be agreed.” is postponed.***

#### **Topic 3:** connected mode UE failing to acquire an accurate UE location to be used in the calculation of the full TA.

In final round of offline [AT116bis][101], the following proposal was discussed and supported by 14 of 16 companies:

***Proposal: RAN2 do not address the issue on connected mode UE failing to acquire an accurate UE location to be used in the calculation of the full TA.***

The main concern from companies which do not agree (and also recognized by some companies who do) is that if UE cannot fix GNSS, then its TA would not be valid and it should not perform any UL transmission. Rapporteur suggests RAN2 can capture the above concern, however considering the very large majority support do not address this issue in RAN2 specification.

**Question 5: Do you agree with the following proposal?:**

***Proposal: RAN2 understanding: UE failing to acquire an accurate UE location to be used in the calculation of the full TA should not perform any UL transmission until GNSS is fixed. No RAN2 specification impact.***

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments**  |
| CATT | Agree |  |
| OPPO | Agree, but  | We think this issue may be only valid for IoT NTN where IoT devices could not acquire the GNSS fix during RRC connected mode and not so relevant for NR NTN. |
| Samsung | Agree |  |
| Nokia | Agree | We understand it is UE’s implementation to decide whether the UE location is accurate enough for full TA estimation. Maybe we can describe it more specifically:***Proposal: RAN2 understanding: UE failing to acquire ~~an~~ sufficiently accurate UE location to be used in the calculation of the full TA should not perform any UL transmission until GNSS is within accuracy limits ~~fixed~~. No RAN2 specification impact.*** |
| Intel | agree  |  |
| Apple | Agree |  |
| vivo | Agree | We agree that no RAN2 impact is needed. |
| Lenovo, Motorola Mobility | Agree |  |
| Huawei, HiSilicon | Partially agree | No to the “RAN2 understanding” partWe understand the intention of this proposal, but would like to say that this is not the best way to handle this. We think if that is RAN2 understanding (which is not based on majority opinion), then it should be reflected in specs for best implementation. Back to the issue, we think it is obviously a corner case. What’s not clear to us is how the UE can know the UE location is accurate or not. This is out of 3GPP scope. Even if UE location is not exactly accurate, UL transmission may still be able to perform, e.g. with less finer accuracy, and is not supposed to be stopped. So we prefer not to further pursue this and nothing needs to be captured.  |
| ASUSTeK | Agree |  |
| ZTE | Agree |  |
| Qualcomm | Agree |  |
| Xiaomi | Agree |  |
| China Telecom | Agree |  |
| Spreadtrum | Agree |  |
| LG | Agree but | We need to clarify how the UE can acquire the accurate UE location. |
| Thales | Agree |  |
| NEC | Agree |  |
| MediaTek | Agree |  |
| Ericsson | Agree | If the UEs accuracy of TA estimation is not within limits, the UE shall refrain from all UL transmissions. We assume that this will be specified in RAN1 or RAN4 spec. We propose:***Proposal: RAN2 understanding: UE failing to acquire ~~an~~ sufficiently accurate UE location to be used in the calculation of the full TA should not perform any UL transmission until UE location~~GNSS~~ is within accuracy limits ~~fixed~~. No RAN2 specification impact.*** |
| Sequans | Agree |  |
| InterDigital | Agree |  |

***Rapporteur Summary:***

*Out of 22 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***Support the above proposal?*** |
| *Agree/Agree with comment* | *Disagree* |
| *22* | *-* |

*The following comments are noted:*

* *Issue may only be valid for IoT NTN where IoT devices could not aquire GNSS fix.*
* *UE’s implementation decides whether location is accurate enough for full TA estimation*
* *This is a corner case, and out of 3GPP scope. Prefer not to further pursue.*
* *Need to clarify how the UE can acquire accurate UE location*
* *Assume that limits will be specified by RAN1 or RAN4.*

*There is consensus support that in general, the above proposal is agreeable. The further clarification by Nokia/Ericsson also seems acceptable.*

***Proposal 7: RAN2 understanding: UE failing to acquire sufficiently accurate UE location to be used in the calculation of the full TA should not perform any UL transmission until UE location is within accuracy limits. No RAN2 specification impact. (consensus)***

## Details of new MAC CEs

### Details of UE-specific K\_Offset and TA reporting MAC CEs

Rel-17 NTN has introduced two new MAC CEs, captured in the current version of the MAC CR [2] as follows:

#### 6.1.3.XX UE-Specific TA MAC CE

The UE-Specific TA MAC CE is identified by MAC subheader with LCID as specified in Table 6.2.1-2. It has a fixed size and consists of two octets defined as follows (Figure 6.1.3.X-X):

- UE-specific TA: This field contains the UE estimate of the full UE-specific TA (i.e., T\_TA as defined in the UE’s TA formula). The length of the field is 16 bits

#### 6.1.3.XX Differential UE-Specific K\_Offset MAC CE

The Differential UE-Specific K\_Offset MAC CE is identified by a MAC subheader with eLCID as specified in Table 6.2.1-2b. It has a fixed size and consists of a single octet defined as follows (Figure 6.1.3.X-X):

- Differential UE-Specific K\_Offset: This field contains the differential UE-specific K\_Offset, The length of the field is 8 bits.

RAN2 to confirm details of new MAC CEs, including the structure and name of both MAC CEs.

**Question 6a: Do you agree UE-specific MAC CE consists of only one field with length 16 bits, which contains the UE estimate of full UE-specific TA (i.e., T\_TA as defined in the UE’s TA formula)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments**  |
| CATT | Agree |  |
| OPPO | Agree |  |
| Samsung | Agree but | Max full TA cannot exceed 14 bits (consider GEO max RTT 541ms for different numerologies), 2 bits can be reserved. Also fine to go with majority. |
| Nokia | Agree |  |
| Intel | Agree |  |
| Apple | Agree |  |
| vivo | Disagree | “R” field is needed in the UE-specific TA MAC CE.As the maximum TA value could be 541.46ms and the granularity of the reported TA is slot, the 10 bits are enough for TA reporting with 15khz SCS. Currently, RAN1 only agreed that 15 kHz is used as the reference subcarrier spacing value for the unit of TA reported in FR1. However, considering the forward compatibility, 120khz SCS can also be considered in the design of TA MAC CE. We suggest that 14 bits are used for reporting full TA, the remaining 2 bits are R fields. |
| Lenovo, Motorola Mobility | Agree |  |
| Huawei, HiSilicon | Agree |  |
| ASUSTeK | Agree |  |
| ZTE | Disagree | Share the same view as vivo.  |
| Qualcomm | Agree |  |
| Xiaomi | Agree |  |
| Spreadtrum | Agree |  |
| LG | Agree |  |
| Thales | Agree |  |
| NEC | Agree |  |
| MediaTek | Agree, but | 16 bits seems enough to accommodate the maximum T\_TA value in slot granularity for all numerologies. Suggest to use a simple MAC CE design without optimizations. Also, fine to leave 2 R-bits as suggested by Samsung and vivo. |
| Ericsson | Agree with comment | The clarification “the full UE-specific TA (i.e., T\_TA as defined in the UE’s TA formula)” shall be more precise. The reference in the definition of UE-gNB RTT in section 3.1 can be reused: “the UE’s Timing Advance value (see TS 38.2XX [Y] clause X.X)”Also see answer to 6c.  |
| Sequans | Agree |  |
| InterDigital | Agree |  |

***Rapporteur Summary:***

*Out of 21 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***UE-specific MAC CE consists of only one field with length 16 bits, which contains the UE estimate of full UE-specific TA ?*** |
| *Agree/Agree with comment* | *Disagree* |
| *19* | *2* |

*The following comments are noted:*

* *(4) “R” field can be specified (e.g., 2 bits can be reserved).*
	+ *(4) Max full TA cannot exceed 14 bits.*
* *Should further clarify the field description making reference to UE-gNB RTT definition.*

*Based on near consensus support, the proposal seems in general acceptable. It is noted that the exact field definition can be further refined during Stage 3 CR review.*

***Proposal 8: RAN2 confirms UE-specific TA MAC CE consists of only one field with length 16 bits, which contains the UE estimate of full UE-specific TA. (19/21)***

**Question 6b: Do you agree Differential UE-Specific K\_Offset MAC CE consists of only one field with length 8 bits, which contains the Differential UE-Specific K\_Offset?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments**  |
| CATT | Agree |  |
| OPPO | Agree |  |
| Samsung | Agree |  |
| Nokia | Agree |  |
| Intel | Agree |  |
| Apple | Agree |  |
| vivo | Yes |  |
| Lenovo, Motorola Mobility | Agree |  |
| Huawei, HiSilicon | Agree |  |
| ASUSTeK | Agree |  |
| ZTE | Agree |  |
| Xiaomi | Agree |  |
| Spreadtrum | Agree |  |
| LG | Agree |  |
| Thales | Agree |  |
| NEC | Agree |  |
| MediaTek | Agree | According to the RAN1 agreement: *The value range of the differential UE specific K\_offset provided in MAC CE is 0 – 63 ms.*So it makes sense to have a length of 8 bits. |
| Ericsson | Agree | Also see answer to 6c. |
| Sequans | Agree |  |
| InterDigital | Agree |  |

***Rapporteur Summary:***

*Out of 20 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***UE-Specific K\_Offset MAC CE consists of only one field with length 8 bits, which contains the Differential UE-Specific K\_Offset?*** |
| *Agree* | *Disagree* |
| *20* | *-* |

*The following comments are noted:*

* *8 bits is sufficient considering RAN1 agreement.*

*Based on consensus support, the proposal seems in general acceptable. It is noted that the exact field definition can be further refined during Stage 3 CR review.*

***Proposal 9: RAN2 confirms Differential UE-Specific K\_Offset MAC CE consists of only one field with length 8 bits, which contains the Differential UE-Specific K\_Offset. (consensus)***

**Question 6c: Do you agree with the following names: 1) UE-specific TA MAC CE; and 2) Differential UE-Specific K\_Offset MAC CE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments**  |
| CATT | Agree |  |
| OPPO | Agree |  |
| Samsung | Agree |  |
| Nokia | Agree |  |
| Intel | Agree |  |
| Apple | Agree |  |
| vivo | Yes |  |
| Lenovo, Motorola Mobility | Agree |  |
| Huawei, HiSilicon | Agree, but | Not sure about the use of “UE-specific”, maybe can be removed. We don’t have “UE-specific” for TA command MAC CE. No strong view, though. |
| ASUSTeK | Agree |  |
| ZTE | Agree |  |
| Xiaomi | Agree |  |
| Spreadtrum | Agree |  |
| LG | Agree |  |
| Thales | Agree |  |
| NEC | Agree |  |
| MediaTek | Disagree | Suggest to use **UE-specific TA Report MAC CE.** |
| Ericsson | Disagree | For 1) It is better to use the same terminology as RAN1 have been using in 38.211 v17.0.0 section 3.1 and 4.3.1 where the quantity is  Timing advance between downlink and uplink; see clause 4.3.1…Uplink frame number  for transmission from the UE shall start $$T\_{TA}=\left(N\_{TA}+N\_{TA,offset}+N\_{TA,adj}^{common}+N\_{TA,adj}^{UE}\right)T\_{c}$$before the start of the corresponding downlink frame at the UE where - $N\_{TA}$ and $N\_{TA,offset}$ are given by clause 4.2 of [5, TS 38.213], except for msgA transmission on PUSCH where $N\_{TA}=0$ shall be used;- $N\_{TA,adj}^{common}$ is derived from the higher-layer parameters *TACommon*, *TACommonDrift*, and *TACommonDriftVariation* if configured, otherwise $N\_{TA,adj}^{common}=0$;- $N\_{TA,adj}^{UE}$ is computed by the UE based on satellite-ephemeris-related higher-layers parameters if configured, otherwise $N\_{TA,adj}^{UE}=0$.Thus in RAN1, there is no mentioning of “UE” nor of “specific” for the quantity to report. Further RAN1 agreed:**Agreement**15 kHz is used as the reference subcarrier spacing value for the unit of TA reported in FR1.**Agreement**The reported TA is the least integer number of slots greater than or equal to the corresponding TA value.Thus as the report is not the UE specific part of the TA that is reported “UE specific” can be dropped from the name. This MAC CE is similar to the PHR and BSR (it reports some information from the UE), and should contain “report” at the end. To include “UE” or “specific” in the name is redundant, all stuff reported from a UE is about that UE and it is specific for that UE. Therefore we propose to use the name “Timing Advance Report MAC CE” and change as follows:6.1.3.XX Timing Advance Report MAC CEThe Timing Advance Report (TAR) MAC CE is identified by MAC subheader with LCID as specified in Table 6.2.1-2. It has a fixed size and consists of a single field defined as follows (Figure 6.1.3.XX-1):- Timing Advance: In FR1, the Timing Advance field indicates the least integer number of subframes greater than or equal to the Timing Advance value (see TS 38.211 section 4.3.1). The length of the field is 16 bits. We also suggest to modify the reference and the text in 3.1 definition of UE-gNB RTT and the RRC **UE-gNB RTT:** For non-terrestrial networks, the sum of the UE’s Timing Advance value (see TS 38.211 [Y] clause 4.3.1) and K-Mac.For 2)We prefer to also use the same terminology as RAN1 have been using in TS 38.213 v17.0.0 for example in section 4.2:For a timing advance command received on uplink slot $n$ and for a transmission other than a PUSCH scheduled by a RAR UL grant or a fallbackRAR UL grant as described in clause 8.2A or 8.3, or a PUCCH with HARQ-ACK information in response to a successRAR as described in clause 8.2A, the corresponding adjustment of the uplink transmission timing applies from the beginning of uplink slot $n+k+1+2^{μ}∙K\_{offset}$ where $k=\left⌈N\_{slot}^{subframe, μ}∙{\left(N\_{T,1}+N\_{T,2}+N\_{TA,max}+0.5\right)}/{T\_{sf}}\right⌉$, $N\_{T,1}$ is a time duration in msec of $N\_{1}$ symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured, $N\_{T,2}$ is a time duration in msec of $N\_{2}$ symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214], $N\_{TA,max}$ is the maximum timing advance value in msec that can be provided by a TA command field of 12 bits, $N\_{slot}^{subframe, μ}$ is the number of slots per subframe, $T\_{sf}$ is the subframe duration of 1 msec, and $K\_{offset}=K\_{cell,offset}-K\_{UE,offset}$, where $K\_{cell,offset}$ is provided by *Koffset* in *ServingCellConfigCommon* and $K\_{UE,offset}$ is provided by a MAC CE command; otherwise, if not respectively provided, $K\_{cell,offset}=0$ or $K\_{UE,offset}=0$.Same as for Timing Advance Report, no need to use “specific” in the name, and if we use “Differential Koffset” it is already differentiated from the cell-specififc Koffset, thus we can drop the “UE” in the name. Further the RAN1 agreement on the size is:**Agreement**The value range of the differential UE specific K\_offset provided in MAC CE is 0 – 63 ms.Thus, the size of the field is only 6 bitsWe propose6.1.3.YY Differential Koffset MAC CEThe Differential Koffset MAC CE is identified by a MAC subheader with eLCID as specified in Table 6.2.1-2b. It has a fixed size and consists of one octet defined as follows (Figure 6.1.3.YY-1):- R: Reserved bit, set to 0;- Differential Koffset: This field contains the differential UE-specific Koffset. The length of the field is 6 bits. |
| Sequans | Agree |  |
| InterDigital | Agree |  |

***Rapporteur Summary:***

*Out of 20 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***Do you agree with the following names: 1) UE-specific TA MAC CE; and 2) Differential UE-Specific K\_Offset MAC CE?*** |
| *Agree* | *Disagree* |
| *18* | *2* |

*The following comments are noted:*

* *(2) Can remove “UE specific”*
	+ *This would be more in-line with RAN1 specification in 38.211. field description can be further clarified as well*
* *Should include “Report”*

*Rapporteur notes the large support for this question, however the comment by Ericsson is valid. The TA reporting procedure has been led by RAN1, and RAN2 specification should align with terminology used in latest version of 38.211. It is suggested that confirmation of MAC CE names be postponed to an [AT117e] discussion to ensure naming is in line with RAN1 specification.*

***Proposal 10: RAN2 to further discuss naming of UE-specific TA MAC CE and Differential UE-Specific K\_Offset MAC CE to ensure alignment with RAN1 specification.***

## RA windows and timers

### Extension of *ra-ReponseWindow* and *msgB-ResponseWindow*

In current version of NTN MAC CR Section 5.1.1 [2], there are the following Editor’s Notes regarding *ra-ResponseWindow* and *msgB-ReponseWindow* extension:

Editor’s note: *Agreement:* If the start of *ra-ResponseWindow* is accurately compensated by UE-gNB RTT, *ra-ResponseWindow* is not extended in LEO/GEO. RAN2 to confirm *ra-ResponseWindow* is not extended for NTN.

Editor’s note: *Agreement:* If the start of *msgB-ResponseWindow* is accurately compensated by UE-gNB RTT, *msgB-ResponseWindow* is not extended in LEO/GEO. RAN2 to confirm *msgB-ResponseWindow* is not extended for NTN.

Considering RAN1 has not identified any need for extension, RAN2 may confirm that *ra-ResponseWindow* and *msgB-ReponseWindow* extension is not necessary.

**Question 7: Do you agree *ra-ResponseWindow* and *msgB-ReponseWindow* are not extended in NTN?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments**  |
| CATT | Agree |  |
| OPPO | Agree |  |
| Samsung | Agree |  |
| Nokia | Agree |  |
| Intel | Agree |  |
| Apple | Agree |  |
| vivo | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| Huawei, HiSilicon | Agree |  |
| ASUSTeK | Agree |  |
| ZTE | Agree |  |
| Qualcomm | Agree |  |
| Xiaomi | Agree |  |
| Spreadtrum | Agree |  |
| LG | Agree |  |
| Thales | Agree |  |
| NEC | Agree |  |
| MediaTek | Agree |  |
| Ericsson | Agree |  |
| Sequans | Agree |  |
| InterDigital | Agree |  |

***Rapporteur Summary:***

*Out of 21 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***ra-ResponseWindow and msgB-ReponseWindow are not extended in NTN?*** |
| *Agree* | *Disagree* |
| *21* | *-* |

*Based on consensus support, the above proposal seems acceptable.*

***Proposal 11: RAN2 confirms ra-ResponseWindow and msgB-ReponseWindow are not extended in NTN. (consensus)***

### Remaining details of *ra-ContentionResolutionTimer*

During offline [AT116bis][101], *ra-ContentionResolutionTimer* behaviour was discussed over multiple rounds. Final round outcome resulted in the following proposal, which was acceptable to 10/13 companies:

***Proposal: UE stops ra-ContentionResolutionTimer upon receiving PDCCH indicating Msg3 retransmission and then starts ra-ContentionResolutionTimer after the end of the Msg3 retransmission plus UE-gNB RTT.***

The primary concern of disagreeing companies is the limitation placed on MSG3 blind retransmission, noting if the above proposal is adopted the UE is not required to monitor PDCCH and may miss the blind retransmission of MSG3 between the moment when UE stops *ra-ContentionResolutionTimer* and the moment the UE (re)starts *ra-ContentionResolutionTimer*. This may impact cell coverage, which is a key issue given the large cell sizes of non-terrestrial networks.

Rapporteur notes that a large majority support the above proposal, and there is not consensus MSG3 blind retransmission is needed. It is suggested that the above proposal be adopted for Rel-17, and impact to coverage and possible enhancement to support MSG3 blind retransmission be considered in the Rel-18 NTN coverage enhancement study item.

**Question 8: Do you agree with the following compromise proposal?:**

***Proposal: UE stops ra-ContentionResolutionTimer upon receiving PDCCH indicating Msg3 retransmission and then starts ra-ContentionResolutionTimer after the end of the Msg3 retransmission plus UE-gNB RTT. I******mpact to coverage and possible enhancements (e.g. to support MSG3 blind retransmission) can be considered in the Rel-18 NTN coverage enhancement SI.***

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Additional comments**  |
| CATT | Agree |  |
| OPPO | Agree |  |
| Samsung | Agree |  |
| Nokia | Disagree | Support blind Msg3 retransmission is a legacy function which is implemented in NW in both LTE and NR from the original release. It is now one typical strategy for Msg3 coverage enhancement in NW implementation. As mentioned by Rapporteur, there is Rel-18 objective to study how to perform NTN coverage enhancement. It makes no sense to disable a legacy mechanism for coverage enhancement in Rel-17 then recover it in Rel-18. Note that Rel-18 enhancement would not be supported for all the NTN UEs.If RAN2 want to disable a legacy function, it is natural to show strong technical reason why this is the reasonable way-forward. However, we don’t see that in this proposal.To solve the root issue addressed by this proposal (i.e. declare unintended Contention Resolution failure during UE-gNB RTT), there is an alternative option2 without negative impact (i.e. simply capture UE does not consider the contention resolution failure in NOTE or MAC procedure).***Option 2: If ra-ContentionResolutionTimer expires during the UE-gNB RTT after Msg3 retransmission, the UE does not consider the Contention Resolution not successful.*** Hence, we think above Option2 is the simple and right way-forward for both Rel-17 and Rel-18 based on technical analysis. We cannot accept the proposal. |
| Intel | Agree |  |
| Apple | Agree |  |
| vivo | Agree | The proposal is acceptable to us. |
| Lenovo, Motorola Mobility | Agree |  |
| Huawei, HiSilicon | Agree |  |
| ASUSTeK | Agree | We agree with the proposal and the issue of Msg3 blind retransmission can be considered in coverage enhancement in Rel-18 NTN. |
| ZTE | See comments | We share some sympathy on Nokia’s comments. One possible compromise is to make it configurable.For the case coverage enhancement is enabled UE doesn’t stop ra-ContentionResolutionTimer and won’t consider the ra-ContentionResolutionTimer expires during the UE-gNB RTT after Msg3 retransmission is an failed contention resolution. But for other case UE stops ra-contentionResolutionTimer as proposed in the proposal. |
| Qualcomm | Agree |  |
| Xiaomi | Prefer to only have a note to reduce spec impact | We would suggest some simple solution: i,e, add a note to say that UE ignores the expiry of ra-ContentionResolutionTimer during the delay of the restart of the ra-ContentionResolutionTimer by UE-gNB RTT. |
| Spreadtrum | Agree |  |
| LG | Prefer to only have a note to reduce spec impact | Agree with Xiaomi |
| Thales | Agree |  |
| NEC | Agree |  |
| MediaTek | Agree |  |
| Ericsson | Agree | If higher reliability is needed, Msg3 repetition can be used instead of blind Msg3 retransmissions.  |
| InterDigital | Agree |  |

***Rapporteur Summary:***

*Out of 20 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***Support the above proposal?*** |
| *Agree/Agree with comments* | *Disagree* |
| *16* | *1* |

*An additional* ***3*** *companies did not explicitly provide an Agree/Disagree response, however provided comments which are captured below:*

* *(2) prefer to only have a note to reduce spec impact*
* *Support of blind Msg3 transmission is a legacy function from LTW and NR from original release. It makes no sense to disable a legacy mechanism in Rel-17 and recover it in Rel-18 without strong technical justification.*
	+ *Can be a configurable option*
	+ *Msg3 repetition can be used if higher reliability is needed*

*It is noted that although the proposal seems widely acceptable, at least one company objects. Considering this proposal was intended to be a compromise, Rapporteur suggests that current proposal remain the basis of online discussion, and if needed be further addressed in an [AT117e] discussion.*

***Proposal 12: UE stops ra-ContentionResolutionTimer upon receiving PDCCH indicating Msg3 retransmission and then starts ra-ContentionResolutionTimer after the end of the Msg3 retransmission plus UE-gNB RTT. Impact to coverage and possible enhancements (e.g. to support MSG3 blind retransmission) can be considered in the Rel-18 NTN coverage enhancement SI. (16/20)***

# Other MAC Aspects

## LCP

### DRX and LCP parameter names

Based on comment to offline [AT116bis][107], several companies note that naming/descriptions of *allowedHARQ-DRX-LCP,* *uplinkHARQ-DRX-LCP-Mode* and HARQ DRX-LCP modes should be revised for further clarity in the specification.

**Question 9a: What is your preferred parameter naming?**

* **Option 1: *uplinkHARQ-mode*, *allowedHARQ-mode, and HARQ mode A/B***
* **Option 2: *uplinkHARQ-DRX-mode, allowedHARQ-DRX-mode, and HARQ-DRX mode A/B***

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option?** | **Additional comments**  |
| CATT | Option 1 | The UL HARQ transmission mode has impacts on LCP and DRX procedure, therefore the option 1 is more acceptable. |
| OPPO | Option 1 |  |
| Samsung | Option 1 |  |
| Nokia | Keep the original names | We think original parameter names is good enough to reflect the LCP and DRX impacts by seting different HARQ mode. So we prefer to keep the original names. However, to make progress, we are fine to accept Option1. |
| Intel | option 1 |  |
| Apple | Option 1 |  |
| vivo | None |  |
| Lenovo, Motorola Mobility | Option 1 |  |
| Huawei, HiSilicon | Option 1 | Simple and clear. |
| ASUSTeK | Option 1 |  |
| ZTE | Option 1 or the original names | Either to go with a simple name or go with the name reflecting the compete functions. Both can work since how the mode is used is clear specified in stage 3 thus there will be no confusion. |
| Xiaomi | Option 1  |  |
| Spreadtrum | Option 1 |  |
| LG | Option 1 but | For HARQ mode A/B, we prefer to change the HARQ mode A/B to HARQmode |
| NEC | Option 1 |  |
| MediaTek | None | Keep uplinkHARQ-DRX-LCP-Mode and allowedHARQ-DRX-LCP, and replace StateA/B with RTT-TimerUL-extended and RTT-TimerUL-disabled respectively. |
| Ericsson | Option 1 except for the names of the states. | We suggest to use: uplinkHARQ-Mode, allowedHARQ-Mode to follow RRC naming conventions, and for the two states of uplinkHARQ-Mode we can use modeA and modeB to make them shorter (alternatively “drxModeA” and “drxModeB”). The main purpose of uplinkHARQ-Mode is to affect the DRX timer for a HARQ process. Affecting LCP is a secondary possible effect (if other RRC fields are configured), so LCP shall definitely be dropped from the name. The main purpose of allowedHARQ-DRX-LCP is to affect the LCP for a LCH by limiting the LCH to only certain HARQ DRX modes. As it is part of the logicalChannelConfiguration there is no need to have LCP in the name (and similar filed do not end with LCP, for example allowedPHY-PriorityIndex). Therefore, allowedHARQ-Mode is a good name.  |
| Sequans | Option 1 |  |
| InterDigital | Option 1 |  |

***Rapporteur Summary***

*Out of 19 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***What is your preferred parameter naming?*** |
| *Option 1/Option 1 with comments* | *Option 2* | *None* | *Original names* |
| *16* | *-* | *2* | *2* |

*The following key comments are noted (detailed summary in Section 4):*

* *Option 1:*
	+ *(2) Simple and clear*
	+ *UL HARQ mode has impacts to LCP and DRX, so Option 1 is better suited.*
		- *Original parameter name is good enough to reflect the LCP and DRX impacts*
* *For HARQ mode A/B, prefer to change name to:*
	+ *HARQmode*
	+ *RTT-TimerUL-extended and RTT-TimerUL-disabled*
	+ *modeA/mode B or drxmodeA/drxmodeB*

*Based on large majority support, it seems that in general the revised names under Option 1 are acceptable.*

***Proposal 13: Existing parameter names are updated to: uplinkHARQ-mode, allowedHARQ-mode, and HARQ mode A/B. (16/19)***

**Question 9b: Companies are invited to provide a revised/updated description of any of the above- listed parameters.**

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| vivo | We propose to rename “allowedHARQ-DRX-LCP” , “uplinkHARQ-DRX-LCP-mode” and “HARQ DRX-LCP modes” into “allowedHARQ-Schemes”, “uplinkHARQ-Schemes” and “HARQ-Schemes”, respectively. |
| MediaTek | RTT-TimerUL-extended: drx-HARQ-RTT-TimerDL/UL are extended by UE-gNB RTT.RTT-TimerUL-disabled: drx-HARQ-RTT-TimerDL/UL are disabled. |
| Ericsson | Change the field description of uplinkHARQ-Mode to “Used to set the DRX mode per HARQ process ID, see TS 38.321 [3]. The first/leftmost bit corresponds to HARQ process ID 0, the next bit to HARQ process ID 1 and so on. Bits corresponding to HARQ process IDs that are not configured shall be ignored. A bit set to one identifies a HARQ process with drxMmodeA and a bit set to zero identifies a HARQ process with drxModeB.”. Change the MAC spec description of uplinkHARQ-Mode in the beginning of 5.7 of running MAC CR to “uplinkHARQ-Mode (optional per HARQ process and per Serving Cell): the configuration to set the DRX mode per UL HARQ process per Serving Cell”. Change the allowedHARQ-Mode field description to “If the field is present, UL MAC SDUs from this logical channel can only be mapped to a grant associated with a HARQ process ID not configured with a uplinkHARQ-Mode or to a grant associated with a HARQ process ID configured with uplinkHARQ-Mode indicating a value equal to the value configured by this field. If the field is not present, UL MAC SDUs from this logical channel can be mapped to any grant.” |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

***Rapporteur Summary:***

*Considering only a small subset of companies responded to this question it seems the current descriptions are largely acceptable. It is noted further clarification can be considered in Stage 3 discussion, and can incorporate any relevant agreements made during RAN2#117e.*

### HARQ mode for PUSCH transmission scheduled by RAR

During offline [AT116bis][107], HARQ mode for PUSCH transmission scheduled by RAR was discussed over multiple rounds. Final round outcome resulted in the following proposal, which was acceptable to 9/12 companies:

***Proposal: When HARQ process 0 carries PUSCH transmission scheduled by RAR or PUSCH payload of MsgA, configuration of HARQ mode and allowedHARQ-DRX-LCP is up to NW implementation, and UE always follows it (no specification impact).***

During discussion, the following technical concerns were raised regarding the proposed solution:

**Technical Issue 1)** we need to clarify whether the configuration of “No HARQ state” is per HARQ process or per UE?

* *Rapporteur understanding is that based on agreement in RAN2#116e [6]: “if uplinkHARQ-DRX-LCP-Mode-r17 is configured, a HARQ process may be mapped to either ‘HARQ mode A’ or ‘HARQ mode B’.” either all HARQ processes are configured as “no HARQ state” or as “HARQ mode A/B”. This implies that “no HARQ state” is configured per UE.*

**Technical Issue 2)** if network configure HARQ process #0 with no HARQ state, dynamic scheduling may not be able to use this HARQ process since DRX RTT timer can not be extended by RTT.

* *Rapporteur understanding is that if a UE is not configured with uplinkHARQ-DRX-LCP-Mode-r17 or allowedHARQ-DRX-LCP, the LCH mapping rules do not apply.* *In this case legacy LCP operation applies and there should be no issue. Note: dynamic scheduling may rely on e.g., the UE being in Active time for other reasons if DRX timers prematurely expire.*

**Technical Issue 3):** if network configure HARQ process #0 with HARQ state, it means the LCHs configured with other HARQ state can not use it even if the RACH is triggered by them due to data arrival. It will greatly increase the delay.

* *Rapporteur understanding is that based on RAN2#116bis-e discussion outcome, majority think that this can be handled by NW implementation without specification impact.*

**Question 10a: Companies are invited to comment on the above technical issues or provide additional comments regarding the above proposal.**

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| OPPO | Agree with the proposal, and regarding the above issues we have the same understanding as rapporteur. |
| Samsung | Agree with the proposal. We share the same understanding. |
| Nokia | Agree with Rapporteur for the technical issues analysis. |
| Intel | Agree with Rapporteur |
| Apple | Agree with rapporteur. |
| vivo | For technical issue 1~3, we share the views with Rapporteur. |
| Lenovo, Motorola Mobility  | We agree that “no HARQ state” should be per UE. As outlined in our previous contributions, we think that a PUSCH transmission scheduled by RAR, which is a dynamically scheduled PUSCH transmission, e.g. in the 4-step contention based random access procedure the RAR schedules PUSCH msg3 transmission and for CFRA RAR schedules a “normal” PUSCH transmission, requires some specific handling since the HARQ process is fixed to zero.If NW configures HARQ process #0 with a HARQ state, it may lead to some delay for the transmission of UL data, since LCHs configured with a different HARQ state cannot use the PUSCH resource. It’s not clear to us how the NW could make sure that it configures the “correct” HARQ state in order to avoid the problem of delaying data. There are companies which argue that this could be generally handled by NW implementation, i.e. NW configuring “no HARQ state” for HARQ process = 0 in order to ensure that a PUSCH transmission scheduled by RAR UL grant doesn’t undergo any further LCH restrictions (apart from the LCH restrictions defined for Rel-16). However, such solution will be quite restrictive in terms of NW scheduling flexibility in particular given that UE may not perform a RACH procedure very often. It would basically mean that HARQ process = 0 cannot be used by gNB according to its scheduling strategy.It should be also note that PUSCH transmission scheduled by RAR have some special handling since Rel-15. For example In TS38.213 it is specified that UE always transmits the PUSCH scheduled by a RAR UL grant without repetitions. Even though UE is configured with a pusch-AggregationFactor, which indicates the number of repetitions to be used for a PUSCH transmission scheduled by an UL grant, UE uses no repetition for PUSCH transmission scheduled by RAR UL grant. Basically, UE ignores the field pusch-Aggregation configured by the network for cases when a PUSCH transmission is scheduled by a RAR UL grant. We think similar behaviour should be used for this case here, i.e. specifying that UE applies always “no HARQ state” for PUSCH scheduled by RAR.  |
| Huawei, HiSilicon | For Technical Issue 3, we think it better to make an exception for the LCH if RACH is triggered by this LCH due to data arrival to avoid extra latency. For instance, if there is room for uplink data during RACH, it is better to be left to useful data rather than padding. |
| ZTE | Agree with Rapporteur’s analysis for technical issue 1~2. Regarding to 3rd, we share some sympathy on Lenovo’s comments. For the case UL data arrival when out-of-sync it is not guaranteed that NW can always configure HP#0 with correct states, therefore additional delays can be introduced. This can be mitigated by configuring LCH have higher delay requirement with dedicated SR. But perhaps the simpler method is to make an exception as suggested by Lenovo. |
| Qualcomm | During initial access, there is no any configuration yet. A default behaviour for the HARQ mode should be specified. Then same behavior would apply even after network configuration. |
| Xiaomi | We generally agree that “no HARQ state” is configured per UE. Thus, network may not be able to configure “no HARQ state” to HARQ process #0 and “HARQ state A/B” to other HARQ processes. Then, network can only configure a HARQ state to HARQ process #0 if HARQ state is needed for other HARQs. It means the LCHs configured with other HARQ state can not use HARQ #0 even if the RACH is triggered by them due to data arrival. It will greatly increase the delay. But if companies are ok not to solve this issue, we can live with it. |
| Spreadtrum | Agree with Rapporteur for the technical issues analysis. |
| LG | Agree with rapporteur. |
| MediaTek | Technical issue 1: Agree with the rapporteur. For NTN, all HARQ processes must be mapped to either State A or B. For TN, State A and B are not needed.Technical issue 2: Normally, HARQ process #0 would be configured with State A for NTN. Any LCH mapped to State A would transmit data on this PID. If there are any LCHs mapped to State B, we would not expect that the data from those LCHs would be required to be transmitted on PUSCH scheduled by RAR. So, this can be handled by proper network configuration.Technical issue 3: Same comment as TI#2 above, this can be handled by proper network configuration. |
| Ericsson | TI1 and TI2 we have same understanding as the rapporteur. TI3 This is an issue, and therefore we suggest to specify that the allowedHARQ-Mode does not apply to LCP procedures for Msg3 nor for MsgA. However, this may be a rare case that do not happen during normal operation in a well configured system. We propose that to specify that**Proposal:** **The allowedHARQ-Mode does not apply to Msg3 nor to MsgA LCP procedures.**  |
| Sequans | According to following agreements, it seems to us that "No HARQ state" is per process:- For at least dynamic grants, the network may optionally configure an UL HARQ retransmission state per HARQ process- If HARQ process has not been configured with an UL HARQ retransmission state, new LCH mapping rule has no effect (i.e. UE applies legacy behaviour).- For HARQ process(es) not configured with an UL HARQ retransmission state, drx-HARQ-RTT-TimerUL and drx-RetransmissionTimerUL behave as per legacy.With "No HARQ state" per process, this can be handled by NW implementation. |
| InterDigital | Agree can be handled by NW implementation |

***Rapporteur Summary:***

*Out of 17 responding companies, the following key comments are noted (detailed summary in Section 4):*

***Technical Issue 1)*** *we need to clarify whether the configuration of “No HARQ state” is per HARQ process or per UE?*

* *(12) Configuration of HARQ state is configured per UE*
* *Based on past agreements, “No HARQ state” is per HARQ process.*

***Technical Issue 2)*** *if network configure HARQ process #0 with no HARQ state, dynamic scheduling may not be able to use this HARQ process since DRX RTT timer can not be extended by RTT.*

* *(10) No issue as legacy LCP operation applies*
* *Can be handled by proper NW configuration*

***Technical Issue 3):*** *if network configure HARQ process #0 with HARQ state, it means the LCHs configured with other HARQ state can not use it even if the RACH is triggered by them due to data arrival. It will greatly increase the delay.*

* *(11) This can be handled by NW implementation*
	+ *May still be a rare case in a well configured system*
* *(3) May lead to some delay for transmission of UL data, since LCHs configured with different HARQ state cannot use the PUSCH resource.*
	+ *If there is room for UL datta during RACH, better to use useful data rather than padding*
* *Would restrict NW scheduling flexibility*
* *PUSCH transmission scheduled by RAR has some special handling since Rel-15 (e.g., UE always transmits the PSUCH scheduled by RAR without repetitions).*

*Based on company input, most companies seem to think that technical issues 1 and 2 do not require further discussion. For technical issue 3, although a majority think proper NW implementation can manage delay when in the case when HARQ process 0 carries PUSCH transmission scheduled by RAR or PUSCH payload of MsgA, there are still some companies which disagree. Rapporteur suggests that this be further discussed in a subsequent [AT117e] discussion.*

***Proposal 14: RAN2 to further discuss “HARQ process 0 carries PUSCH transmission scheduled by RAR or PUSCH payload of MsgA, configuration of HARQ mode and allowedHARQ-DRX-LCP is up to NW implementation, and UE always follows it (no specification impact).”***

In the RRC open issues email discussion [Pre117][NTN][101], Open issue 19 describes the following:

***Open issue 19:*** *HARQ type for SRBs or RRC message may need to be clarified to guarantee the reliability.*

*The open issue is about the LCP procedure in MAC, where it is decided to enable configuring either HARQ mode A or Mode B or none (any HARQ mode is fine) for each LCH, and then only allow data from that LCH to be transmitted on a HARQ process configured with that HARQ mode. Then the question is about do we need to enable configuring a HARQ mode also for SRBs. This open issue is moved to [Pre117-e][NTN][103] MAC open issues.*

**Question 10b: Companies are invited to comment on the above issue (e.g., whether configuration of HARQ mode and *allowedHARQ-DRX-LCP* is applied also for SRBs?)**

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| OPPO | We think configuration of HARQ mode and *allowedHARQ-DRX-LCP* can also be applied for SRBs, depending on network implementation. |
| Samsung | SRBs are all using logical channels, then LCP mapping rules should be applied to SRBs. |
| Nokia | The configuration of HARQ mode and *allowedHARQ-DRX-LCP* is applied for SRB 1 to SRB3. |
| Intel | also applied for SRBs |
| Apple | Should apply to SRBs too. |
| vivo | We think there is no need to restrict the HARQ type for SRB, as SRB is anyway configured with AM mode, which can guarantee the reliability. |
| Lenovo, Motorola Mobility | No strong opinion here. But seems simpler to have same behaviour for DRBs and SRBs |
| Huawei, HiSilicon | Yes. Same as other restrictions for LCP. |
| ZTE | The same as legacy, LCHs carrying SRB can be applied with new LCP if configured by NW/ |
| Qualcomm | The Question in other word is “will network disable HARQ feedback for important RRC reconfiguration message”? We prefer the network always enable the HARQ feedback. |
| Xiaomi | Applies also to SRBs |
| Spreadtrum | It is simple to apply for SRB and DRB. |
| LG | Since the configuration is up to network implementation, it should be applied to SRB as well.  |
| MediaTek | Yes, configuration of HARQ mode and allowedHARQ-DRX-LCP apply also for SRBs. Normally we would expect SRBs to be mapped to State A. This can be left to the network configuration. |
| Ericsson | The allowedHARQ-Mode is applied to SRB1, 2 and 3, if configured. The running RRC CR, allowedHARQ-DRX-LCP is in the LogicalChannelConfig which is mandatory to include for DRBs and optional for SRB1, 2 and 3.  |
| Sequans | No need to differentiate DRB/SRB handling. |
| InterDigital | Agree with others there should be consistent behaviour between DRBs and SRBs |

***Rapporteur Summary:***

*Out of 17 responding companies, the following key comments are noted (detailed summary in Section 4):*

* *(many companies) configuration of HARQ mode and allowedHARQ-DRX-LCP also applies to SRBs.*
	+ *(2) Applies to SRBs 1-3*
* *Prefer network always enables HARQ feedback for important RRC reconfiguration message.*

*Based on company comment, there seems to be a general understanding that configuration of HARQ mode and allowedHARQ-DRX-LCP also applies to SRBs.*

***Proposal 15: uplinkHARQ-DRX-LCP-mode and allowedHARQ-DRX-LCP, if configured, also apply for SRB1 to SRB3.***

## Miscellaneous timers

### Details of HARQ RTT Timer extention

In Rel-17 NTN, HARQ RTT timer behaviour is modified based on configuration of *downlinkHARQ-FeedbackDisabled* and *uplinkHARQ-DRX-LCP-Mode*. As an example, how the UE sets *drx-HARQ-RTT-TimerDL* length in NTN is captured in the NTN MAC running CR as follows:

1> if this Serving Cell is part of a non-terrestrial network:

2> if this Serving cell is configured with *downlinkHARQ-FeedbackDisabled* and DL HARQ feedback is enabled for a HARQ process:

3> set *drx-HARQ-RTT-TimerDL* length for the corresponding HARQ process to *drx-HARQ-RTT-TimerDL* included in *DRX-Config* plus UE-gNB RTT.

2> else:

3> set *drx-HARQ-RTT-TimerDL* length for the corresponding HARQ process to *drx-HARQ-RTT-TimerDL* included in *DRX-Config*.

During CR review in [Post116bis-e][109], two comments have been raised regarding current CR implementation of setting HARQ RTT timer behaviour:

**Comment 1)** The use of additional helper variables to set timer length

One company comments that when the drx HARQ RTT timers are extended for some HARQ processes and not extended for some HARQ process (in UL respectively DL), the description in MAC spec section 5.7 becomes messy as it in legacy always refer to the RRC parameters (*drx-HARQ-RTT-TimerDL/UL*) while the timer values will depend on the HARQ process ID.

They note to avoid ambiguity of what the UE shall do with received RRC parameters it is proposed to introduce two helper variables *HARQ\_RTT\_TIMER\_DL* and *HARQ\_RTT\_TIMER\_UL* to replace *drx-HARQ-RTT-TimerDL/UL* in all procedural text (companies are encouraged to refer to R2-2201629 for further discussion and an example text proposal).

**Question 11: What is your preferred method of implementing HARQ RTT timer extension?**

* **Option 1: Current implementation is sufficient**
* **Option 2: Introduce new helper variables *HARQ\_RTT\_TIMER\_DL* and *HARQ\_RTT\_TIMER\_UL* to replace existing instances of *drx-HARQ-RTT-TimerUL/DL.***

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option?** | **Additional comments**  |
| CATT | Option 1 |  |
| OPPO | Option 1 |  |
| Samsung | Option 1 |  |
| Nokia | Option 1 or Option2 | We are open to capture the UE-gNB RTT delay in a clear way. |
| Intel | option 1 |  |
| Apple | Option 2 | Seem cleaner to go this way, but no strong view. |
| vivo | No strong view | We slightly prefer the option 2, which has cleaner spec descriptions. But fine to follow the majority’s preference. |
| Lenovo, Motorola Mobility | Option 1 |  |
| Huawei, HiSilicon | Option 1 |  |
| ASUSTeK | Option 1 |  |
| ZTE | No strong view | Both can work. |
| Qualcomm | Option 1 |  |
| Xiaomi | Option 1 |  |
| Spreadtrum | Option 1 |  |
| LG | Option 1 but | No strong view. |
| NEC | Option 1 |  |
| MediaTek | Option 1 | In any case, we do not foresee a case where some HARQ processes are extended by UE-gNB RTT and others are not extended, in the same network (NTN or TN). |
| Ericsson | Option 2 | Without the helper variables, it is ambiguous if the UE is changing the received RRC fields or not. We suggest asking the spec rapporteur.  |
| InterDigital | Option 1 but | No strong opinion |

***Rapporteur Summary:***

*Out of 19 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***What is your preferred method of implementing HARQ RTT timer extension?*** |
| *Option 1* | *Option 2* |
| *15* | *3* |

*An additional* ***2*** *companies have no strong view.*

*The following key comments are noted (detailed summary in Section 4):*

* *Option 2:*
	+ *(2) Cleaner spec description*
* *(4) Both can work/No strong view*
* *Open to additional clarification*
* *Do not foresee a case where some HARQ processes are extended by UE-gNB RTT and others are not extended.*
* *Without helper variables, it is ambiguous if the UE is changing the received RRC fields.*

*Rapporteur has some sympathy for the issue raised and agrees that the specification should not be interpreted as changing a configured RRC field. To properly evaluate the alternatives, the following potential implementations are provided:*

*Per Option 1, to ensure that specification is not interpreted as changing a configured RRC field, additional clarification can be added. For example:*

1> if this Serving Cell is part of a non-terrestrial network:

2> if this Serving cell is configured with *downlinkHARQ-FeedbackDisabled* and DL HARQ feedback is enabled for a HARQ process:

3> set duration of MAC DRX timer *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process to RRC configured value *drx-HARQ-RTT-TimerDL* included in *DRX-Config* plus UE-gNB RTT.

2> else:

3> set duration of MAC DRX timer *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process to RRC configured value *drx-HARQ-RTT-TimerDL* included in *DRX-Config*.

…

*Per Option 2, the following exemplary change can be made.*

The following UE variables are used for the DRX operation:

- *HARQ\_RTT\_TIMER\_DL* (per downlink HARQ process, except for the broadcast process).

- *HARQ\_RTT\_TIMER\_UL* (per uplink HARQ process).

When DRX is configured, the MAC entity shall:

1> if this Serving cell is configured with *downlinkHARQ-FeedbackDisabled* and DL HARQ feedback is enabled for a HARQ process:

2> set *HARQ\_RTT\_TIMER\_DL* for the corresponding HARQ process to *drx-HARQ-RTT-TimerDL* plus UE-gNB RTT.

1. else:

2> set *HARQ\_RTT\_TIMER\_DL* for the corresponding HARQ process to *drx-HARQ-RTT-TimerDL*.

…

*From specification perspective, Rapporteur thinks that Option 2 is cleaner and unambiguous. However, It is noted that this would have a minor impact to existing specification by requiring UE to use new variables HARQ\_RTT\_TIMER\_UL and HARQ\_RTT\_TIMER\_DL. It is suggested that both Options be presented with full exemplary text proposals and further evaluated in a subsequent [AT117e] email discussion.*

***Proposal 16: RAN2 to further discuss implementation HARQ RTT timer extension.***

**Comment 2)** The location of specification text setting the timer length

Considering agreement that uplinkHARQ-DRX-LCP-Mode also applies to CG, a unified procedure to modify RTT timer length was introduced in latest MAC running CR to simplify specification. one company comments that DRX RTT timer length cannot be set with UE-gNB RTT at the start of DRX section. This is because UE will set the DRX RTT with the current UE-gNB RTT instead of the UE-gNB RTT when DRX RTT is actually started. Thus, UE can only set the DRX RTT timer right before DRX RTT is started/restarted.

**Question 12: What is your preferred location for HARQ RTT timer extension text?**

* **Option 1: Current implementation is sufficient**
* **Option 2: Repeated at each instance prior to start of *drx-HARQ-RTT-TimerUL/DL.***

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option?** | **Additional comments**  |
| CATT | Option 1 |  |
| OPPO | Option 1 |  |
| Nokia | Option 1 with comments | Agree to further clarify that the UE-gNB RTT should be the one right before DRX RTT timer started/restarted. |
| Intel | option 1 |  |
| Apple | Option 1 |  |
| vivo | Option 2 |  |
| Lenovo, Motorola Mobility | Option 1 |  |
| Huawei, HiSilicon | Option 1 | We think the current description is sufficient which means to add latest UE-gNB RTT when DRX RTT timer is started/restarted. Of course, if companies have concerns, the wording can be improved a little bit.  |
| ASUSTeK | Option 1 |  |
| ZTE | Option1 | Same view as Huawei |
| Qualcomm | Option 1 | Ok to add clarification when timer is started, latest UE-gNB RTT is used in the length. |
| Xiaomi | Option 1 with note | The following note can be added to clarify: Note: the set of the *drx-HARQ-RTT-TimerDL*/ *drx-HARQ-RTT-TimerUL* should be right before the start/restart of the timer. |
| Spreadtrum | Option 1 | Agree with Huawei. |
| LG | Option 1 |  |
| NEC | Option 1 |  |
| MediaTek | Option 1 | We could add a NOTE for clarification, but we do not think this is crucial. |
| Ericsson | Option 1 with comment | As this added text in the beginning of the procedure is not stated to be done “for each slot”/”for each DL assignment” or similar, it could be anytime or all the time. Therefore we think it can be left for UE implementation. We agree to clarify that the UE-gNB RTT value used must be updated right before using it in a timer.  |
| InterDigital | Option 1 | Okay to also further clarify as suggested by Nokia. |

***Rapporteur Summary:***

*Out of 18 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***What is your preferred location for HARQ RTT timer extension text?*** |
| *Option 1/Option 1 with comments* | *Option 2* |
| *17* | *1* |

*The following key comments are noted (detailed summary in Section 4):*

* *(9) Open to further clarification (e.g., via a note).*

*There is near consensus that in general, current implementation is sufficient. However many companies are okay to further clarify that when timer is started, latest UE-gNB RTT is used in the length. Rapporteur agrees this is intended behaviour, and suggests that this is addressed via a clarifying Note added to text section where timer length is set. Exact wording to be confirmed in Stage 3.*

***Proposal 17: A NOTE is added to MAC CR clarifying that prior to starting drx-HARQ-RTT-TimerUL/DL, latest UE-gNB RTT is used to set timer length.***

### Extension of the *configuredGrantTimer*.

During offline [AT116bis][107], extension of the *configuredGrantTimer* was discussed over multiple rounds. Final round outcome resulted in several observations, which led to the following proposal:

***Proposal: configuredGrantTimer length is extended by UE-gNB RTT in NTN.***

During subsequent discussion, several technical issues were raised regarding the proposed solution:

**Technical Issue 1):** Mismatch between UE and gNB

Mismatch between UE and gNB making the UE not transmit when the gNB expects the UE to (UE misses a CG opportunity) or making the gNB not decoding a CG when the UE transmits (This is maybe not a severe issue as it shall not happen frequently).

* *Rapporteur notes that based on past discussion outcome companies recognize this as an issue, however a large majority (8/11) think this may be handled by existing mechanisms with no further specification impact.*

**Technical Issue 2):** gNB resource planning

gNB cannot plan the future resource usage as gNB cannot know how the UE-gNB RTT will vary in advance. In legacy periodicity times configuredGrantTimer gives the time that the timer will be running. A change to base the running of this timer on the UE-gNB RTT means the gNB do not know in advance when in time a CG will be reused by one UE. It also means that the running time of this timer for different UEs will vary differently depending on where in a cell they are located. The gNB may handle thousands of UEs, and not knowing how a CG-config will be used by the UEs is a new limitation for the gNB that it would need to handle the overhead from. This decreases the possibility for the gNB to use CG for as many users as possible.

**Technical Issue 3)** Overhead

Using a new field configuredGrantTimer-r17 of 8 bits will not lead to any overhead, as configuredGrantTimer is an optional parameter.

* *Rapporteur agrees a new IE of 8 bits does not increase overhead. However, based on past discussion a majority (7/11) do no not think that values in Option 2 can be selected to balance overhead and approximately compensate UE-gNB RTT. Comments should therefore focus on whether companies think 8 bits is sufficient to approximately compensate UE-gNB RTT.*

**Question 13: Companies are invited to comment on the above technical issues or provide additional comments regarding the above proposal.**

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| OPPO | Argee with the proposal.For issue 1, extension by UE-gNB RTT applies to various timers in NTN, and the mismatch issue between UE and gNB has not been identified for the other timers such as drx-HARQ-RTT-TimerUL/DL. For configuredGrantTimer the situation is the same, and there is no reason to consider it problematic.Issue 2 is related to issue 1, with TA reporting, network could know UE-gNB RTT and plan the cell radio resourece properly. |
| Samsung | We don’t agree with the proposal and we think issue 1 and 2 are valid issues when extending by UE-gNB RTT. Different from other timers extended by UE-gNB RTT, e.g. drx-HARQ-RTT-TimerUL/DL, for which the network does not need to know how much the timer is extended nor the status of the timer, for *configuredGrantTimer* the network need to fix the timer length and know the timer status to schedule transmission as the purpose of the configured grant is to allocate resources in a semi-static manner. However, the dynamic UE-gNB RTT contradicts the purpose of configured grant. We think *configuredGrantTimer* should be extended by fixed values that accommendate UE-gNB RTT as much as possible. |
| Nokia | For Issue 1), we think the issue is not a rare case. It can happen frequently in LEO when the satellite is moving which will cause a time-varied UE-gNB RTT. It will cause the CG timer mismatch between UE and gNB. For example, if the configuredGrantTimer is extended by the UE-gNB RTT right before the CG transmission time, while the UE-gNB RTT is increasing due to the UE-gNB distance increased with satellite moving, the NW scheduled retransmission may arrive in UE later than the CGT timer expiry. UE may recover the new CG transmission in CG occasion after the timer expiry while it received a retransmission for the same HARQ process later. It will cause the CG new transmission missed by gNB in the end. Furthermore, it is not possible for NW to avoid the issue via predicting the UE-gNB RTT change since NW may not have UE’s location at all.For Issue 2), agree the Rapporteur analysis. Any mismatch between UE and gNB will cause gNB hard to schedule the UE since gNB can only guess what will happen in UE.For Issue 3), we are not sure whether the NW configured value (via new field configuredGrantTimer-r17) can work well. The time-varied UE-gNB RTT may impact the NW scheduling as well because NW only start the time when it received the CG transmission from the UE, but NW cannot predict how the UE-gNB RTT will change when the UE received the dynamic retransmission. It seems the same mismatch problem in issue 1) can happen in NW configured CGT value solution too. |
| Apple | Prefer extending CGT explicitly by providing new llarger values. |
| vivo | We don’t think the mismatch between UE and gNB (if any) is really a big issue in this case, which can be handled by NW implementation. |
| Lenovo, Motorola Mobility | We see no essential problem for Issues 1) and think NW implementation can handle if any. |
| Huawei, HiSilicon | Agree with the proposal. |
| ZTE | Share the same view as Samsung and Nokia that issue1/2 are valid if autonomous delay by UE-gNB RTT is used. And we prefer to extend CGT with larger values and have it configured by NW. |
| Qualcomm | The issue should be handled by network by proper configuration, if needed assuming worst case RTT or using TA report. But we are ok just to extend the configurable value range larger than 64. |
| Xiaomi | Issue 1 and Issue 2 are actually the same issue. Compared with a static new CG timer, extending CG timer by UE-gNB RTT actually has less impact on gNB scheduling. Let us consider the two cases:Case 1: If network considers a CG resource recurring before the CG timer expiry but UE doesn’t, network may schedule the CG resource for DG while UE may use this CG for new transmission;* for case 1, if network think there may be state mismatch, network can simply not schedule the CG resource for other purpose; Compared with static new configuration, this resource waste is less severe. Because network can only configure CG timer to cover the worst RTT case, leading to more CG resources falling in the CG timer unable to use for new transmission.

Case 2: If network considers a CG recurring after the CG timer expiry but UE doesn’t, network may wait for new UL transmission on the CG resource while UE will not send new UL transmission on the CG resource. * For case 2, if network doesn’t receive new transmission on CG resource, network considers it as UL skipping. There is no impact on network resource scheduling.

Thus, we think extending CG timer is more advantageous than static configuration. |
| Spreadtrum | The mismatch between UE and gNB does not happen frequently, and could be avoided by gNB implementation. |
| LG | We prefer to introduce a new value for CGT using RRC signalling like sr-ProhibitTImer.  |
| NEC | We agree with the conclusion of [AT116bis][107] email discussion. |
| MediaTek | Technical issue 1/2: The TA reporting mechanism and the legacy TA command procedure should ensure that the UE and the network are aligned with respect to UE UL timing. We have agreements to extend other timers by UE-gNB RTT such as drx-HARQ-RTT-TimerDL/UL, where no issues have been raised. So, this should not be an issue for configuredGrantTimer either.Technical issue 3: We agree that it will be difficult for the network to optimally select a fixed extension to configuredGrantTimer that will properly compensate UE-gNB RTT. The extended value range can become quite arbitrary as well (which values to select for the configuredGrantTimer-r17 extension?).Therefore, we support the proposal (configuredGrantTimer length is extended by UE-gNB RTT in NTN). |
| Ericsson | We disagree with the proposal.CGT shall be extended with higher values. The CGT setting is related to the periodicity. We see two main configurations, 1 periodicity is very short (compared to the UE-gNB RTT)Then periodicity\*CGT that is a little longer than the maximum UE-gNB RTT will mean maximum a few CG opportunities are not used if the actual UE-gNB RTT is shorter than the maximum UE-gNB RTT and the gNB do not need the UE to send a retransmission (the previous). 2 periodicity is close to the UE-gNB RTT, using a CGT=1 (if periodicity<UE-RTT which is the preferred periodicity configuration) or not configuring CGT (if periodicity>UE-gNB RTT) will give gNB the opportunity to send CG retx grants (if a CG tx was not correctly decoded). In legacy periodicity\*CGT is not used to exactly cover one HARQ RTT, it usually covers one HARQ RTT plus some slots giving the gNB some flexibility of sending a retransmission grant. Thus, it is not necessary to let the periodicity\*CGT cover exactly one HARQ RTT plus a little in NTNs, it is sufficient to use a CGT value that do not vary with the UE-gNB RTT and instead have periodicity\*CGT cover a little longer than the maximum UE-gNB RTT duing the connection to a cell. TI1 is rare. TI2 will be a major issue for the gNB as the CGT varies in a different way for each UE. TI3: There is no overhead issue with using a fixed extended CGT with a new field of 8 bits.  |
| Sequans | We have same understanding as Samsung. It should be extended explicitly with fixed values instead. |
| InterDigital | Agree with Samsung, and think the CGT should be extended with higher values, not UE-gNB RTT. |

***Rapporteur Summary:***

*Out of 17 responding companies, the following key comments are noted (detailed summary in Section 4):*

***Technical Issue 1):*** *Mismatch between UE and gNB*

* *(8) Should instead be extended by higher fixed values*
	+ *Like sr-ProhibitTimer*
* *Extension by UE-gNB RTT applies to various timers and mismatch has not been identified as an issue in other cases.*
	+ *(4) For CGT, NW needs to fix the timer length and know timer status to schedule transmission as the purpose of CG is to allocate resources in a semi-static manner.*
* *(3) Can be handled by NW implementation/configuration*
* *Can happen frequently in LEO*
	+ *This is a rare case*
* *It is not possible for NW to avoid the issue via predicting the UE-gNB RTT change since NW may not have UE’s location at all.*

***Technical Issue 2):*** *gNB resource planning*

* *(2) Can be mitigated via TA reporting*
* *Issue 1 and 2 are the same issue, and extending CG timer by UE-gNB RTT has less impact on gNB scheduling:*
	+ *If network considers a CG resource recurring before the CG timer expiry but UE doesn’t, network may schedule the CG resource for DG while UE may use this CG for new transmission.*
		- *network can simply not schedule the CG resource for other purpose.*
	+ *If network considers a CG recurring after the CG timer expiry but UE doesn’t, network may wait for new UL transmission on the CG resource while UE will not send new UL transmission on the CG resource*
		- *network considers it as UL skipping.*
* *Will be a major issue for gNB as CGT varies in a different way for each UE.*

***Technical Issue 3)*** *Overhead*

* *Mismatch problem in issue 1 can also occur for NW configured CGT value as well.*
* *Will be difficult for NW to optimally select a fixed extension to configuredGrantTimer.*
	+ *In legacy periodicity\*CGT is not used to exactly cover one HARQ RTT, it usually covers one HARQ RTT plus some slots giving the gNB some flexibility of sending a retransmission grant. Thus, it is not necessary to let the periodicity\*CGT cover exactly one HARQ RTT plus a little in NTNs*
* *No overhead using a fixed extended CGT with new field of 8 bits.*

*There still seems significant divergence on whether the CGT should be extended by UE-gNB vs. fixed higher values. Rapporteur suggests that this issue be further addressed in subsequent [AT117e] email discussion.*

***Proposal 18: RAN2 to further discuss method of configuredGrantTimer extension.***

## Other Issues

### Identification of non-terrestrial network cells

To identify when UE is to perform NTN-specific actions (e.g., timer extensions to accommodate addition RTT) text such as the following is used in the current version of the running NTN MAC CR [2]:

1> if this Serving Cell is part of a non-terrestrial network:

2> if this Serving cell is configured with *downlinkHARQ-FeedbackDisabled* and DL HARQ feedback is enabled for a HARQ process:

3> set *drx-HARQ-RTT-TimerDL* length for the corresponding HARQ process to *drx-HARQ-RTT-TimerDL* included in *DRX-Config* plus UE-gNB RTT.

….

This has led to the following Editor’s Note:

Editor’s note: How UE detects cell originates from a non-terrestrial network to be confirmed by RAN2.

In RAN2#116bis-e, the following was agreed [7]:

1.*UE can know the NW type implicitly no later than SIB1 reception, there is no explicit NW type indication in SIB1.*

RAN2 therefore needs to conclude whether existing text referring to non-terrestrial networks in MAC running CR is sufficient, or if additional clarification is needed how the UE implicitly detects NTN NW type.

**Question 14: Does MAC specification require further clarification on how UE detects a cell originates from a non-terrestrial network? If ‘Yes’, please describe how.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Additional comments**  |
| CATT | No with comment | We agree with the current text, but it is better if the MAC can quote other specification (e.g. RRC) which will specify the related mechanism of NTN type determination.  |
| OPPO | Maybe Yes |  |
| Samsung | No but | We don’t need specify “1> if this Serving Cell is part of a non-terrestrial network”. The description starting with “2> if this Serving…” is sufficient to work. |
| Nokia | No |  |
| Intel | No | if this clarification is needed, we can add reference to RRC spec |
| Apple | No | Current text is sufficient. |
| vivo | No |  |
| Lenovo, Motorola Mobility | No |  |
| Huawei, HiSilicon | No | Agree with Samsung. |
| ASUSTeK | No |  |
| ZTE | No |  |
| Xiaomi | No |  |
| Spreadtrum | No |  |
| LG | No |  |
| Thales | No | Nwk type can be detected with the broadcasting of NTN specific SIB |
| NEC | No |  |
| MediaTek | No | This should be known by the UE by the existence of the NTN specific SI. This does not need to be captured in the MAC specification. |
| Ericsson | No | It is fine to use “Serving Cell is part of a non-terrestrial network”. One option for further clarification is to add a sentence in the definition in 3.1 of “Non-terrestrial network” with a reference to a reference to the presence of the new SIB in the RRC spec. |
| Sequans | No but | Same view as Samsung. |
| InterDigital | No |  |

***Rapporteur Summary:***

*Out of 20 responding companies, the following table presents a summary of responses to the above question:*

|  |
| --- |
| ***Does MAC specification require further clarification on how UE detects a cell originates from a non-terrestrial network?*** |
| *Yes* | *No/no with comment* |
| *19* | *1* |

*The following key comments are noted (detailed summary in Section 4):*

* *(3) Better specified in RRC/reference RRC*
	+ *(3) Can be detected via NTN-specific SIB*
* *(3) Don’t need to specify that serving cell is part of a non-terrestrial network*

*Based on near consensus, there does not seem a need to further clarify how a UE detects a cell originates from a non-terrestrial network in MAC specification.*

***Proposal 19: MAC does not specify how UE detects a cell originates from a non-terrestrial network. (19/20)***

# Conclusions

Based on company input, the following is proposed:

## Likely Agreeable

**Proposal 1: During RA procedure for RRC re-establishment procedure, the UE should trigger TA report if an indication is broadcasted by the target cell’s SI. (consensus in IoT NTN discussion)**

**Proposal 2: During RA procedure for handover, the UE should trigger TA report if the target cell indicates this in the handover command. (consensus in IoT NTN discussion)**

**Proposal 3: Other than re-establishment and handover procedure, TA reporting in connected mode is not controlled by enabling/disabling indication in SI. (16/17 in IoT NTN discussion)**

**Proposal 7: RAN2 understanding: UE failing to acquire sufficiently accurate UE location to be used in the calculation of the full TA should not perform any UL transmission until UE location is within accuracy limits. No RAN2 specification impact. (consensus)**

**Proposal 8: RAN2 confirms UE-specific TA MAC CE consists of only one field with length 16 bits, which contains the UE estimate of full UE-specific TA. (19/21)**

**Proposal 9: RAN2 confirms Differential UE-Specific K\_Offset MAC CE consists of only one field with length 8 bits, which contains the Differential UE-Specific K\_Offset. (consensus)**

**Proposal 11: RAN2 confirms *ra-ResponseWindow* and *msgB-ReponseWindow* are not extended in NTN. (consensus)**

**Proposal 12: UE stops ra-ContentionResolutionTimer upon receiving PDCCH indicating Msg3 retransmission and then starts ra-ContentionResolutionTimer after the end of the Msg3 retransmission plus UE-gNB RTT. Impact to coverage and possible enhancements (e.g. to support MSG3 blind retransmission) can be considered in the Rel-18 NTN coverage enhancement SI. (16/20)**

**Proposal 13: Existing parameter names are updated to: *uplinkHARQ-mode, allowedHARQ-mode,* and *HARQ mode A/B.* (16/19)**

**Proposal 15: *uplinkHARQ-DRX-LCP-mode* and *allowedHARQ-DRX-LCP*, if configured, also apply for SRB1 to SRB3.**

**Proposal 17: A NOTE is added to MAC CR clarifying that prior to starting *drx-HARQ-RTT-TimerUL/DL*, latest UE-gNB RTT is used to set timer length.**

**Proposal 19: MAC does not specify how UE detects a cell originates from a non-terrestrial network. (19/20)**

## For further discussion

**Proposal 4: RAN2 to further discuss if SR can be triggered when a TA report is triggered and no UL-SCH resources are available, or if RACH can be triggered if SR is triggered but there are no available PUCCH resources.**

**Proposal 10: RAN2 to further discuss naming of UE-specific TA MAC CE and Differential UE-Specific K\_Offset MAC CE to ensure alignment with RAN1 specification.**

**Proposal 14: RAN2 to further discuss “*HARQ process 0 carries PUSCH transmission scheduled by RAR or PUSCH payload of MsgA, configuration of HARQ mode and allowedHARQ-DRX-LCP is up to NW implementation, and UE always follows it (no specification impact).”***

**Proposal 16: RAN2 to further discuss implementation HARQ RTT timer extension.**

**Proposal 18: RAN2 to further discuss method of *configuredGrantTimer* extension.**

## Postponed

**Proposal 5: “*Whether both UE location and/or UE specific TA information are needed in parallel for the purposes of TA reporting*” is postponed.**

**Proposal 6: “*Reuse the TA-based trigger event if reporting UE location information for TA reporting purpose in connected mode can be agreed.*” is postponed.**

# References

1. R2-2201755 – Summary of [AT116bis][101][NTN] RACH aspects (OPPO)
2. R2-2201899 – [DRAFT] 38.321 running NTN CR (InterDigital)
3. R2-2201739 – Summary of [AT116bis-e][107][NTN] Other MAC issues (InterDigital)
4. R2-2201849 – Summary of [AT116bis-e][107][NTN] Other MAC issues Phase 2 (InterDigital)
5. R2-2201900 – Summary of [Post116bis-e][109][NTN] MAC running CR and list of open issues (InterDigital)
6. R2-2201970 – Report of 3GPP TSG RAN WG2 meeting #116-e (ETSI MCC)
7. Draft\_R2-116bise\_Meeting\_Report\_v1 (ETSI MCC)

# Appendix: Remaining open issues

The following are identified open issues from R2-2201900 which have not been covered under the scope of this discussion.

## To be addressed by CR editor

**Open Issue 4:** Event triggering for UE-specific TA reporting

RAN2 to finalize details regarding event-triggered TA reporting for UE in RRC Connected in RRC specification, with update to MAC as needed (e.g. parameter name of offset threshold). NOTE: This is not to define new behaviour, but to update MAC specification based on RRC.

**Open Issue 5:** Details of UE-specific K\_Offset and TA reporting MAC CEs

Additional details of K\_Offset MAC CE can be updated as needed.

**Open Issue 12:** Details of SR-Prohibit Timer extension – MAC impact.

RAN2 to confirm values included in new *sr-ProhibitTimerExt-r17* IE in RRC discussion. MAC CR can be updated if any impact identified.

## To be addressed by contribution to RAN2#117e

**Open Issue 14:** drx-HARQ-RTT-TimerDL/UL behaviour for HARQ feedback enabled and UL HARQ state A

RAN2 to discuss UE DRX behaviour when PDCCH indicates a UL/DL transmission doesn’t consider the case where drx-HARQ-RTT-TimerUL/DL for the corresponding HARQ process has already been running. (Companies are referred to [R2-2201739](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Inbox/R2-2201739.zip), Section 5.2 for additional details).

**Open Issue 15:** Repetition transmission based HARQ retransmission

RAN2 to discuss whether repetition transmission based HARQ retransmission is always allowed and is explicitly indicated via DCI or semi-statically with RRC signalling (as in legacy). (Companies are referred to [R2-2201739](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Inbox/R2-2201739.zip), Section 5.2 for additional details).

**Open Issue 16:** details of DRX behaviour after sending SR and msg3 for CFRA

RAN2 to discuss whether:

* for DRX in NTN, in the case that a UE sends an SR, the UE enters Active time to monitor for a response after an offset time has elapsed.
* In the case that a UE sends msg3 as response to a RAR message during CFRA, the UE enters Active time when an offset time has elapsed.

(Companies are referred to [R2-2201739](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Inbox/R2-2201739.zip), Section 5.2 for additional details).

**Open Issue 17:** UL synchronization failure

RAN2 to discuss how to handle UL synchronization failure due to the validity timer expiry (discussed in R2-2201755 but no conclusion)

**Open Issue 18:** DL MAC CE execution delay

RAN2 to discuss if we need to capture the DL MAC CE execution delay by K\_MAC agreed by RAN1.

**Open Issue 19:** UE location information for pruposes of TA reporting

RAN2 to confirm support of UE location information for purposes of TA reporting.