3GPP TSG-RAN WG2 Meeting #125bis R2-240xxxx

Changsha, China, 15 – 19 April 2024

**Agenda item: 7.6.2**

**Source: Nokia, Nokia Shanghai Bell**

**Title: [AT125bis][303][IoT NTN Enh] Open issues on GNSS enhancements (Nokia)**

**WID/SID: IoT\_NTN\_enh - Release 18**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report of the following email discussion:

* [AT125bis][303][IoT NTN Enh] Open issues on GNSS enhancements (Nokia)

      Scope: Discuss the proposals in [R2-2403480](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2403480%20Further%20discussion%20on%20stage-2%20open%20issues%20for%20IoT%20NTN.docx) (and possible counter-proposals from other companies on the same issues)

      Intended outcome: Report of the offline discussion

      Deadline for rapporteur's summary (in R2-2403764):  Wednesday 2024-04-17 22:00

# 2 Contact Points

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

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| --- | --- | --- |
| Company | Name | Email Address |
| Nokia, Nokia Shanghai Bell | Ping Yuan | Ping.1.Yuan@nokia-sbell.com |
| Ericsson | Robert | robert . s . karlsson AT ericsson . com |
| Google | Ming-Hung Tao | mhtao@google.com |
| ZTE | Lu Ting | lu.ting@zte.com.cn |
| Xiaomi | Xiaowei jiang | jiangxiaowei@xiaomi.com |
| Samsung | Jonas Sedin | j.sedin@samsung.com |
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# 3 Discussion

## 3.1 UE behaviour when network-triggered GNSS measurement fails

Based on the online discussions and companies’ views indicated in RAN2-125 post-meeting email discussion [R2-2401584], there may be different reasons for the network to trigger the GNSS measurement including:

1. Network has observed the UE’s uplink synchronization is lost.
2. Network wants more than one chance to trigger the GNSS measurement and therefore sends the first trigger long before the current validity duration expiry.
3. Network is planning a long repetition period during which the current GNSS validity duration will expire, hence trigger the GNSS measurement long before the current validity duration expiry.

If the UE failed to acquire the GNSS during the measurement gap, companies have different views on UE behaviour. Below is a collection of proposals from companies at RAN2 #125bis.

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| Company | Proposal |
| R2-2403480 [1] | Proposal 1: The GNSS Measurement Command MAC Control Element can indicate whether the UE shall move to RRC Idle or can stay RRC Connected if the GNSS measurement fails during the triggered GNSS measurement gap.Proposal 1a: For GNSS measurement triggered by the network, the UE shall move directly to RRC idle mode after the end of the GNSS measurement gap if the UE failed to re-acquire the GNSS position, independently of the GNSS position status. |
| R2-2402773 [2] | Proposal 2a: For the network triggered GNSS measurement, upon the measurement failure, the UE doesn’t enter RRC\_IDLE in case the GNSS position is valid or the uplink transmission extension is active. (No spec change)Proposal 2b: RAN2 to confirm once GNSS measurement fails, regardless of which kind of GNSS measurement it is, UE will go to RRC IDLE if the GNSS position is outdated and uplink transmission extension is not active. (No spec change) |
| R2-2402186 [3] | Proposal 2 The UE does not move to idle mode upon a failed GNSS acquisition triggered by the network, if GNSS validity duration does not expire. |
| R2-2402705 [4] | Proposal 3 UE stays in connected mode if the GNSS position is still valid after UE fails to acquire GNSS position triggered by eNB. |
| R2-2403081 [5] | Proposal 1 If UE fails to conduct the GNSS position fix in an aperiodic GNSS measurement gap, the UE can still remain in RRC\_CONNECTED until [X + GNSS validity duration] expires. This is what has been specified in 36.331 and hence no spec change is needed. |

From Rapporteur’s point of view, the above proposals on the UE behaviour can be summarized as below options:

* **Option1: For GNSS measurement triggered by the network, the UE shall move directly to RRC idle mode after the end of the GNSS measurement gap if the UE failed to re-acquire the GNSS position, independently of the GNSS position status.**

The main consideration is the Case A above, the UE shall move to RRC Idle if the UE does not manage to reacquire the GNSS position within the allocated GNSS measurement gap. Otherwise, the UE will cause interference to other UEs during later transmissions because the UE’s uplink synchronization is insufficient despite the remaining GNSS validity duration is non-zero.

* **Option2: if UE fails to conduct the GNSS position fix in an aperiodic GNSS measurement gap, the UE can still remain in RRC\_CONNECTED until [X + GNSS validity duration] expires.**

The main consideration is the Case B and C above, the UE could be allowed to stay in RRC Connected and await another network trigger before the expiry of current GNSS validity duration or even perform the autonomous GNSS measurement at expiry of the current GNSS validity duration.

* **Option3: The network indicates whether the UE shall move to RRC Idle or can stay RRC Connected if the GNSS measurement fails during the network-triggered GNSS measurement gap.**

The main consideration is to differentiate the causes why NW trigger the GNSS measurement. NW can indicate whether the UE shall move to RRC Idle (for CaseA) or can stay RRC Connected (for Case B and Case C) in the GNSS Measurement Command MAC CE.

After checking the RAN1 discussion in R1-2308236, it seems both option1, option2 and option3 have been discussed. Finally, in RAN1-114 meeting, RAN1 has agreed to go Option1 (i.e., Alt-1 in RAN1 agreement) for simplicity.

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| ***Second Round Proposal 5-3a:*****From RAN1 perspective, *for the aperiodic GNSS measurement gap triggered by eNB with MAC CE, down select one of the alternatives for the failure of GNSS measurement:**** **Alt-1: UE goes to IDLE mode after the end of GNSS measurement gap if UE failed to re-acquire GNSS position fix within GNSS measurement gap.**
* **Alt-2: If UE failed to re-acquire GNSS position fix within the GNSS measurement gap:**
* **if the end of GNSS measurement gap is after *current GNSS validity duration expires*, UE goes to IDLE mode after the end of GNSS measurement gap.**
* **if the end of GNSS measurement gap is before *current GNSS validity duration expires*, UE can stay in RRC\_CONNECTED state.**
	+ **FFS: UE behaviour in RRC\_CONNECTED state.**
		- **Alt-A: UE can be allowed to transmit and receive**
		- **Alt-B: UE can only be allowed to receive**
		- **Alt-C: whether UE is allowed to remain connected based on network configuration**
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| RAN1-114 Agreement​:From RAN1 perspective, for the aperiodic GNSS measurement gap triggered by eNB with MAC CE, down select one of the alternatives for the failure of GNSS measurement:​* Alt-1: UE goes to IDLE mode after the end of GNSS measurement gap if UE failed to re-acquire GNSS position fix within GNSS measurement gap.
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**Question 1: Do companies agree Option1 listed below is aligned with RAN1 agreement ?**

* **Option1: For GNSS measurement triggered by the network, the UE shall move directly to RRC idle mode after the end of the GNSS measurement gap if the UE failed to re-acquire the GNSS position, independently of the GNSS position status.**

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| Answers to Question 1 |
| Company | Yes/No | Comments |
| Ericsson | Yes |  |
| Google |  | As far as we know RAN1 did consider to consult RAN2 when they were about to make the final decision between alt-1 and alt-2. We think this is a RAN2 issue and only RAN2 specs are impacted, hence the decision shall be made in RAN2. Option 2 has been implemented in 36.331/36.300 since v18.0.0 and RAN1 did not raise a concern so far, which means everything is fine and we do not need to look back what RAN1 has agreed. [Nokia:] We don’t think this is only a RAN2 issue. RAN1 identified the FFS to support UE in RRC Connected (after a failed NW-triggered GNSS measurement) which definitely has RAN1 impact. RAN1 stop discussing the issues because they select a simple solution to let UE go idle hence the issues can be avoided.In our view, we think RAN2 should follow RAN1 conclusion instead of re-open the discussion to repeat the discussion on all the open issues. |
| ZTE | Yes |  |
| Xiaomi |  | We doubt about the case that UE GNSS validity duration is still valid, but network cannot adjust its TA by TAC due to big location change at UE side. RAN4 has specified the requirement of GNSS location accuracy around 50meter. GNSS location accuracy lower than that should not be considered in Rel-18. It is bad eNB implementation that eNB doesn’t update TA until not being able to update. If that case really happens, eNB can always rely on RRC release, no need to optimize this.[Nokia:] The UE may move but it cannot re-acquire the GNSS (due to no gap configured) hence the GNSS is outdated. Though the original GNSS validity duration is not expired, UE can only use the outdated GNSS for TA pre-compensation which may bring big error. Considering the small TA adjustment steps in TAC MAC CE, the NW may not update the TA to bring the UE back to UL sync in-time.For RRC Release, it may cause many issues. We have provided the analysis after this table. |
| Samsung | Yes | We can see the argument from both sides and it depends on how you view the feature. We were originally for the UE to stay in connected mode if the GNSS position fix fails, but we have changed our minds hearing some of the arguments. If a GNSS measurement fails, then there are likely some issues, and it would be best if the UE does not stay in connected mode. Another reason is that if the GNSS position fix fails and the UE is still in connected mode, then we need to think about how the UE reports the failing, and we would prefer to not go in to that type of discussion.  |
| Lenovo | Yes |  |
| Qualcomm | No | While GNSS is still valid, it is possible UE may get another GNSS measurement trigger command or another UL Tx extension MAC CE or even receive proper RRC release message.So probably motivation should first be convincing why there is a need for UE to rush to IDLE mode autonomously?[Nokia:] In this case, it is the GNSS validity duration not expired but the GNSS is not valid since NW detects UL sync lost due to invalid GNSS. |
| OPPO |  | If GNSS validity duration is still valid, UE should stay in CONNECTED mode instead of going to IDLE mode |
| Nokia | Yes | RAN2 should follow the RAN1 agreement if no error found. Otherwise, RAN2 needs to address the FFS for Alt-2 (this is not reasonable in this late stage of Rel-18).  |
| MediaTek | Yes |  |
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In the online discussion, some companies think that the network can send the RRC Connection Release message to the UE if the UL synchronization is really broken (i.e., for Case A above); In this case the UE will follow the Rel-17 behaviour and perform GNSS measurement in the idle state. Hence the UE can remain in RRC\_CONNECTED until [X + GNSS validity duration] expires (i.e., for Case B and C above). In other words, NW can handle the different cases in different way.

From Rapporteur’s point of view, for Rel-18, if the NW detects the UL synchronization is really broken the NW should not directly send RRC Release message as Rel-17. Instead, NW should trigger an aperiodic GNSS measurement trying to recover the UL synchronization and keep the UE in RRC Connected. This is because Rel-18 aims to improve the GNSS operation to maintain UE in RRC connected during long connection time. If the NW-triggered GNSS measurement failed while UE is kept in RRC Connected (Option2) , the UE may cause interference to other UEs since UE may send UL transmissions (e.g., SR, PRACH) with the broken UL synchronization. It seems RAN1 had discussed the UE behaviour in RRC Connected state in [R1-2308236]. None of the three identified Alternatives was agreed. From RAN2’s point of view, Rapporteur thinks there is no need to repeat the RAN1 discussions.

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| * + **FFS: UE behaviour in RRC\_CONNECTED state.**
		- **Alt-A: UE can be allowed to transmit and receive**
		- **Alt-B: UE can only be allowed to receive**
		- **Alt-C: whether UE is allowed to remain connected based on network configuration**
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For Option3, it is a possible solution to differentiate the cause why NW trigger the GNSS measurement. NW indicates whether the UE shall move to RRC Idle or can stay RRC Connected based on the exact reason for the triggering. However, it seems not needed according to what has been agreed in RAN1.

**Question 2: Which option is preferred by companies:**

* **Option1: For GNSS measurement triggered by the network, the UE shall move directly to RRC idle mode after the end of the GNSS measurement gap if the UE failed to re-acquire the GNSS position, independently of the GNSS position status.**
* **Option2: if UE fails to conduct the GNSS position fix in an aperiodic GNSS measurement gap, the UE can still remain in RRC\_CONNECTED until [X + GNSS validity duration] expires.**
* **Option3: The network indicates whether the UE shall move to RRC Idle or can stay RRC Connected if the GNSS measurement fails during the network-triggered GNSS measurement gap.**
* **Other options (please specify the details)**

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| Answers to Question 2 |
| Company | Option | Comments |
| Ericsson | Option 1 | Just make one simple solution for IoT NTN! Also option 3 is acceptable. |
| Google | Option 2 | Option 1 has negative impact to the UE and makes it worse than Rel-17 UE. In Rel-17, the UE can anyway stay in RRC\_CONNECTED until the GNSS becomes outdated, or until receiving the RRC Connection Release from the NW. In Rel-17 the NW also relies on the RRC Release procedure to deal with UEs having potential UL synchronization problem and there seems to be no issue, why we need an extra mechanism in Rel-18 that is only harmful to the UE? In Rel-18 if UE does not report the GNSS validity duration after a network-triggered GNSS measurement, the NW can choose to release the UE and we think this is sufficient.  |
| ZTE | **Option1** | No strong view and fine to following RAN1 suggestion. |
| Xiaomi | Option 2 |  |
| Samsung | Option 1 |  |
| Lenovo | Option 1 |  |
| OPPO | Option 2 |  |
| Nokia | Option1 | Same view as Ericsson. Also option3 is acceptable. |
| MediaTek | Option 1 | We are fine to follow RAN1’s agreement. It is simple and clean.Regarding Google’s comment on network sending RRCConnectionRelease after an unsuccessful GNSS measurement, network will have to wait for a period to make sure the UE will not report the remaining GNSS duration. During this period, UE may already cause interference to other UEs with the broken UL synchronization. |
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## 3.2 UE behaviour when autonomously triggered GNSS measurement fails

For the UE autonomously triggered GNSS measurement, below proposal was raised in [1].

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| Company | Proposal |
| R2-2403480 [1] | Proposal 2: For autonomous GNSS acquisition, if the GNSS measurement fails the UE always moves to RRC Idle upon the end of autonomous GNSS measurement timer, except the measurement is triggered autonomously by the UE during C-DRX inactive time.  |
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[1] mentioned the potential cases for GNSS measurement failure and related UE behavior are:

1. If the UE autonomously triggered the GNSS measurement in C-DRX inactive time and the GNSS validity duration is not expired there is no need for the UE to go to idle.
2. If the UE autonomously triggered the GNSS measurement at the GNSS validity duration expiry the UE shall go to idle.
3. If the UE autonomously triggered the GNSS measurement at the GNSS validity duration + extension duration X expiry the UE shall go to idle.

If the UE triggers the GNSS measurement autonomously it will always happen when the GNSS is outdated, either at the end of the GNSS validity duration (Case2) or at the end of the GNSS validity duration + extension duration X (Case3). The only exception is the autonomous measurement triggered by the UE during C-DRX inactive time (Case1). In the C-DRX inactive time case, the GNSS validity duration may still be valid and thus UE can remain RRC Connected (as agreed in RAN2-123 meeting below).

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| 5. If UE failed to autonomously re-acquire the GNSS position fix and the GNSS position is still valid during the inactive state of C-DRX, UE does not move to RRC\_IDLE. There is no specification impact. |

Furthermore, RAN1 has agreed the exact time point when the UE should go to RRC Idle.

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| RAN1-114 Agreement​:From RAN1 perspective, after autonomous GNSS measurement timer expires if UE failed to re-acquire GNSS position fix within the autonomous GNSS measurement timer UE goes to IDLE mode​ |

**Question 3: Do companies agree below proposal ?**

* **For autonomous GNSS acquisition, if the GNSS measurement fails the UE always moves to RRC Idle upon the end of autonomous GNSS measurement timer, except the measurement is triggered autonomously by the UE during C-DRX inactive time.**

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| Answers to Question 3 |
| Company | Yes/No | Comments |
| Ericsson | Yes | Three autonomous cases:1. autonomous GNSS measurement failed during C-DRX: NW does not know the UE measure GNSS and it expect the UE to be connected until original GNSS validity duration expires, therefore the UE shall only go to IDLE if [previous GNSS position is invalid] and [UL transmission extension is not active].
2. autonomous GNSS measurement failed after GNSS validity duration expires and UL extension is not configured, UE shall always go to IDLE immediately
3. autonomous GNSS measurement failed after UL transmission extension expires, UE shall always go to IDLE immediately
 |
| Google | Yes |  |
| ZTE | Yes to the intention but not the wording  | Different from NW-trigger GNSS measurement and also some measurements during C-DRX which may occur early before the expiration of GNSS, autonomous GNSS measurement (except the measurement during C-DRX) generally occurs after GNSS already expires. So we think it can be general understanding that UE needs to move to RRC Idle if UE failed to re-acquire GNSS position fix within the autonomous measurement gap.Please note, it’s unsuitable to say “if the GNSS measurement fails the UE always moves to RRC Idle upon the end of autonomous GNSS measurement timer”. We have no autonomous GNSS measurement timer-like thing in RAN2 spec, and we only have the terminology of “gap” which is common for NW-trigger GNSS measurement and autonomous GNSS measurement. This gap would be indicated to other module, e.g., GNSS module. We assume only when UE fails to re-acquire GNSS position fix within the “measurement gap” or “autonomous gap”, UE will declare that GNSS measurement fails.We think the current text in Stage-2 “*Upon failed GNSS acquisition, the UE shall move to idle mode if the GNSS position is outdated and uplink transmission extension is not active*.” can already cover this case.[Nokia:] Agree with ZTE the “autonomous GNSS measurement timer” should be “GNSS measurement gap”. We will update the proposal in the summary. |
| Xiaomi | Yes |  |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| Nokia | Yes |  |
| MediaTek | Yes |  |
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For autonomous GNSS acquisition in C-DRX inactive time, if the GNSS position is outdated and uplink transmission extension is not active, [3] believes UE can still try autonomous GNSS measurement upon failure of autonomous GNSS acquisition. Failure of GNSS measurement in C-DRX inactive time does not mean that autonomous GNSS measurement after validity timer expires will also fail.

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| Company | Proposal |
| R2-2402186 [3] | Proposal 3 Upon failure of autonomous GNSS acquisition in C-DRX inactive time, the UE can still try autonomous GNSS measurement, if configured by the network, after GNSS position is outdated and uplink transmission extension is not active. |
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**Question 4: Do companies agree below proposal ?**

* **Upon failure of autonomous GNSS acquisition in C-DRX inactive time, the UE can still try autonomous GNSS measurement, if configured by the network, after GNSS position is outdated and uplink transmission extension is not active.**

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| Answers to Question 4 |
| Company | Yes/No | Comments |
| Ericsson | Yes |  |
| Google | Yes |  |
| ZTE | No | We suggest to keep things simple. Even for this GNSS measurement during C-DRX, if GNSS position is already outdated, it’s better to let UE move to RRC\_IDLE after GNSS measurement failure.The exceptional case may be that, the UE may proactively perform GNSS measurement a bit early even GNSS is still valid (e.g., everything is still good), with the intention to make use of the inactive period of C-DRX. Then if finally GNSS measurement fails but previous GNSS is still valid, we think UE can keep in connected mode till the previous GNSS become invalid. This may be different from NW-triggered GNSS. For NW-triggered GNSS, NW may already detect some error that may be general reason for NW to trigger an early GNSS measurement. So we are fine in such case, even the GNSS may be still valid, it’s better for UE to go to idle if NW-triggered GNSS fails. |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| Nokia | Yes | We think the key point here is that, after GNSS position is outdated and uplink transmission extension is not active, UE can trigger autonomous GNSS measurement, if configured by the network. This is a normal and unified solution.  |
| MediaTek | Yes | By UE implementation, UE may try its best to utilize the C-DRX inactive time in an attempt to update GNSS position fix. Maybe the result will not always be a success due to the limited time. In this case, UE deserve a full time GNSS measurement after the GNSS position is outdated. |
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## 3.3 UE behaviour for autonomous GNSS acquisition in C-DRX inactive time

For UE autonomously triggered GNSS acquisition in C-DRX inactive time, [1] further discuss the conditions on when the UE should move to RRC idle. If the GNSS validity duration (and extension duration X) expires during the GNSS measurement the UE should move to RRC Idle. However, [5] thinks UE can remain in RRC\_CONNECTED when the GNSS position becomes outdated in a c-DRX inactive state.

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| Company | Proposal |
| R2-2403480 [1] | Proposal 3: For autonomous GNSS acquisition in C-DRX inactive time, the UE shall move to RRC idle mode if either of below conditions is met:1) the GNSS position is outdated and uplink transmission extension is not active, or 2) the UL transmission extension period is expired. |
| R2-2403081 [5] | Proposal 2 UE can remain in RRC\_CONNECTED when the GNSS position becomes outdated in a c-DRX inactive state (i.e., in a c-DRX OFF duration). |

**Question 5a: Do companies agree below proposal ?**

* **For autonomous GNSS acquisition in C-DRX inactive time, the UE shall move to RRC idle mode if either of below conditions is met:**

**1) the GNSS position is outdated and uplink transmission extension is not active, or**

**2) the UL transmission extension period is expired.**

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| Answers to Question 5a |
| Company | Yes/No | Comments |
| Ericsson | Needs reformulation | * **For failed autonomous GNSS acquisition in C-DRX inactive time, the UE shall move to RRC idle mode if ~~either of~~ below condition~~s~~ is met:**

**1) the GNSS position is outdated and uplink transmission extension is not active** |
| Google | No | Please see our comments in Q5b below |
| ZTE | No | We are a bit confused. If the GNSS position is outdated and uplink transmission extension is not active, UE should follow the existing principle to determine whether to trigger autonomous GNSS acquisition. Only if no autonomous GNSS configured and no NW trigger received, UE can go to idle, no matter in C-DRX or not.We only need to discuss the failure case, as previous questions.We think the Ericsson’s wording suggestion is aligned with our preference in Q4. |
| Samsung | No | Agree with ZTE |
| Lenovo | No | Agree with ZTE |
| Qualcomm | No | No need to touch or define any actions for the case of UE’s best effort procedure for GNSS fix during inactive time of C-DRX.The existing condition of going to IDLE mode seems already clear. |
| OPPO |  | Agree with Ericsson |
| Nokia | Yes. OK to discuss the failure case only. | For Ericsson’s proposal, we wonder whether we need to cover the case where the uplink transmission extension is active. |
| MediaTek | No | We agree with the first paragraph of ZTE’s comment. |
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**Question 5b: If the answer to Question 5a is No, do companies agree below proposal ?**

* **UE can remain in RRC\_CONNECTED when the GNSS position becomes outdated in a c-DRX inactive state (i.e., in a c-DRX OFF duration).**

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| Answers to Question 5b |
| Company | Yes/No | Comments |
| Ericsson | No | NW expects the UE to not be in CONNECTED if GNSS is invalid and no UL extension is active |
| Google | Yes | We think it’s better to have the implementation flexibility allowing UE to perform the GNSS measurement anytime during the c-DRX inactive time, even if the GNSS validity duration has expired. This is beneficial for UE power saving as UE can delay the GNSS measurement until the UE has uplink data or right before starting the c-DRX ON duration, which potentially reduces the number of GNSS measurement need to be performed by the UE. |
| ZTE | No | See our comments for Q5a. |
| Samsung | No | We do not see how we can allow for the “implementation flexibility” as suggested by Google.  |
| Lenovo | No |  |
| Qualcomm |  | No need to discuss it. It is clear when UE should go to IDLE. |
| OPPO | No |  |
| Nokia | No |  |
| MediaTek | No |  |
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In the email discussion R2-2401584 it was asked whether UE triggers GNSS remaining validity duration report after autonomous GNSS acquisition in C-DRX inactive time.

At RAN2 #122 the following was agreed:

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| The UE triggers GNSS measurement reporting every time upon completing the GNSS fix operation. |

[1] thinks the UE will report the GNSS validity duration report after autonomously acquiring the GNSS position during C-DRX inactive time. Whether the UE will postpone the reporting to the C-DRX active time or not can be left for UE implementation. The network will anyway not know when the UE has performed the autonomous measurement during the C-DRX inactive time. During the email discussion R2-2401584 it was questioned whether the release 18 UE will report the remaining GNSS validity duration report in a release 17 cell. Below is a collection of proposals from companies at RAN2 #125bis.

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| Company | Proposal |
| R2-2403480 [1] | Proposal 4: UE implementation can determine whether to report the remaining GNSS validity duration based on the presence of ‘gnss-PositionFixDurationReporting-r18’ in SIB2.Proposal 5: RAN2 can discuss whether the condition based on ‘gnss-PositionFixDurationReporting-r18’ to report the remaining GNSS validity duration shall be captured in specification. |
| R2-2402773 [2] | Proposal 3: No special handling is needed regarding GNSS remaining validity duration report to the legacy eNB. |
| R2-2402186 [3] | Proposal 4 UE triggers GNSS remaining validity duration report after autonomous GNSS acquisition in C-DRX inactive time. |
| R2-2402705 [4] | Proposal 6 UE doesn’t trigger GNSS remaining validity duration report after autonomous GNSS acquisition in C-DRX inactive time if the UE is communicating in a network not supporting releases later than Release 17. |
| R2-2402213 [6] | Proposal 1: RAN2 confirms UE will trigger GNSS remaining validity duration report after autonomous GNSS acquisition in C-DRX inactive time when the UE is communicating in a network not supporting releases later than Release 17. No spec change is needed. |

The companies seem to agree the UE will report the new remaining GNSS validity duration, when the UE has completed a GNSS measurement during C-DRX inactive time. There is also some support for not performing the reporting, when the serving cell is based on release 17.

[1] indicates the UE implementation can ensure not to attempt this MAC CE reporting based on the presence of ‘*gnss-PositionFixDurationReporting-r18’* in SIB2. If the flag ‘*gnss-PositionFixDurationReporting-r18*’is true it is an indication of a release 18 cell, which supports UEs performing GNSS measurements during RRC Connected mode. In that case, the UE can also report the remaining GNSS validity duration report.

**Question 6a: Do companies agree the UE triggers GNSS validity duration report after successful autonomous GNSS acquisition in C-DRX inactive time ?**

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| Answers to Question 6a |
| Company | Yes/No | Comments |
| rapporteur | Yes | The proposal has been agreed in online discussion on April.17. The question can be skipped. |
| Ericsson | Yes |  |
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**Question 6b: Do companies agree UE shall not report the GNSS validity duration to a release 17 serving cell ?**

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| Answers to Question 6b |
| Company | Yes/No | Comments |
| Ericsson | Yes | GNSS validity duration report with MAC CEs shall only be reported to a cell that has enabled GNSS measurements |
| Google | Yes | Rel-17 serving cell does not recognize the new MAC CE introduce in Rel-18.  |
| ZTE | Yes | UE cannot waste air interface resource to report the GNSS validity duration to an eNB which cannot support this function. |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| Qualcomm |  | We suggest to clarify if the cell configures UE with at least one of the followings, then only UE should assume the cell supports this feature.* UL Tx extension is configured or
* Autonomous GNSS measurement is enabled or
* Network triggered GNSS measurement is enabled.
 |
| OPPO | Yes |  |
| Nokia | Yes |  |
| MediaTek | Yes |  |
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**Question 7: Do companies see a need to specify in the specification for the GNSS validity duration report after** **autonomous GNSS acquisition in C-DRX inactive time, or is the UE implementation sufficient?**

* **Option1: No specification impact (UE implementation)**
* **Option2: capture the UE behaviour in specification.**

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| --- |
| Answers to Question 7 |
| Company | Option | Comments |
| Ericsson | Option 1 | It is already specified that UE must report GNSS validity duration, however when this happens is not specified.  |
| Google | Option 1 | We prefer not to mandate the UE behaviour (e.g., via CBRA) or the timing on reporting the GNSS validity duration in c-DRX inactive time, and prefer to have the flexibility to delay the reporting until the c-DRX ON duration.  |
| ZTE | Option 1 | UE can rely on the existing NW indication to identify whether the eNB is a R18 eNB.For example, both of the following indications can be considered:* *gnss-PositionFixDurationReporting*
* *gnss-AutonomousEnabled*

We think at most we only capture some common understanding in Chair note that UE only needs to report to a **R18** eNB. No need of change to spec.Moreover, we think it’s beneficial to consider to let *gnss-AutonomousEnabled* can cover both of normal autonomous measurement (after expiration of GNSS) and autonomous measurement during C-DRX. That means, it’s better that UE only perform autonomous measurement during C-DRX after reception of this dedicated configuration. This may be beneficial for better consistence between UE and NW. But anyway, as autonomous measurement during C-DRX is mainly left to UE implementation, we think no further clarification for spec is needed.  |
| Samsung | Option 1 | But we think that it should be captured in Stage 2 or similar. |
| Lenovo | Option 1 |  |
| OPPO | Option 1 |  |
| Nokia | Option 1 |  |
| MediaTek |  | The 36.331 5.5.9 has already captured this UE behaviour: “1>upon indication the new GNSS becomes valid: 2>instruct low layers to report the remaining GNSS measurement validity duration (See TS36.321 [6]).”  |
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# 4 Conclusion

TBD.

# 5 Reference

1. R2-2403480 Further discussion on stage-2 open issues for IoT NTN, Nokia ,Nokia Shanghai Bell

2. R2-2402773 Remaining issues on GNSS operation enhancements, Huawei

3. R2-2402186 Discussion on GNSS operation for IoT NTN, OPPO

4. R2-2402705 Discussion on IOT NTN GNSS operation enhancement related open issues, Xiaomi

5. R2-2403081 Remaining Issues on the GNSS Operation Enhancements, Google

6. R2-2402213 Discussion on Autonomous GNSS Fix in C-DRX Inactive Time, vivo

7. R2-2403630 R18 IoT NTN stage 2 remaining issues, Ericsson