**3GPP TSG-RAN WG2 #121bis-e R2-230xxxx**

Online, 17th – 26th April, 2023

**Title: [AT121bis-e][417][POS] LS on GNSS integrity parameters (Huawei)**

**Source: Huawei, HiSilicon**

**Agenda item: 6.7.1?**

**Document for: Discussion and Decision**

# Introduction

During R2#120 meeting, LS R2-2213320 has been sent to SA2 for the parameters sent between LCS client/UE/AF and LMF

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| RAN2 would like to thank SA2 for the LS on GNSS integrity requirement provisioning. RAN2 would like to provide the following answer to SA2's question on the parameters that are needed:* + LCS client/UE/AF sends TIR, AL, TTA to the LMF
	+ LMF returns the system available/unavailable indication to the LCS client/UE/AF
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While in this meeting, LS R2-2302404 has been received from SA4, enquiring about the range of the paremters.

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| CT4 is implementing the GNSS integrity requirements as agreed SA2 CR S2-2300953 defined in TS 23.273 below: *The LCS service request may include integrity requirements including Time-to-Alert (TTA), Target Integrity Risk (TIR) and Alert Limit(AL). Definitions of these parameters are specified in TS 38.305 [9].*However, there is no clear data structure definition of TTA, TIR and AL in TS 38.305, CT4 could not implement this feature based on current definition.CT4 would like to kindly ask RAN2 to define the data structure of TTA, TIR and AL, and provide the related reference to CT4 in order to implement this feature. |

During R2#121bis, the following email discussion has been arranged for the discusison for the reply LS

* [AT121bis-e][417][POS] LS on GNSS integrity parameters (Huawei)

      Scope: Consider the LS in R2-2302404 and draft a reply.

      Intended outcome: Report and approvable LS

      Deadline: Friday 2023-04-21 1000 UTC

In this contribution, we discuss the data structure of the TTA, TIR, AL and propose a reply LS to CT4

# Discussions

In the current LPP spec, only the data structure for Target Integrity Risk has been defined, as follows:

CommonIEsRequestLocationInformation ::= SEQUENCE {

 locationInformationType LocationInformationType,

 triggeredReporting TriggeredReportingCriteria OPTIONAL, -- Cond ECID

 periodicalReporting PeriodicalReportingCriteria OPTIONAL, -- Need ON

 additionalInformation AdditionalInformation OPTIONAL, -- Need ON

 qos QoS OPTIONAL, -- Need ON

 environment Environment OPTIONAL, -- Need ON

 locationCoordinateTypes LocationCoordinateTypes OPTIONAL, -- Need ON

 velocityTypes VelocityTypes OPTIONAL, -- Need ON

 ...,

 [[

 messageSizeLimitNB-r14 MessageSizeLimitNB-r14 OPTIONAL -- Need ON

 ]],

 [[

 segmentationInfo-r14 SegmentationInfo-r14 OPTIONAL -- Need ON

 ]],

 [[

 scheduledLocationTime-r17

 ScheduledLocationTime-r17 OPTIONAL, -- Need ON

 targetIntegrityRisk-r17

 TargetIntegrityRisk-r17 OPTIONAL -- Need ON

 ]]

}

The reason is that during the previous R2 discussion, we have agreed that only Mode 1 for the integrity report is supported in R2#117

Agreements:

Proposal 3. Release 17 supports only Reporting Mode 1 (PL reporting). Reporting Mode 2 can be revisited in future releases.

Proposal 4. For reporting Mode 1, TTA is not needed.

Proposal 5 (modified). Provide achievable TIR as optional parameter in the Integrity Information Result

While during the discussion in R2#120, for a separate discussion on the assistance data for UE-based integrity, the following contribution has been proposed for adding the AD for alert limit and time to alert, with proposed TP

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| [R2-2212892](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202211%20-%20RAN2_120%2C%20Toulouse%5CExtracts%5CR2-2212892%20integrity.docx) Integrity measurements definition and missing integrity requirements Ericsson discussion Rel-17 |

We think the data structure of the contribution above can be taken as the baseline for the discussion on the reply LS to CT4

***Question1: Do companies agree to adopt the values for Alert Limit and Time to Alert in R2-2212892 for the data structure of TIR and AL?***

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| ***Company*** | ***Yes/No*** | ***Comment*** |
| **Nokia** | **No** | **There was no consensus on R2-2212892 in RAN2#120. Multiple companies felt that the AL and TTA are not needed for UE or UE-based positioning integrity. Adding the AL and TTA to ProvideAssistanceData or RequestLocationInformation signalling from LMF will be a new functionality for Rel-17 then, but there does not seem to be a common understanding in RAN2 on how it is used in the overall integrity solution. One solution is to align the CT4/SA2 specification and RAN2 specification by just signalling the TIR alone from the LCS client in Rel-17. Note that there is a stage-2 CR in R2-2304054 which is under email discussion [AT121bis-e][411] that has dependency to what we decide on this issue.** |
| **Qualcomm** | **No** | **The proposals in R2-2212892 misinterpret the Integrity Principle of Operation as specified in TS 38.305, clause 8.1.1a. Proponents of R2-2212892 have still not shown why a Alert Limit and Time to Alert is needed to determine a Protection Level.**  |
| **OPPO** | **No**  | **Agree with Nokia. R17 UE-based positioning integrity only implies that UE reports the PL to the network.. In addition, the reason why the UE needs to receive the TTA and AL via the LPP msg is not clear. In such case, location request should come from external client, i.e., MT-LR, the UE higher layer does not need to know the positioning integrity result.**  |
| **CATT** | **No** | Generally, above parameters depend on the LCS services which are agreed not in LPP except TIR.In order to give the answer to CT4, 500 meter seems too large for vertical AlertLimit, while horizontal Alertlimit can be longer than 500 meters, considering the existing LCS services. I’m fine with the scale factor is 0.01 metre for AL and the data structure of timeToAlert here. BTW, the description of IEs is missed above.SA1 is supposed to design the QoS of integrity for LCS services which can refer to RTCM or CIAO. |
| **Intel** | **No** | Agree with Nokia. One way is to tell CT4, only signal TIR in Rel-17.  |
| **vivo** |  | We suppose the intention of the rapporteur is not to agree on the contribution, but to refer to the range of values and descriptions.As RAN2 is the leading group of the integrity feature in R17, we think RAN2 should provide the value range of these three parameters rather than only TIR. Two options can be considered:Option 1. The version in the contribution can be a baseline regarding the value range, which already covers the service requirements in TR, that is, 0.5m≤AL <62.5m, TTA ranges from 100s of milliseconds to <30sOption 2. Ask RTCM or CIAO, similar to the view of CATT. |
| **Swift Navigation** |  | Agree with Nokia – this functionality is not agreed in LPP yet so it may be best to only signal TIR for now.Swift still sees some value in introducing the ability to send AL, TTA requirements (e.g. similar to the *CommonIEs RequestLocationInformation* used for TIR), but we think it needs further discussion regarding expected behaviour, as was flagged in [AT119-e][425][POS], e.g:* Is the UE required to use these parameters under certain circumstances or would they always be optional and up to the UE?
* In the latter case, if the UE does not choose to use them, will this lead to a situation where the UE has a different configuration than the LMF expected?
 |
| **Lenovo** | **No** | Share the same view with Nokia, R2-2212892 has been treated online in RAN2#120 meeting, and the above proposed TP aims to add TIR, AL and TTA into the integrity assistance data for UE-based GNSS integrity, but there were different views during discussion and no agreement was reached. We suggest not to use the TP as baseline for the LS response. Considering current LPP spec only supports the data structure for TIR, it is still controversial for the signalling/message to transmit e.g., TTA and AL. For the R17 GNSS integrity, only Mode 1 for UEs is supported, and achievable TIR may be provided as optional parameter while TTA is not needed. So RAN2 may only identify the data structure for TIR and align with CT4 at this stage, while for AL and TTA, it may need a clearer solution from RAN2’s perspective. |

With the above, we have also drafted a reply LS to CT4 for this issue, we’d like also to collect companies’ view on this

***Quesiton2: Do companies have any comment on the reply LS in draft LS in Annex A?***

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| ***Company*** | ***Comment*** |
| **Nokia** | **Please see our comment on Q1. If we agree to just signal TIR from LCS client then the LS needs to be modified accordingly.** |
| **Qualcomm** | **See our comment to Q1 above. There are no *IntegrityRequirements-r17* in RAN2 specifications.** |
| **OPPO** | **TIR is enough** |
| **CATT** | **QoS of LCS service is out of scope of RAN2. However in order to give the answer to CT4, RAN2 may share our views on the parameters for their consideration.****For TTA and AL, the following range of values can be taken into consideration with field description:**IntegrityRequirements-r17 ::= SEQUENCE { horizontalAlertLimit-r17 INTEGER (0..100000), verticalAlertLimit-r17 INTEGER (0..5000) OPTIONAL, -- Need ON timeToAlert-r17 INTEGER (1,2000) OPTIONAL, -- Need ON ...} |
| **vivo** | **If we need to ask RTCM or CIAO on this issue, the TIR can be provided in the LS reply, and inform CT4 that the rest two will be feedback when available.** |
| **Swift Navigation** | In response to CATT and Vivo – RTCM have not standardized integrity yet and are still some way from doing so . ICAO (not CIAO) is for aviation use cases only, not the extensive list of 3GPP use cases illustrated in 9.2.4 (TR38.857). Besides, as we have discussed for some time now, the actual KPI requirements are specific to the implementation because they depend on how the internal integrity system is designed to meet a given safety case. The UE implementation determines if the 3GPP assistance data is useful/valid for helping it satisfy these KPIs. |
| **Lenovo** | See the comments to Q1 above, identify the data structure for TIR and response to CT4. |

# Conclusions

***TBD***

# Annex A: Draft LS

3GPP TSG RAN WG2#121bis-e R2-230

Online, 17th - 26th April, 2023

**Title: Reply LS on GNSS integrity requirement parameters definition**

**Response to: C4-230655 “LS on GNSS integrity requirement parameters definition”**

**Release: Rel-17**

**Work Item: NR\_pos\_enh-Core**

**Source:** **RAN2**

**To:** **CT4**

**Cc: SA2**

**Contact person: Yinghao Guo**

 **yinghaoguo@huawei.com**

**Send any reply LS to: 3GPP Liaisons Coordinator,** **mailto:3GPPLiaison@etsi.org**

**Attachments:** **NA**

# 1 Overall description

RAN2 would like to thank CT4 for the LS on GNSS integrity requirement parameters definition, and would like to ask CT4 to take the following RAN2 feedback into consideration:

**Question**: CT4 would like to kindly ask RAN2 to define the data structure of TTA, TIR and AL, and provide the related reference to CT4 in order to implement this feature.

**Answer**: For TIR, the data structure is defined by IE *targetIntegrityRisk*, which is specified in TS 37.355. For TTA and AL, the following range of values can be adopted with field description

IntegrityRequirements-r17 ::= SEQUENCE {

 horizontalAlertLimit-r17 INTEGER (0..50000),

 verticalAlertLimit-r17 INTEGER (0..50000) OPTIONAL, -- Need ON

 timeToAlert-r17 INTEGER (1,2000) OPTIONAL, -- Need ON

 ...

}

| ***IntegrityRequirements* field descriptions** |
| --- |
| ***horizontalAlertLimit***This field indicates the horizontal alert limit for the integrity principle of operation by the device along the semi-major axis of the error ellipse. Scale factor 0.01 metre; range 0 – 500 meters.  |
| ***verticalAlertLimit***This field indicates the vertical alert limit for the integrity principle of operation by the device. Scale factor 0.01 metre; range 0 – 500 metres. To be compared to the horizontal protection level determined by the device.  |
| ***timeToAlert***The maximum allowable elapsed time from when the protection level (PL) exceeds the Alert Limit (AL) until the function providing positioning integrity annunciates a corresponding alert. Scale factor 0.1 second. |

# 2 Actions

**To CT4**

**ACTION: RAN2 kindly requests CT4 to take the above answers into consideration.**

# 3 Dates of next RAN WG2 meetings

RAN2 #122 22-26 May 2023 Incheon

 <meeting\_identity> <start\_date> - <end\_date> <town>, <country>