**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 |

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:\Users\mtk16923\Documents\3GPP%20Meetings\202211%20-%20RAN2_120,%20Toulouse\Extracts\R2-2212892%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?***

|  |  |  |
| --- | --- | --- |
| ***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.**  ***[Rapp] In the Toulouse meeting, we have already agreed wit the following and a reply LS has been sent to SA2.***  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   ***The intention of the question is not to ask whether to support it for UE-based integrity, but to ask whether the previous proposal from E// on the data structure of the Alert Limit and Time to Alert can be used as the data structure for service layer request (CT4 spec)*** |
| **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 <30s  Option 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. |
| **ZTE** | **No** | Agree with Nokia that only TIR needs to be signalled. |
| **Xiaomi** | **No** | In rel-17, only TIR is specified, and the AL and TTA in LPP could be considered in R18. |
| **Apple** | **No** | We prefer to stick to the Rel-17 integrity model and therefore only TIR is needed |
| **Ericsson** | **Yes** | I think companies answering No have misunderstood the question. As agreed in Toulouse, LMF needs TIR, AL and TTA in order to properby configure AD w.r.t. periodicities etc to the UE, even though the AD itself does not include AL and TTA.  RAN2 sent an LS from Toulouse to SA2 that these parameters can be configured in LCS and now SA2 comes back asking about the value ranges for these values.  The proposal from the rapporteur is to use the value ranges we once suggested for LPP ProvideAssistanceData, but the proposal is only to use the suggested value ranges. To make it clear, we can motivate directly what value ranges   - for TIR, use the agreed value range from RequestLocationInformation, IE  TargetIntegrityRisk-r17 ::= INTEGER (10..90)  where the TIR is calculated by *P*=10-0.1*n* [hour-1] where *n* is the value of *targetIntegrityRisk* and the range is 10-1 to 10-9 per hour.  - for alert limit, use the agreed value range for protection level. These are separated into horizontal and vertical in IE IntegrityInfo-r17, scale factor 0.01 m.  horizontalProtectionLevel-r17 INTEGER (0..50000),  verticalProtectionLevel-r17 INTEGER (0..50000) OPTIONAL,  - for TTA, use a value range encapsulatine all values in Table 9.2.4 in TR 38.857, where TTA values range from 100ms to 30s. One suggested value range could therefore be 100ms – 200s, e.g. INTEGER (1..2000), scale factor 0.1 s |

***Summary***

* Nokia, Qualcomm, Intel, Lenovo, ZTE, Xiaomi, Apple think that only TIR is needed from LCS client
* CATT thinks that 500 meters for horizontal alert limit is too large ahile the scale fator of 0.01 meters is fine for AL. CATT also thinks that the QoS should come from SA1 and can refer to RTCM/ICAO
* VIVO thinks that there can be two options (1) adopt the values in the R2-2212892 as baseline (2) ask RTCM/ICAO
  + While in the reply to the question2, Swift has indicated that RTCM has not discussed on this and ICAO’s implementation is not quite applicable for the use cases that 3GPP has agreed, e.g., in the TR.
  + Swift also indicates that the range of the KPI is highly implementation-specific, depending on the use cases.
* Swift Nav thinks we only need to signal TIR for now while still see some values for signaling AL and TTA. This would need furtuer discussion on the following issues
  + 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?
* Ericsson, Huawei clarifies that TIR, AL and TTA have already been agreed in the Toulouse meeting and LS has already sent to SA2. The discussion is not about adopting the original proposal in R2-2212892, but only to discuss on the data structure.

***Rapp Observations:***

Based on the inputs from the companies above, the possible way-forwards can be as follows:

* Option1: Revert the agreement in R2-2213320 and reply to SA2 that only TIR is signaled from the LCS client to the LMF
* Option2: Reply to SA2 that R2 has only concluded on the data stuture for TIR; while for AL and TTA, it is still under discussion
* Option3: Ask RTCM or ICAO
* Option4: Adopt the data structure of AL and TTA in R2-2212892 as baseline.

Based on the possible options above, we propose the following for further discussion in RAN2

***Proposal 1:* RAN2 to downselect from the following options for the reply LS to SA2 on GNSS integrity parameters:**

* **Option1: Revert the agreement in R2-2213320 and reply to SA2 that only TIR is signaled from the LCS client to the LMF**
* **Option2: Reply to SA2 that R2 has only concluded on the data stuture for TIR; while the data stuctures for AL and TTA are still under discussion**
* **Option3: Ask RTCM or ICAO**
* **Option4: Adopt the data structure of AL and TTA in R2-2212892 as baseline.**

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?***

|  |  |
| --- | --- |
| ***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. |
| **ZTE** | Only TIR needs to be signalled. |
| **Xiaomi** | We suggest provide the data structure of TIR only and indicate RAN2 don’t specify the data structure of AL and TTA. |
| **Apple** | See comments for Q1 |
| **Ericsson** | The LS could avoid using ASN.1 representation of the value ranges, since this seems to confuse companies. CT4 will not use ASN.1 anyhow.  Therefore, the following answer could be considered instead:  **Answer**: The requested parameters TIR, AL and TTA are represented as follows   * TIR, representation adopted from TS 37.355, IE TargetIntegrityRisk-r17 of IE CommonIEsRequestLocationInformation, which is represented as INTEGER (10..90), where the TIR is calculated by *P*=10-0.1*n* [hour-1] where *n* is the value of *targetIntegrityRisk* and the range is 10-1 to 10-9 per hour. * Alert Limit, separated into a horizontal and vertical alert limit, with a value range adopted from horizontal and vertical protection level attributes in TR.37.355 and the IE IntegrityInfo-r17 of the IE CommonIEsProvideLocationInformation, which contains the following fields, scale factor 0.01 meters   + horizontalProtectionLevel-r17 INTEGER (0..50000)   + verticalProtectionLevel-r17 INTEGER (0..50000)   Time to alert representation can be adopted from the TR 38.857, Table 9.2.4, where TTAs are listed in different use cases from 100ms to 30s. In order to allow some wider TTAs, the recommended value range is INTEGER (1..2000), scale factor 0.1 s. |

***Summary***

Ericsson has given a alternative draft for the LS that we shouldn’t directly indicate the ASN.1 to CT4.

Based on the inputs above, we propose the following:

**Proposal2: if we agree to adopt the data structure in R2-2212892 as baseline, include in the reply LS the following answer:**

**Answer: The requested parameters TIR, AL and TTA are represented as follows**

* **TIR, representation adopted from TS 37.355, IE TargetIntegrityRisk-r17 of IE CommonIEsRequestLocationInformation, which is represented as INTEGER (10..90), where the TIR is calculated by *P*=10-0.1*n* [hour-1] where *n* is the value of *targetIntegrityRisk* and the range is 10-1 to 10-9 per hour.**
* **Alert Limit, separated into a horizontal and vertical alert limit, with a value range adopted from horizontal and vertical protection level attributes in TR.37.355 and the IE IntegrityInfo-r17 of the IE CommonIEsProvideLocationInformation, which contains the following fields, scale factor 0.01 meters**
  + **horizontalProtectionLevel-r17 INTEGER (0..50000)**
  + **verticalProtectionLevel-r17 INTEGER (0..50000)**
* **Time to alert representation can be adopted from the TR 38.857, Table 9.2.4, where TTAs are listed in different use cases from 100ms to 30s. In order to allow some wider TTAs, the recommended value range is INTEGER (1..2000), scale factor 0.1 s.**

# 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**](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>