3GPP TSG-RAN WG2 118 Tdoc R2-20xxxxx

Electronic Meeting, 9th – 20th May, 2022

Agenda Item: 6.11.2.4

Source: Ericsson

Title: Summary of GNSS Positioning Integrity AI 6.11.2.4

Document for: Discussion, Decision

# Introduction

This document summarises the following contributions submitted for Agenda Item 6.11.2.4 on GNSS Positioning Integrity.

|  |  |  |  |
| --- | --- | --- | --- |
| [**R2-2204997**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2204997.zip) | Draft LS to SA1/SA2 on GNSS integrity | Huawei, HiSilicon | LS out |
| [**R2-2205017**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205017.zip) | Correction to stage2 on service level support for GNSS integrity | Huawei, HiSilicon | CR |
| [**R2-2205488**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205488.zip) | Corrections on Positioning Integrity parameter table | Samsung R&D Institute UK | draftCR |
| [**R2-2205815**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205815.zip) | Remaining issues for integrity | Ericsson | discussion |
| [**R2-2206037**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2206037.zip) | [C002] Correction on the Note of the Protection Level (PL) | CATT | CR |

# Correction Discussions

The below t-docs which discusses/provides correction are

## Stage 3 RIL C002 R2-2206037

|  |  |  |  |
| --- | --- | --- | --- |
| [**R2-2206037**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2206037.zip) | [C002] Correction on the Note of the Protection Level (PL) | CATT | CR |

CATT motivates a needed change of the note defining how to determine PL, where AL should not be part of the equation, but the equation shall be seen as an implicit definition of PL in consideration of the established positioning error distribution and the target integrity risk.

|  |
| --- |
| **Text proposal for TS 37.355, Section 6.4.2, *CommonIEsProvideLocationInformation* IE:** NOTE: The Protection Level (PL) is a statistical upper-bound of the Positioning Error (PE) that ensures that, the probability per unit of time of the true error being greater than the PL , for longer than the TTA, is less than the required TIR, i.e., the PL satisfies the following inequality:  *Prob per unit of time* [((*PE>PL*)) *for longer than TTA*] *< required TIR*  An alert will be triggered if the PL, which is derived based on above inequality, is larger than AL, which is specified by applications. When the PL bounds the positioning error in the horizontal plane or on the vertical axis then it is called Horizontal Protection Level (HPL) or Vertical Protection Level (VPL) respectively. A specific equation for the PL is not specified as this is implementation-defined. For the PL to be considered valid, it must simply satisfy the inequality above. |
|  |

Rapporteur sees the rationale with the proposed change, which could go one step even further to become fully mathematically correct or use equality instead of the last “less than”.

1. Discuss the reasonable clarification and agree to a text proposal.

## Stage 2 Corrections [R2-2205017](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205017.zip) and [R2-2205488](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205488.zip)

|  |  |  |  |
| --- | --- | --- | --- |
| [**R2-2205017**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205017.zip) | Correction to stage2 on service level support for GNSS integrity | Huawei, HiSilicon | CR |

Huawei notes that any service level description for GNSS integrity is missing. In the description, there is a need to clarify that the target integrity risk comes from the service layer along with the LCS request. And the protection level and achievable target integrity risk need to be transferred back to the service layer as the results of the positioning procedure. The following additions are proposed:

|  |
| --- |
| **TS 38.305, Section 7.3.2:**  The AMF sends a location request to the LMF for a target UE and may include associated QoS, the scheduled location time, target integrity risk and the UE LPP positioning capabilities when available, as described in TS 23.273 [35].  2. The LMF may obtain location related information from the UE and/or from the serving NG-RAN Node. In the former case, the LMF instigates one or more LPP procedures to transfer UE positioning capabilities, provide assistance data to the UE and/or obtain location information from the UE. The UE may also instigate one or more LPP procedures after the first LPP message is received from the LMF (e.g., to request assistance data from the LMF). If a scheduled location time is provided in step 1, the LMF may schedule location measurements by the UE to occur at or near to the scheduled location time. The LPP procedures to transfer UE LPP positioning capabilities may be skipped if the LMF already obtained the UE positioning capabilities from the AMF in step 1.  3. If the LMF needs location related information for the UE from the NG-RAN, the LMF instigates one or more NRPPa procedures. Step 3 is not necessarily serialised with step 2; if the LMF and NG-RAN Node have the information to determine what procedures need to take place for the location service, step 3 could precede or overlap with step 2. If a scheduled location time is provided in step 1, the LMF may schedule location measurements by the NG-RAN to occur at or near to the scheduled location time.  4. The LMF returns a location response to the AMF with any location estimate, protection level and achievable target integrity risk obtained as a result of steps 2 and 3. The LMF may also return the LPP UE capabilities as described in TS 23.273 [35]. |
| **TS 38.305, Section 7.3.3:**  5. The LMF invokes the Nlmf Determine Location Response service operation towards the AMF as specified in TS 29.572 [33] which includes any location estimate, protection level and achievable target integrity risk obtained as a result of steps 3 and 4. The LMF may also return the LPP UE capabilities as described in TS 23.273 [35].  6. If the UE requested location transfer to a third party the AMF transfers the location, protection level and achievable target integrity risk received from the LMF in step 5 to the third party as defined in TS 23.273 [35].  7. The AMF sends an MO-LR location service response message included in a DL NAS TRANSPORT message as specified in TS 24.501 [29]. |
| **TS 38.305, Section 7.3.4:**  1. The UE sends a supplementary services event report message to the LMF as described in TS 24.571 [41] which is transferred via the serving AMF and is delivered to the LMF using an Namf\_Communication\_N1MessageNotify service operation. The event report may indicate the type of event being reported and may include an embedded positioning message which includes any location measurements or location estimate, protection level and achievable target integrity risk.  2. If LMF determines no positioning procedure is needed, steps 3 and 4 are skipped.  3. The LMF may utilize any location information received in step 1. The LMF may also retrieve location related information from the UE and/or from the serving NG-RAN Node. In the former case, the LMF instigates one or more LPP procedures to provide assistance data to the UE and/or obtain location information from the UE. The UE may also instigate one or more LPP procedures after the first LPP message is received from the LMF (e.g., to request assistance data from the LMF).  4. If the LMF needs location related information for the UE from the NG-RAN, the LMF instigates one or more NRPPa procedures. Step 3 is not necessarily serialised with step 2; if the LMF and NG-RAN Node have the information to determine what procedures need to take place for the location service, step 3 could precede or overlap with step 2.  5. The LMF invokes an Nlmf\_Location\_EventNotify service operation towards the GMLC with an indication of the type of event being reported and any location estimate, protection level and achievable target integrity risk obtained as a result of steps 2 and 3. |

Proposal for discussion

1. Agree to the addition of service level integrity aspects in the description, based on R2-2205017.

|  |  |  |  |
| --- | --- | --- | --- |
| [**R2-2205488**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205488.zip) | Corrections on Positioning Integrity parameter table | Samsung R&D Institute UK | draftCR |

Samsung points out that the stage-2 Table 8.1.2.1b-1: Mapping of Integrity Parameters is not aligned with LPP.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TS 38.305, Table 8.1.2.1b-1:**  **Table 8.1.2.1b-1: Mapping of Integrity Parameters**   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Error** | **GNSS Assistance Data** | **Integrity Fields** | | | | | | **Integrity Alerts** | **Integrity Bounds (Mean)** | **Integrity Bounds (StdDev)** | **Residual Risks** | **Integrity Correlation Times** | | Orbit | SSR Orbit Corrections | Real-Time Integrity  (see Section 8.1.2.1.8) | Mean Orbit Error  Mean Orbit Rate Error | Variance Orbit Error  Variance Orbit Rate Error  (using this values for deriving StdDev) | Probability of Onset of Constellation Fault  Probability of Onset of Satellite Fault  Mean Constellation Fault Duration  Mean Satellite Fault Duration | Orbit Range Error Correlation Time  Orbit Range Rate Error Correlation Time | | Clock | SSR Clock Corrections | Mean Clock Error  Mean Clock Rate Error | Standard Deviation Clock Error  Standard Deviation Clock Rate Error |  | Clock Range Error Correlation Time  Clock Range Rate Error Correlation Time | | Code Bias | SSR Code Bias | Mean Code Bias Error  Mean Code Bias Rate Error | Standard Deviation Code Bias Error  Standard Deviation Code Bias Rate Error |  |  | | Phase Bias | SSR Phase Bias | Mean Phase Bias Error  Mean Phase Bias Rate Error | Standard Deviation Phase Bias Error  Standard Deviation Phase Bias Rate Error | | Ionosphere | SSR STEC Correction | Ionosphere DNU | Mean Ionospherre Error  Mean Ionospherre Rate Error | Standard Deviation Ionosphere Error  Standard Deviation Ionosphere Rate Error | Probability of Onset of Ionosphere Fault  Mean Ionosphere Fault Duration | Ionosphere Range Error Correlation Time  Ionosphere Range Rate Error Correlation Time | | Troposphere Vertical Hydro Static Delay | SSR Gridded Corrections | Troposphere DNU | Mean Troposphere Vertical Hydro Static Delay Error  Mean Troposphere Vertical Hydro Static Delay Rate Error | Standard Deviation Troposphere Vertical Hydro Static Delay Error  Standard Deviation Troposphere Vertical Hydro Static Delay Rate Error | Probability of Onset of Troposphere Fault  Mean Troposphere Fault Duration | Troposphere Range Error Correlation Time  Troposphere Range Rate Error Correlation Time | | TroposphereVertical WetDelay | Mean Troposphere Vertical Wet Delay Error  Mean Troposphere Vertical Wet Delay Rate Error | Standard Deviation Troposphere Vertical Wet Delay Error  Standard Deviation Troposphere Vertical Wet Delay Rate Error | |

Proposal for discussion:

1. Agree to the changes in R2-2205488 to TS 38.305, Table 8.1.2.1b-1.

# LS Discussions

## LS to SA and CT groups: R2-2204997 and R2-2205815

|  |  |  |  |
| --- | --- | --- | --- |
| [**R2-2204997**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2204997.zip) | Draft LS to SA1/SA2 on GNSS integrity | Huawei, HiSilicon | LS out |

Huawei has provided a draft LS to SA1 and SA2 about GNSS integrity and KPIs as well as some procedural changes to RAN2 stage-2 (TS 38.305).

Proposal for discussion:

1. Agree to the LS to SA1/2 in R2-2204997.

|  |  |  |  |
| --- | --- | --- | --- |
| **[R2-2205815](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_118-e/Docs/R2-2205815.zip)** | Remaining issues for integrity | Ericsson | discussion |

Ericsson notes that QoS and requirements signalling from AMF to LMF is defined in TS 29.572 which CT4 is responsible group. Furthermore, the GLMC interface in TS 29.515 is also impacted to introduce support for interactions with network applications. Thus, RAN2 needs to liase with CT4 to define the integrity requirements and results signalling.

SA2 should also investigate impacts on the stage 2 description. For example, the integrity requirements and results may influence TS 23.273.

Proposals for discussion

1. RAN2 to liase with SA2 and CT4 to provide signalling of Integrity requirements and results.
2. Agree LS in appendix of R2-2205815 or trigger an email discussion aiming at refining the LS to SA2, CT1 and CT4.

# Conclusion

Based on the discussion in section 2 the summary identifies the following proposals:

Proposal 1 Discuss the reasonable clarification and agree to a text proposal.

Proposal 2 Agree to the addition of service level integrity aspects in the description, based on R2-2205017.

Proposal 3 Agree to the changes in R2-2205488 to TS 38.305, Table 8.1.2.1b-1.

Proposal 4 Agree to the LS to SA1/2 in R2-2204997.

Proposal 5 RAN2 to liase with SA2 and CT4 to provide signalling of Integrity requirements and results.

Proposal 6 Agree LS in appendix of R2-2205815 or trigger an email discussion aiming at refining the LS to SA2, CT1 and CT4.