3GPP TSG-RAN WG Meeting #91-e
e-Meeting, March 16th–26th, 2021
Agenda Item: 9.7.25
Document for: Discussion & Decision

RP-210318

WID scope for Rel-17 ePositioning

Considerations

- Prioritize the recommended enhancement from WG discussion
- Aspects that need further study and then specify may be added into the WID only if the time unit for this WID can be increased, including:
  - Aperiodic PRS, other latency enhancement
- Covering the four aspects explicitly mentioned in the SID with balanced scope
  - Device efficiency, high accuracy, low latency, network efficiency

Recommendation from RAN1 & RAN2

vivo

- The following has been recommended from RAN1 & RAN2 discussion:
  - NR positioning for UEs in RRC_INACTIVE state
    - Including DL positioning measurement in RRC_IDLE state
    - Including RAT-independent positioning in RRC_IDLE/INACTIVE state
  - On-demand transmission and reception of DL PRS
  - The methods, measurements, signaling, and procedures for mitigating the UE Rx/Tx timing delays, and/or and gNB Rx/Tx timing delays (already captured in Rel-17 WID)
  - The enhancements of the procedure, measurements, reporting, and signalling for improving the accuracy of UL-AoA and DL-AoD positioning solutions (already captured in Rel-17 WID)
  - Enhancements of signalling & procedures for reducing NR positioning latency, including enhancements on the measurement gap, measurement request and reporting (e.g. via RRC signaling, MAC-CE and/or physical layer procedure, and/or priority rules), the measurement, response and request of positioning assistance data (e.g., via location scheduling in advance of the time of when the location is needed)
  - Signaling and procedures to support GNSS positioning integrity
- **All recommended enhancements should be captured into positioning enhancement WID.**

Positioning in RRC IDLE/INACTIVE state

vivo

- In RAN2#113e, RAN2 confirms on the following recommendation
  - Proposal 1a: Positioning in RRC_INACTIVE
    - DL, UL and DL+UL positioning methods
    - UE-based and UE-assisted positioning solutions
    - Support of UE positioning measurements for UEs in RRC_INACTIVE state
      - Options that can be considered include DL-PRS or DL-PRS and SSB
    - Support of gNB positioning measurements for UEs in RRC_INACTIVE state
  - Proposal 1b: Positioning in RRC_IDLE
    - It is feasible for a UE to perform DL positioning measurement in RRC_IDLE state
    - It is up to RAN2 to decide whether to support the enhancements of NR positioning reporting of DL positioning measurements and/or positioning estimates for RRC_IDLE UEs
- In addition to DL positioning, UL and DL+UL positioning method, gNB positioning measurement, UL reference signals and UL related procedures should be included in the WID scope of RRC_INACTIVE positioning
- DL positioning measurement should be included in the WID scope of RRC_IDLE positioning
- The following should be included in the WID scope:
  - **Specify NR positioning for UEs in RRC_INACTIVE state, including**
    - **DL measurement and report in RRC_INACTIVE state**
    - **UL RS (e.g. SRS for positioning) transmission in RRC_INACTIVE state**
  - **Specify DL positioning measurement in RRC_IDLE state**

On-demand PRS

- Observations from study
  - On-demand corresponds to the UE-initiated or network-initiated request of PRS, including UE or LMF request/suggesting/recommending specific PRS pattern, ON/OFF, periodicity, BW, etc.
  - The network and device efficiency can be improved by on-demand PRS (assuming the same latency) compared to periodic PRS
  - The latency will be reduced considering on-demand PRS may reduce the alignment time of periodic PRS

- The following should be including in the WID scope:
  - **Specify LMF/UE-initiated on-demand transmission and reception of DL PRS**

Enhancements for reducing NR positioning latency-I

vivo

- Observations from RAN1 study
  - Estimated minimum DL PRS measurement time in Rel.16 can be 88.5ms depending on DL PRS configuration settings
  - The following list provides the major physical layer latency components for Rel.16 DL TDOA/DL-AOD UE-assisted NR Positioning
    - DL PRS alignment, transmission, measurement (including processing time) and report delay. Enhancements at least include aperiodic PRS, prioritized PRS measurement and PRS reporting.
    - Measurement gap request, configuration and alignment time. Enhancements at least include PRS measurement without MG, enhancement for MG.
    - UE/gNB higher layer (LPP/RRC) processing times. This aspect at least includes enhancement on reporting and requesting measurement and assistance data.
- The following items recommended by RAN1 should be included in the WID scope:
  - **Specify enhancements of signalling & procedures for reducing NR positioning latency, including latency reduction related to:**
    - **Measurement gap**
    - **The reporting and request of the measurement, e.g. including:**
      - **RRC signalling, MAC-CE and/or physical layer procedure**
      - **Priority rules for PRS reporting**
    - **Measurement time**

Enhancements for reducing NR positioning latency-II

- In RAN2#113e, for reducing latency, response and request of positioning assistance data was discussed.
  - E.g. for deferred MT-LR positioning, if location scheduling in advance of the time of when the event is triggered, steps of response and request of positioning assistance data are no longer needed.
- The following items recommended by RAN2 should be included in the WID scope:
  - **Specify enhancements of signalling & procedures for reducing NR positioning latency, including latency reduction related to:**
    - **The response and request of positioning assistance data, e.g. including:**
      - **Location scheduling in advance of the time of when the location is needed**

[Draft] objectives in WID

The objective of this work item is to specify solutions to enable RAT dependent (for both FR1 and FR2) and RAT independent NR positioning enhancements for improving positioning accuracy, latency, network and/or device efficiency. The specific objectives of this work are:

- Specify methods, measurements, signalling, and procedures for improving positioning accuracy of the Rel-16 NR positioning methods_by mitigating UE Rx/Tx and/or gNB Rx/Tx timing delays, including [RAN1]
  - DL, UL and DL+UL positioning methods
  - UE-based and UE-assisted positioning solutions

- Specify the procedure, measurements, reporting, and signalling for improving the accuracy of [RAN1]
  - UL AoA for network-based positioning solutions.
  - DL-AoD for UE-based and network-based (including UE-assisted) positioning solutions.

[Draft] objectives in WID-cont'd

vivo

- Specify enhancements of signalling & procedures for reducing NR positioning latency, including latency reduction related to:
  - Measurement gap [RAN1, RAN4]
  - The reporting and request of the measurement (e.g., via RRC signaling, MAC-CE and/or physical layer procedure, and/or priority rules) [RAN1, RAN2]
  - Measurement time [RAN1]
  - The response and request of positioning assistance data (e.g., via location scheduling in advance of the time of when the location is needed) [RAN2]
  - Study, and if needed, specify:
    - Aperiodic reception of DL PRS from the TRPs of the serving gNB and aperiodic reception of DL PRS from the TRPs of the neighbouring gNBs [RAN1, RAN2]
    - The request and response of positioning assistance data (e.g., via RRC signaling, MAC-CE and/or physical layer procedure) [RAN1,RAN2]
    - The reception of PRS (e.g., priority rules for the reception of DL PRS) [RAN1]
    - The reporting of the measurements (e.g., CG-based transmission) [RAN2]
    - The request and response of UE positioning capabilities (e.g., via storing UE capabilities in the network) [RAN2]

[Draft] objectives in WID-cont'd

vivo

- Specify methods, measurement, signalling and procedure for UE positioning in RRC_INACTIVE and RRC_IDLE state including:
  - Support of DL, UL, DL+UL positioning for UEs in RRC_INACITIVE state, including:
    - UE positioning measurements for UEs in RRC_INACITIVE state [RAN1]
      - Options that can be considered include DL-PRS or DL-PRS and SSB
    - UE reporting of positioning measurement and/or location estimate performed in RRC_INACTIVE when UE is in RRC_INACTIVE[RAN2]
      - The reporting is enabled by enhancing small data transmission in RRC_INACTIVE
    - gNB positioning measurements for UEs in RRC_INACTIVE state [RAN1]
    - UL reference signal transmission in RRC_INACTIVE state for gNB positioning measurements [RAN1]
      - Options that can be considered include SRS for positioning or PRACH preambles
    - UE-based and UE-assisted positioning solutions
  - Support of DL positioning measurements for UEs in RRC_IDLE state [RAN1]
  - Support of RAT-Independent positioning in RRC_INACTIVE and RRC_ IDLE state [RAN2]

- Specify LMF/UE-initiated on-demand transmission and reception of DL PRS, including [RAN2, RAN1]
  - DL and DL+UL positioning methods
  - UE-based and UE-assisted positioning solutions

[Draft] objectives in WID-cont'd

- Specify signalling and procedures to support GNSS positioning integrity determination, including [RAN2] :
  - The assistance information that will be used to support integrity determination
  - The information that will be used to provide the positioning integrity KPIs and integrity results
  - Integrity for UE-Based and UE-Assisted A-GNSS positioning

THANK YOU