**3GPP TSG-RAN WG2 Meeting #112-eDRAFT R2-2010881**

**Electronic meeting, November 2nd – 13th, 2020**

**Agenda item:** 8.11.2

**Source:** CATT

**Title:** TP on the proposed latency enhancements for TR 38.857

**Document for:** Discussion and Agreement

# 1 Introduction

This is to provide text proposal on the proposed latency enhancements for TR38.857 based on:

* [AT112-e][607][POS] Gathering of latency enhancement solutions (CATT)

 Scope: Describe and discuss the proposed latency enhancements in a format suitable for developing into a TP.

 Intended outcome: Text proposal in R2-2010868

 Deadline: Friday 2020-11-13 0000 UTC

# 2 Text Proposal

*Start of Text Proposal*

### X.Y.1 Location server functionality in the RAN

Location server functionality in the RAN was studied in TR 38.855 [1] section 9.3.1 and TR 38.856 [2]. By moving the location server to the NG-RAN the number of signalling hops (and therefore, the complexity and latency) can be reduced significantly. As shown in [3], location server functionality in the RAN (e.g., LMC) could reduce the positioning procedure latency between 41% and 61% compared to a 5GC LMF.

However, in order to reduce latency and better support NR positioning a "full" location server functionality (e.g., LMC) would not necessarily be required in the NG-RAN. The RAN location server functionality could be restricted to radio related coordination and signalling as well as to position calculation. In order to distinguish this reduced NG-RAN location server from an LMC considered in [1][2], the term "Location Server Surrogate" (LSS) is used. The potential positioning architecture is illustrated in Figure 1. The following functions can be considered as a starting point: The LSS in the gNB receives measurements from the UE and/or TRPs, calculates a location (for UE assisted mode) and sends a location to a UE or external client. In addition, the LSS would coordinate DL-PRS and UL-SRS (and beams) between UE and serving/neighbour TRPs.

Also there are deployment options available for local 5GC nodes.

There is no conclusion on LMC in NG-RAN from RAN3 or SA2 during Rel-16 SI. RAN3 did not evaluate the benefits of any of the architecture options in terms of latency towards the core network, RAN3 also did not fully evaluate, e.g., mobility issues associated with the introduction of the LMC[2].

RAN3 could not reach consensus on any recommendation for normative work[2].

Note: RAN3 has not evaluated any LSS option yet.

RAN2 will check with SA3 for privacy/security issue if we want RAN node to compute user location.



Figure 1: Positioning Architecture with LSS.

[1] 3GPP TR 38.855, "Study on NR positioning support".

[2] 3GPP TR 38.856, "Study on local NR positioning in NG-RAN".

[3] R2-2010096, "NR Positioning Latency Analysis and Enhancements", Qualcomm Incorporated.

### X.Y.2 The capability procedure

Time to first fix should be considered in latency studies and any improvements in this area can be studied. Considering TTFF in latency may relax the other core latency requirements for performing measurements and reporting to the location server for positioning computation.

Potential improvement during TTFF can be storage of UE positioning capabilities by AMF. AMF would thus forward it to LMF.

One potential way is that UE provides the positioning capabilities as part of first attach procedure or after expiry of certain timer in Tracking Area update message. AMF stores the capabilities and provides to the selected LMF. It could be done even before first positioning to speed up even the first one.

There can be cases when AMF does not have the capability stored. In such case, legacy mechanism where LMF fetches from UE can be realized. In such case when LMF has not obtained capability from AMF; LMF may upload the obtained UE capabilities to AMF.

The alternative 2: the LMF stores and forwards the capability to AMF, and then AMF store it.

Note: All approaches will have CT4 impact but should be minimal. SA2 will need to be consulted for stage 2 aspects.

### X.Y.3 SRS configuration and PRS configuration optimization

According to [1], SRS configuration+activation (step 3-8) is 66- 133ms and LPP assistance data is 28-44.5ms, if the latency consumption of these two parts can be reduced, the total E2E latency can be further optimized.

Potential solution 1: DL PRS assistance information can be pre-configured in UE. Multiple DL PRS configurations can be associated with DL PRS configuration ID and activated when necessary;

Potential solution 2: SRS for positioning configuration information can be pre-configured in UE. Multiple configurations of SRS for positioning can be associated with SRS for positioning configuration ID and activated when necessary;

In addition, for Deferred MT-LR procedure, several steps in the baseline positioning procedures would not need to be executed each time the event is triggered, e.g, UE Capability signaling, Assistance Data via broadcast or dedicated signaling, UL-SRS configuration. The latency with the baseline positioning procedures can be reduced 35.8% to 43.1% [2].

Potential solution 3: Specify signalling and procedures for Deferred MT-LR to support positioning configuration signalling in advance.

[1] R2-2009023, " Solution directions to reduce end-to-end latency ". Intel Corporation

[2] R2-2010096, "NR Positioning Latency Analysis and Enhancements", Qualcomm Incorporated.

### X.Y.4 Measurement report optimization

Grant Free UL Transmission enables reduce UL transmission delays and achieve URLLC Reliability targets. If this procedure can be used for periodic positioning measurement reporting, then signals and multiple configuration latency can be saved.

CG Type 1 is very much similar to LTE semi-persistent scheduling (SPS) where UL data transmission is based on RRC reconfiguration without any L1 signaling. RRC provides the grant configuration to UE through higher layer parameter without the detection of any UL grant in a DCI. So the periodic positioning measurement report could be sent without waiting uplink configuration.

The impact on NRPPa and measurement report optimization will be further studied in SI.

*End of Text proposal*

# 3 Conclusion

**Proposal 1: Capture the following enhancements for reducing NR positioning latency as the potential direction in potential solution section for TR 38.857. (Note: not as the recommened enhancements)**

* + **location server functionality in the RAN**
	+ **enhancement of capability procedure**
	+ **SRS configuration and PRS configuration optimizations**
	+ **measurement report optimization**

# 4 References

1. R2-2010669 Summary of 8.11.2 Enhancements for commercial use cases
2. R2-2008810 Further discussion on enhancements for commercial use cases, CATT
3. R2-2008886 Discussion on End-to-End Latency Reduction for DL/UL Positioning, InterDigital, Inc.
4. R2-2009001 Report of [Post111-e][625][POS] End-to-end latency analysis (Intel), Intel Corporation
5. R2-2009023 Solution directions to reduce end-to-end latency, Intel Corporation
6. R2-2010096 NR Positioning Latency Analysis and Enhancements, Qualcomm Incorporated
7. R2-2010276 Discussion on IDLE INACTIVE pos, on-demand PRS and latency analysis, Huawei, HiSilicon
8. R2-2010277 Discussion on R17 positioning enhancement, Huawei, HiSilicon
9. R2-2010072 Enhancements for commercial use cases, Ericsson
10. R2-2009039 Discussion on positioning enhancement, vivo
11. R2-2009137 Discussion on positioning enhancements for commercial use cases, Spreadtrum Communications
12. R2-2009577 Positioning enhancements on RRC idle/inactive UE and latency reduction, Beijing Xiaomi Electronics
13. R2-2009897 Considerations on potential positioning enhancements, Sony
14. R2-2010627 Discussion on enhancement for commercial use cases, Samsung R&D Institute UK
15. R2-2008261 [AT111-e][612][POS] Assumptions for analysis of commercial use cases, Ericsson
16. R2-2010868 [AT112-e][607][POS] Gathering of latency enhancement solutions, CATT