3GPP TSG RAN#101 **RP-232438**
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Agenda item: **9.3.1.9**

Source: **Lenovo**

Title: **Scope Reduction for Rel-18 WI on Expanded and Improved NR Positioning**

Document for: **Discussion**

1 Introduction

The Rel-18 WID on expanded and improved NR positioning was approved at the RAN#98-e meeting [1]. This WID included a comprehensive set of areas of positioning enhancements including SL positioning. At the last RAN2#123 meeting [2], the SL positioning topic consumed more than 2 TUs, however only little progress was achieved. As result, RAN2 concluded that there is a potential risk to completion of sidelink positioning based on the current objective scope.

RAN2#123 Agreements:
…
RAN2 see risk to completion of sidelink positioning with the current scope.

In this contribution, we provide our views and recommendations on the potential reduction of scope of SL Positioning.

2 Working Group Status

The SL Positioning WID objectives comprise of objectives which involve most RAN WGs including RAN1, RAN2, RAN3 and RAN4. From SA perspective, SA2 and SA3 have SL Positioning/ranging objectives with potential RAN impacts. Table 1 summarizes the current status of the different WGs for SL Positioning after the August meetings.

Table 1: Summary of SL Positioning Status on WG level

WG	SL Positioning Progress Status
RAN1	RAN1 work on specifying the basic features including SL-PRS design, SL Positioning Measurements and reporting and SL Positioning Resource allocation has been completed.
RAN2	A number of open issues remain regarding Stage 2 and Stage 3 specification including: • SL Positioning operation scenarios, e.g., Network-based and UE-only, • Seperate procedures for server UE if not part of anchor UE/target UE, e.g., server UE discovery and selection, • Supported cast types for SLPP messages, i.e., unicast/groupcast/broadcast, • Session-based and session-less operations.
RAN3	The messages were agreed on which SL Positioning/Ranging authorization information is provided over NGAP, XnAP and F1AP. RSPP/SLPP transport QoS parameters are provided from AMF to the NG-RAN for scheduled resource allocation mode resource management.

	RAN3 impacts on SL-PRS allocation need more progress from RAN1/RAN2.
SA2	Normative work on the Architectural Enhancements to support Ranging based services and Sidelink Positioning has been already finalized in May 2023 and captured in TS 23.586 [7].
SA3	Normative work on the security and privacy aspects of Ranging based services and Sidelink positioning has been finalized and captured in TS 33.533 [8]. The security features include security and privacy protection for unicast/broadcast/groupcast communication of Ranging/SL positioning control.

3 Rel-18 SL Positioning Scope Reduction

For the overall positioning topic, RAN2 has been allocated a total of 2 TUs per meeting, with RAN2#123bis and RAN2#124 remaining. Based on the current progress, it would be beneficial to discuss whether to increase the number of RAN2 TUs for the next 2 meetings or not. SL positioning is the biggest topic within the WI but considering its current rate of progress in RAN2 (without down scoping of the objectives), 2 TUs may not be sufficient to complete the WI.

The following list includes the suggested areas for SL Positioning scope reduction in order maintain the planned completion time of November 2023:

1. SL positioning for single Target UE
   - Rel-18 may only focus on the single target UE case associated with a LCS request(s).
2. Supported cast types: Limit to unicast operation for SL Positioning and consider in-coverage broadcast and groupcast, if time allows
   - Unicast support for SLPP message transmission may be considered as highest priority.
   - Since SA3 has completed their work on security features for in-coverage broadcast and groupcast, the corresponding support may be considered if time allows.
3. No separate procedures for server UE or Located UE
   - SA2 has specified procedures for server UE or Located UE including discovery and selection of such UEs.
   - In order to reduce the workload, it is recommended to assume that the server UE is collocated with the Anchor UE or Target UE and the Located UE may be equivalent to an Anchor UE with a known location.
4. Discovery parameter/meta information
   - RAN2 may simply provide SA2 with the requested information on the discovery meta data content with the principle that such data is kept minimal and high-level.

Proposal 1: The scope of the Rel-18 SL Positioning objectives can be reduced by considering the following WID updates:

- **SL positioning for single Target UE**
- **Prioritize unicast operation for SL Positioning and consider in-coverage broadcast and groupcast support, only if time allows.**
- **No separate procedures for server UE or Located UE**
- **Discovery related procedures are not discussed within RAN2.**

3.1 Supported Positioning Methods

During the SI phase, RAN1 evaluated a number of positioning methods under different scenarios, which are well documented in [3]. Furthermore, RAN1 has agreed on an initial UE feature list for a common SL-PRS processing capabilities [4] and RRC (higher-layer) parameters list [5], which support all positioning methods including SL-AoA, SL-RTT (single-sided and double-sided) and SL-TDoA. Each of these positioning methods can support the different positioning target requirements as described in Table 5.1-1 of [3].

In general, we feel that implementing SL-TDoA (including both SL-RSTD and SL-RTOA measurements) would not dramatically increase the RAN2 scope since RAN1 has already performed the majority of work including agreeing on the SL-TDoA measurement definitions, SL-TDoA assistance data and SL-TDoA measurement report signalling. The associated higher-layer parameters list has already been agreed in [5].

Furthermore, no new synchronization procedures should be defined by RAN2 for SL-TDoA positioning over and above the agreed RAN1 synchronization information to be signalled to the target-UE. The agreed synchronization information to be signalled only includes 1) RTD information between Anchor nodes and 2) Synchronization source type information as captured in the below RAN1 agreements [6]:

RAN1#114 Agreement
To mitigate the impact of synchronization errors between anchor UEs for SL-PRS based measurement, the exchanged synchronization information of anchor UEs between a UE and LMF or another UE includes the following:

- [The synchronization source type (GNSS, gNB/eNB, and UE) of anchor UEs,
    - If the synchronization source of an anchor UE is SyncRef UE, the anchor UE can optionally indicate the coverage status and synchronization connection status (whether the SyncRef UE is directly or indirectly synchronized to GNSS/gNB, or other SyncRef UE) of the SyncRef UE
    - If the synchronization source of an anchor UE is gNB, the anchor UE can further provide cell identity information]
- [Synchronization quality/accuracy information]
- The RTD between anchor UEs

RAN1#114 Agreement
Support to include the following in the exchanged synchronization information of anchor UEs between a UE and LMF or another UE:

- The synchronization source type (GNSS, gNB/eNB, and UE) of anchor UEs,

The timing alignment of SL-PRS amongst anchor nodes can be left up to implementation in Rel-18 and reconsidered for future releases to reduce Rel-18 work scope. This can be updated with a note in WID objective.

Proposal 2: Support inclusion of basic functionality of SL-TDoA. Any advanced functionality such as SL-PRS time alignment between anchor nodes and which may require input from other WGs may be considered in future releases.

3.2 Supported SL Positioning Operational Scenarios

According to [7], SA2 has specified the following SL positioning operational scenarios including 1) Network-based, 2) Network-assisted and 3) UE-only operations. These procedures are supported for in-coverage, partial coverage and out-of-coverage scenarios. Supporting all three coverage scenarios will incur a significant workload considering the remaining time available before the Rel-18 stage 3 completion and therefore we recommend to only consider the following scenarios:

- Network-based operation for only in-coverage scenarios
- UE-only operation for in-coverage and out-of-coverage scenarios

NW-based operation for in-coverage scenario would be aligned with SA2 stage 2 work, which has been the guiding principle of RAN2 work based on the following RAN2 agreement [2]:

RAN2#123 Agreement:
For LMF involved SL based positioning, follow SA2 on how to handle LMF involved SL based positioning between UE (who has connection with network), LMF and AMF. FFS on how to handle session for UEs involved in the same LMF involved SL based positioning and the relationship between routing ID/correlation ID and session ID.

RAN1 has also agreed on Scheme 1 resource allocation, which only assumes gNB (NG-RAN) involvement and therefore UE-only operation would be sufficient to perform SL Positioning (same UE-only operation would apply to Scheme 2 resource allocation as well). It is therefore recommended to only support network-based operation (in-coverage) and UE-only operation (in-coverage and out-of-coverage) in Rel-18.

Proposal 3: Only support network-based operation (in-coverage) and UE-only operation (in-coverage and out-of-coverage) in Rel-18 for SL Positioning.

4 Conclusion

The proposals relating to the potential reduction of scope of SL Positioning are summarized as follows:

Proposal 1: The scope of the Rel-18 SL Positioning objectives can be reduced by considering the following WID updates:

- **SL positioning for single Target UE**
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- **No separate procedures for server UE or Located UE**
- **Discovery related procedures are not discussed within RAN2**

Proposal 2: Support inclusion of basic functionality of SL-TDoA. Any advanced functionality such as SL-PRS time alignment between anchor nodes and which may require input from other WGs may be considered in future releases.

Proposal 3: Only support network-based operation (in-coverage) and UE-only operation (in-coverage and out-of-coverage) in Rel-18 for SL Positioning.

5 References

[1] RP-223549, "New WID on Expanded and Improved NR Positioning", RAN#98-e, Dec. 2022.

[2] R2-2308964, "Report from session on positioning and sidelink relay", Session Chair (MediaTek), RAN2#123, Aug. 2023.

[3] 3GPP TR 38.859, "Study on expanded and improved NR Positioning (Release 18)", Dec. 2022.

[4] R1-2306161, "Session Notes of AI 9.16.2", Ad-Hoc Chair (AT&T), RAN1#113, May 2023.

[5] R1-2306838, "Higher layer parameters for Rel-18 Expanded and Improved NR Positioning", Rapporteur(Intel), RAN1#114, Aug. 2023.

[6] R1-2308545, "Session notes for 9.5 Expanded and Improved NR Positioning", Ad-Hoc Chair (Huawei), RAN1#114, Aug. 2023.

[7] 3GPP TS 23.586, "Ranging based services and Sidelink Positioning (Release 18)", June 2023.

[8] 3GPP TS 33.533, "Security aspects of ranging based services and sidelink positioning (Release 18)", V1.0.0, Aug. 2023.