**3GPP TSG RAN WG1 #112bis-e R1-230XXXX**

**e-Meeting, April 17th – April 26th, 2023**

**Source: Moderator (Xiaomi)**

**Title:** **Moderator summary on discussion of RAN2 LS in R1-2302281 on RAN dependency for Ranging & Sidelink Positioning**

**Agenda item: 9.5.1**

**Document for:** **Discussion**

# Introduction

This document is the summary of comments under [112bis-e-R18-Pos-09] on drafting RAN1 reply LS on incoming RAN2 LS in R1-2302281 [1] on RAN dependency for Ranging/Sidelink Positioning.

[112bis-e-R18-Pos-09] Email discussion on RAN2 LS on RAN dependency for ranging & sidelink positioning in R1-2302281by April 26 – Qun (Xiaomi)

* Check points: April 21, April 26

# Background

In [1], RAN2 requests RAN1 to confirm whether RAN2’s response to SA2 is correct, and whether additional SL positioning QoS parameters are needed:

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| --- |
| Regarding issue 2, from RAN2 perspective, SL positioning QoS parameters may include:  - for absolute & relative positioning: absolute/relative horizontal accuracy, verticalCoordinateRequest, absolute/relative vertical accuracy, response time, and velocityRequest.  - for ranging: distance accuracy, direction accuracy, response time, and velocityRequest.  Whether additional QoS parameters are required may need to be addressed during the work item.  ……  **To RAN1**  **ACTION:** RAN2 respectfully asks RAN1 to evaluate whether RAN2’s understanding on SL positioning QoS parameters is correct and whether additional parameters are needed. |

# 1st round discussion

There are 8 companies providing their views on the reply LS draft [2-12]. Among them, 4 companies [9,10,11,12] think RAN1 can confirm that RAN2 understanding is correct.

The moderator would like to check whether consensus can be made to agree that RAN2 understanding is correct. Note that we can further discuss (in Q2 and Q3) whether additional clarification or additional parameters from RAN1 perspective is included in the reply LS.

**Q1: Do you agree that RAN1 confirms that RAN2’s understanding on SL positioning QoS parameters is correct?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes |  |
| Samsung |  | For SL absolute and relative positioning, RAN1 can confirm the RAN2 understanding since the existing LPP has the same QoS parameters for absolute positioning and it is straightforward to define these parameters also for SL absolute and relative positioning. However, SL ranging is something new and we think that further RAN1 discussion is necessary. |
| OPPO | No | See our comments to Q2 |
| CATT | No | The parameter of velocityRequest needs further clarification, as shown in Q2. |
| Intel | Yes |  |
| Xiaomi | Yes |  |
| Nokia, NSB | Yes |  |
| ZTE | Yes | RAN1 never touched the evaluation/discussion on relative velocity, etc. |

Some clarification on RAN2’s understanding was suggested to be included in the reply LS [3, 12], including:

* Option 1: RAN1 suggests to use relativeVelocityReuest rather than velocityRequest for relative positioning and ranging as in these 2 cases only relative velocity w.r.t. the reference UE can be estimated.
* Option 2: From RAN1 perspective, the response time was not evaluated in the study item and was not tasked to RAN1 for related normative work
* Option 3: RAN1 assumes that no specific solution is needed to handle to the velocity determination for SL positioning or ranging other than that for the general positioning methods.
* Option 4: RAN1 understands that the direction QoS parameter of ranging direction could correspond to direction either expressed in global coordinate system (GCS) that is referenced to geographic north or expressed in local coordinate system (LCS), and request SA2 to feedback whether the architecture design supports the ranging direction in LCS without translating to GCS.

The moderator would like to check whether there is majority view on potential clarifications on RAN2’s understanding from RAN1 perspective, using the following question:

**Q2: Does RAN1 need to provide further clarification on RAN2’s understanding from RAN1 perspective? If yes, pls indicate which option of clarifications you think is necessary.**

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Yes/No | Option | Comments |
| Qualcomm | No |  |  |
| Samsung | No |  |  |
| OPPO | Yes | Option 1, Option 2 and Option 3 | velocityRequest has already been used to request absolute velocity in absolute positioning, for ranging and relative positioning absolute velocity cannot be estimated, relativeVelocityRequest should be used to avoid ambiguity.  RAN1 should also inform RAN2 the situation about response time, absolute/relative velocity estimation as indicated in Option 2 and 3. |
| CATT | Yes | Option 1  Option 3 | Regarding the velocityRequest, further clarifications are needed from RAN1 perspective. |
| Intel | No |  | Regarding velocityRequest, given that it is already clear that it is in context of ranging, that it is referring to relative velocity should be obvious and further clarification is not needed. |
| Xiaomi | No |  |  |
| Nokia, NSB | Yes | Option 4 |  |
| ZTE | No |  | We don’t think the above information is needed to SA2. |

3 companies [9,10,11] think QoS parameters provided by RAN2 are sufficient and no additional QoS parameters are needed. However, some additional QoS parameters are proposed [2, 4, 7], including:

* priority of SL-PRS should be considered in SL positioning QoS parameters
* from RAN1 perspective, SL positioning QoS parameters may include SL positioning accuracy, SL positioning service latency, SL positioning service availability and effective SL positioning distance
* for SL ranging, it is recommended to introduce a DirectionRequest parameters in order to indicate whether a direction is requested (TRUE) or not (FALSE). RAN1 agree that additional QoS parameters may need to be addressed during the work item.

On priority of SL PRS which has been agreed in RAN1, in SA2 LS S2-2301464 to which RAN2 replied, it has been clarified that the meaning of QoS parameters refers to LCS QoS information.

|  |
| --- |
| *Regarding issue 2), RAN2 requires more information about the meaning of QoS parameters for Service Authorization, i.e. whether it is LCS QoS information or PQI like QoS.*  **SA2 Conclusion:** SA2 concludes that PQI is authorized and provisioned to the UE by 5GC with the mapping to the Ranging/SL positioning service when PC5-U is used as the SLPP transport layer. The positioning QoS parameters (i.e. LCS QoS information) may also be authorized and provisioned. From SA2 perspective, positioning QoS parameters may include accuracy and latency of direction and distance. SA2 would expect RAN WGs to evaluate if that’s a correct understanding. |

From RAN1 perspective, it is not clear whether priority of SL PRS belongs to LCS QoS information or only PQI like QoS. The moderator would suggest that RAN1 informs RAN2 on RAN1 agreement of priority of SL PRS, and asks RAN2 to determine whether SL positioning QoS parameters include priority of SL PRS.

**Q3-1: Do you agree that RAN1 informs RAN2 on RAN1 agreement of priority of SL PRS, and asks RAN2 to determine whether positioning QoS parameters include priority of SL PRS?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | No | RAN2 is already aware of the RAN1 agreement on priority. It is also already part of the sidelink resource selection flow. |
| Samsung | No |  |
| OPPO | No | RAN2 should refer to RAN1’s conclusions during their work, they can decide whether to include priority by themselves. |
| CATT | No | It seems that RAN1 agreement on priority had been known by RAN2. |
| Intel | No |  |
| Xiaomi | No |  |
| Nokia, NSB | No | We can assume that RAN2 are aware of this agreement. |
| ZTE | No | We don’t think SL PRS priority belongs to QoS parameters. It is just a RS, not service requirement. |

The Moderator would also like to check whether there is majority view on other additional QoS parameters not agreed in RAN1, using the following question:

**Q3-2: Is there any other additional SL positioning QoS parameter(s) needed from RAN1 perspective? If yes, pls indicate which of the following parameters is needed.**

**Option 1: SL positioning service latency, SL positioning service availability and effective SL positioning distance**

**Option 2: DirectionRequest parameters in order to indicate whether a direction is requested (TRUE) or not (FALSE) for SL ranging**

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Yes/No | Option | Comments |
| Qualcomm | No |  |  |
| Samsung | Yes | Option 2 | The SL ranging may include distance information only and may not include the direction information. Also, there is a scenario where only distance information is needed. Furthermore, the direction accuracy (i.e. angle accuracy) can be highly affected by the number of receiving antennas equipped by UE. In this regard, we think that the direction information needs to be provided only when it is requested. |
| OPPO | No |  | QoS parameters in Option 1 are not evaluated in RAN1 and not used in Uu positioning either.  For Option 2, as “direction accuracy” is introduced, whether direction is requested or not can be indicated with a certain accuracy value. |
| CATT | Yes | Option 1 | We think Option 1 can be provided to RAN2 for their reference when they discuss the QoS parameters. If the majority considers these parameters had not been studied in RAN1, we can live with RAN1 do not provide the parameters in Option 1 to RAN2. |
| Intel | None |  |  |
| Xiaomi | No |  |  |
| Nokia, NSB | No |  | If Option 2 (DirectionRequest) is agreed, then distanceRequest should also be included, since we defined Ranging as “determination of the distance and/or the direction between a UE and another entity”. So it is also possible that only direction is to be determined. |
| ZTE | No |  | Option 1 is similar as RAN2 reply. Option 2 is not related to the question from RAN2. |

# 2nd round discussion

From companies’ feedback in the 1st round discussion, 5 companies agree that RAN1 can confirm RAN2 understanding on SL positioning QoS parameters, and 3 companies have some concerns. From moderator understanding, the concern is mainly on the parameter **velocityRequest** for relative positioning and ranging. Therefore, the moderator thinks that we can first agree on confirming RAN2 understanding on other parameters.

**Proposal 1: RAN1 confirms that RAN2’s understanding on the following SL positioning QoS parameters is correct:**

**- for absolute positioning: absolute horizontal accuracy, verticalCoordinateRequest, absolute vertical accuracy, response time. and velocityRequest;**

**- for relative positioning: relative horizontal accuracy, verticalCoordinateRequest, relative vertical accuracy, and response time.**

**- for ranging: distance accuracy, direction accuracy, and response time.**

Pls indicate whether you can accept the above proposal 1:

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO | Yes |  |
| Lenovo | Yes |  |
| Huawei, HiSilicon |  | Regarding the response time, we would prefer to highlight to RAN2 that response time was not evaluated in RAN1 and were also not tasked to RAN1 for the normative work. |
| InterDigital | Yes | We are also ok to include the suggestion proposed by Huawei. |
| CATT | Yes |  |

On parameter **velocityRequest** for relative positioning and ranging, there are two opinions:

* Option1: RAN1 confirms that RAN2 understanding is correct without clarification;
* Option 2: RAN1 provides clarification that only relative velocity w.r.t. the reference UE can be estimated ;

As a compromise, the moderator would suggest to both confirm the RAN2 understanding on this parameter, and provide clarification in the reply LS.

**Proposal 2: RAN1 confirms that RAN2’s understanding on SL positioning QoS parameter velocityRequest for relative positioning and ranging is correct, and provide the following clarification:**

**- For relative positioning and ranging, only relative velocity w.r.t. the reference UE can be estimated.**

Pls indicate whether you can accept the above proposal 2:

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO | Yes |  |
| Lenovo | Yes, but | We wonder how this reference UE is derived, is the velocity w.r.t another anchor UE ? Further clarification may be required to avoid confusion on terminology. |
| InterDigital |  | We have a similar question as Lenovo. |
| CATT | Yes | To address the concerns from Lenovo, maybe we can change the wording of reference UE to ahchor UE. We can live with both “reference UE” and “anchor UE” and slightly prefer to use the anchor UE. |

It was also proposed to clarify RAN1 study status on response time and absolute/relative velocity estimation by some companies. However, from moderator point of view, this may not be so useful as RAN2 shall be aware of the study status of RAN1. Considering that majority companies (5 out of 8) think such clarification is not necessary, the moderator would suggest that further clarification on RAN1 study status is not further considered.

On the QoS parameter of ranging direction, it was proposed that RAN1 shall clarify that it could correspond to direction either expressed in global coordinate system (GCS) that is referenced to geographic north or expressed in local coordinate system (LCS), and ask SA2 to feedback whether the architecture design supports the ranging direction in LCS without translating to GCS. From moderator’s understanding, the issue is being discussed in [112bis-e-R18-Pos-02]. The moderator would suggest to treat the issue and discuss whether an LS to SA2 is necessary in that thread.

On additional QoS parameter priority of SL PRS, all companies think RAN1 does not need to inform RAN2 on this. Therefore, the moderator suggests that we do not need to further consider this parameter.

On other additional QoS parameters, it is clear that majority companies (6 out of 8) think no additional SL positioning QoS parameter(s) is needed from RAN1 perspective. Therefore, the moderator would suggest the following proposal:

**Proposal 3: Reply in the reply LS “RAN1 has not identified any additional SL positioning QoS parameters.”**

Pls indicate whether you can accept the above proposal 3:

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| OPPO | Yes |  |
| Lenovo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| InterDigital | Yes |  |
| CATT | Yes |  |

If you have any other comments, pls input into the following table:

|  |  |
| --- | --- |
| Company | Comments |
| Lenovo | One minor clarification on the units of “Direction Accuracy”, will it be in terms of degrees (or radians) ? For the units of the other parameters, accuracy and velocity, it is already clear. |
|  |  |
|  |  |
|  |  |

# Companies view

Some companies have provided their views in contributions, which are summarized as below:

|  |  |
| --- | --- |
| Source | Views |
| [2] | In RAN1’s view, the sensing-based resource allocation has been agreed. In the procedure of sensing-based resource selection, the priority of SL-PRS should be used for sensing. Therefore, we think the priority of SL-PRS should be considered in SL positioning QoS parameters. |
| [3][6] | **RAN1 response**:   * ***On the SL positioning parameters, RAN1 suggests to use relativeVelocityReuest rather than velocityRequest for relative positioning and ranging as in these 2 cases only relative velocity w.r.t. the reference UE can be estimated, RAN2’s understanding on the other parameters is correct and no additional parameter is needed.*** |
| [4][5] | * **From RAN1 perspective, SL positioning QoS parameters may include SL positioning accuracy, SL positioning service latency, SL positioning service availability and effective SL positioning distance.**   + **For absolute & relative SL positioning, SL positioning QoS parameters may include absolute/relative horizontal accuracy, absolute/relative vertical accuracy, SL positioning service latency, SL positioning service availability and effective SL positioning distance.**   + **For ranging, SL positioning QoS parameters may include distance accuracy, direction accuracy, SL positioning service latency, SL positioning service availability and effective SL positioning distance.** |
| [7][8] | RAN1 confirms that QoS parameters for SL absolute and relative positioning are correct. However, for SL ranging, it is recommended to introduce a *DirectionRequest* parameters in order to indicate whether a direction is requested (TRUE) or not (FALSE). RAN1 agree that additional QoS parameters may need to be addressed during the work item. |
| [9] | With regard to SL positioning QoS parameters, RAN1 confirms that RAN2’s understanding is correct, and no additional parameters are needed from RAN1 perspective. |
| [10] | RAN1 confirms that RAN2’s understanding on SL positioning parameter is correct and that the QoS parameters listed in the LS and those provided by using PC5-U as the transport layer for SLPP are sufficient. |
| [11] | Regarding RAN2’s understanding on SL positioning QoS parameters, RAN1 confirms that the understanding is correct.  RAN1 has not identified any other additional SL positioning QoS parameters. |
| [12] | ***Proposal 1: Reply to RAN2/SA2 on the response time, velocity and ranging direction.***  ***Proposal 2: Endorse the reply in the Appendix.***  RAN1 thanks RAN2 for providing the reply on the SL positioning QoS parameters. In general, RAN2’s understanding is aligned with RAN1’s. In addition, RAN1 would like to provide the follow-up answers as below.   * From RAN1 perspective, the response time was not evaluated in the study item and was not tasked to RAN1 for related normative work. * RAN1 assumes that no specific solution is needed to handle to the velocity determination for SL positioning or ranging other than that for the general positioning methods. * RAN1 understands that the direction QoS parameter of ranging direction could correspond to direction either expressed in global coordinate system (GCS) that is referenced to geographic north or expressed in local coordinate system (LCS), and request SA2 to feedback whether the architecture design supports the ranging direction in LCS without translating to GCS.   **2. Actions:**  **To RAN2, SA2**  RAN1 respectfully requests RAN2 and SA2 to take above feedback into account in their future work, and SA2 to feedback whether the architecture design supports the ranging direction in LCS without translating to GCS. |

# Summary and conclusion

TBD

Reference

1. R1-2302281 Reply LS on RAN dependency for Ranging & Sidelink Positioning RAN2, Xiaomi
2. R1-2302447 Draft Reply LS to RAN2 on RAN dependency for Ranging & Sidelink Positioning vivo
3. R1-2302527 Draft reply LS to RAN2 on RAN dependency for Ranging & Sidelink Positioning OPPO
4. R1-2302640 Discussion on RAN2 LS on RAN dependency for Ranging & Sidelink Positioning CATT
5. R1-2302641 Draft reply LS on RAN dependency for Ranging & Sidelink Positioning CATT
6. R1-2302773 Discussion on the LS from RAN2 on RAN dependency for Ranging & Sidelink Positioning OPPO
7. R1-2303097 Draft reply LS on SL positioning QoS parameters Samsung
8. R1-2303098 Discussion on SL positioning QoS parameters Samsung
9. R1-2303273 Draft Reply LS on RAN dependency for Ranging & Sidelink Positioning ZTE
10. R1-2303561 Draft Reply to LS on RAN dependency for Ranging & Sidelink Positioning Qualcomm Incorporated
11. R1-2303645 Draft Reply LS on RAN dependency for Ranging & Sidelink Positioning xiaomi
12. R1-2303800 Discussion on SL positioning QoS parameters Huawei, HiSilicon