**3GPP TSG-RAN WG2 Meeting #124 R2-230xxxx**

**Chicago, USA, Nov. 13th – 17th, 2023**

**Agenda Item:** **7.2.2**

**Source: vivo**

**Title:** **Report of [Post123bis][405][POS] Sidelink positioning discovery metafield (vivo)**

**Document for:** **Discussion and Decision**

# Introduction

This paper is the report of the following email discussion:

* **[Post123bis][405][POS] Sidelink positioning discovery metafield (vivo)**

Scope: Discuss contents of the discovery metafield from RAN2 perspective and attempt to reach consensus on what information is included.

Intended outcome: Report to next meeting

Deadline: Nov. 3rd

At the RAN2#122 meeting, SA2 informed RAN2 that SA2 has decided to include an RSPP (i.e. SLPP) metadata field during discovery, the contents of which are to be specified by RAN2. [1]

At the RAN2#123 meeting, the contents of metadata in discovery were discussed in [2], and the following were proposed based on companies’ comments:

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| **Proposal 1: RAN2 to define the individual metafield structures separately for different discovery messages (Announcement message, Solicitaion message and Response message).**  **Proposal 2: RAN2 to discuss and agree following parameters can be included in the metadata in the discovery message:**  **1) Supported sidelink positioning methods; [11]**  **2) In coverage or not; [9]**  **3) Location; [10]**  **4) PLMN; [10]**  **5) Stationary or movable; [7]**  **And Send an LS to SA2 on the agreement of discovery.** |

However, the additional parameters that can be included in the metadata from RAN2’s perspective are still FFS:

Agreement:

FFS which (if any) additional parameters can be included (as optional or mandatory) in the metadata in the discovery message for anchor and server UE selection; it should be based on technical requirements for the fields and how they will be used.

The latest procedures of Ranging/SL positioning discovery [3] in SA2 are attached in the Annex, which captures the agreed CR [4].

In general, the scope of this email discussion is to converge on the beneficial metafield in discovery from RAN2’s perspective, and provide feedback to SA2, if any.

Contact List

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# Discussion

## 2.1 General issues

In the LS [1], SA2 indicated that SA2 has decided to include an RSPP (i.e. SLPP) metadata field during discovery, the contents of which are to be specified by RAN2. Besides, the existing Metadata information in the discovery message is a container that carries the information from the application layer, and the format of the Metadata is out of the scope of the specification [5].

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| 11.2.13 Metadata  The Metadata parameter carries the application layer metadata information.  The Metadata information element is coded as shown in figure 11.2.13.1 and table 11.2.13.1.  The Metadata is a type 6 information element.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |  | | | Metadata IEI | | | | | | | | | octet 1 | | | Length of Metadata contents | | | | | | | | | octet 2 | | | octet 3 | | | Metadata contents | | | | | | | | | octet 4 | | | octet m | |   **Figure 11.2.13.1: Metadata information element**  **Table 11.2.13.1: Metadata information element**   |  | | --- | | The length of Metadata contents field contains the binary coded representation of the length of the Metadata contents field.  The Metadata contents field contains the octets indicating the Metadata parameter. The format of the Metadata parameter is out of scope of this specification. | |

From the moderator’s understanding, the intention of SA2 is that RAN2 is responsible for the specification of RSPP metadata information in the UE discovery messages. The moderator thinks it is beneficial for RAN2 as RAN2 can independently introduce new information for UE selection, if any.

**Question 1: Do companies agree that RAN2 is responsible for the specification of RSPP metafield in the UE discovery messages, i.e., the metafield is to be specified in SLPP specification?**

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| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes | The meta field should be in SLPP if it is currently specided as out of the scope fo the discovery message specification. However, the SLPP meta field should not be carried in the SLPP message per se. it is just SLPP spec defines what it is. The meta-fields are carried in the discovery message and this should be clear with companies . |
| OPPO |  | We agree that RAN2 should be responsible for the specification of RSPP metafield in the UE discovery message. |
| vivo | Yes | Agree with HW that the metafield is not expected to be included in SLPP message. |
| ZTE | Yes | RAN2 is responsible to design the content of the metadata field for SA2 spec to capture, but the metadata field should not be included in 38.355 |
| Apple | Not sure, see comments | We agree that RAN2 is responsible to decide on the content of the discovery messages.  This, however, doesn’t mean RAN2 should design the format. When TS 24.554 says it is outside of that specification it doesn’t mean it has to be in a RAN2 spec.  Furthermore, as the format is not ASN.1, we are not sure it belongs to the SLPP spec. |
| Intel | Yes | We share the same understanding with Huawei that as per SA2, RAN2 should define what content of the metafield should be (which of course is carried within the discovery message) |
| LG | Yes, but | RAN2 provides the parameters for anchor/server UE discovery from RAN2 perspective. No need to be specified in SLPP spec. |
| Xiaomi | Yes | In order to put a ASN.1 compiled field into an non asn.1 format message, it is important that the ASN.1 field is a basic unit of compiling, i.e. a PDU. To be specific, the metadata contents of metadata IE in discovery message should be defined as a SLPP PDU. |
| Lenovo | Yes | In line with most of the companies understanding, it is reasonable to assume that RAN2 can provide the SLPP meta data content but SA2 is responsible for the format and the associated discovery message signalling of this SLPP meta data. RAN2 has already agreed that UE role information is part of the SLPP meta data, the remaining issue is to agree on additional parameters, that may be useful for the discovery of SL Positioning UEs. One additional suggestion is that the meta data can be specified in the annex of the SLPP specification. |
| Samsung | Yes | Agree with HW and follow SA2 decision according to the LS. |
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It was proposed in [2] to define the individual metafield structures separately for different discovery messages (Announcement message, Solicitaion message and Response message).

In addition to the Model A and Model B discovery for 5G ProSe capable UE, the procedures of Layer-2 link establishment, i.e., Direct Communication Request/Accept messages, can also be utilized for UE discovery with V2X capable UE.

The following two types of procedures for UE discovery are attached in the Annex.

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| The procedure for Ranging/Sidelink Positioning UE discovery with 5G ProSe capable UE uses both Model A discovery and Model B discovery as defined in clause 6.3.2 of TS 23.304 [7].  The procedure for Ranging/Sidelink Positioning UE discovery with V2X capable UE uses the procedures for V2X communication over PC5 reference point as defined in TS 23.287 [6]. |

From the moderator’s understanding, the RSPP metafield in different discovery messages are with different intentions:

* The RSPP metafield in Announcement message is to indicate the supported characteristics of the UE, e.g., authorized UE role(s).
* The RSPP metafield in Ranging/SL Positioning Solicitation and Direct Communication Request messages is to indicate the required characteristics of the discoveree/discovered UE, e.g., specific UE role(s) to be discovered.
* The RSPP metafield in Ranging/SL Positioning Response message and Direct Communication Accept messages is to indicate the satisfied characteristics of the discoveree/discovered UE, e.g., the UE role(s) of the response UE.

Two alternatives can be considered from RAN2’s perspective:

* Alt 1: RAN2 to define the individual metafield structure separately for the following three types of discovery messages, e.g.,
* Metafield A in Announcement message to indicate the supported characteristics of the UE
* metafield B in Ranging/SL Positioning Solicitation and Direct Communication Request messages to indicate the required characteristics of the discoveree/discovered UE
* metafield C in Ranging/SL Positioning Response message and Direct Communication Accept messages to indicate the satisfied characteristics of the discoveree/discovered UE
* Alt 2: RAN2 to define an unified metafield structure for all the discovery messages, and the same metafield in different discovery messages will indicate different information.

**Question 2: Which alternative do companies prefer to define the RSPP metafield for different discovery messages:**

* **Alt 1: define individual metafield structure separately for the following three types of discovery messages, e.g.,**
* **Metafield A in Announcement message to indicate the supported characteristics of the UE**
* **Metafield B in Ranging/SL Positioning Solicitation and Direct Communication Request messages to indicate the required characteristics of the discoveree/discovered UE**
* **Metafield C in Ranging/SL Positioning Response message and Direct Communication Accept messages to indicate the satisfied characteristics of the discoveree/discovered UE**
* **Alt 2: define an unified metafield structure for all the discovery messages, and the same metafield in different discovery messages will indicate different information, e.g.,**
* **Metafield in Announcement message indicates the supported characteristics of the UE**
* **Metafield in Ranging/SL Positioning Solicitation and Direct Communication Request messages indicates the required characteristics of the discoveree/discovered UE**
* **Metafield in Ranging/SL Positioning Response message and Direct Communication Accept messages indicates the satisfied characteristics of the discoveree/discovered UE**
* **Alt 3: Others, please clarify.**

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| Company | Alt 1/2/3 | Comments |
| Huawei, HiSilicon | Alt2 | Alt2 seems simpler while may result in some additional overhead. The impacts can be accessed when it is finally determined how many information will be encoded in the meta-field. For the sake of the remaining discussion time in RAN2 in R18, we repfer Alt2  The meta-field contents should be transparent from SA2’s point of view and hence there should be no SA2 spec impact. |
| OPPO | Alt1 | Alt1 seems more clear for the spec. For Alt2, we wonder whether and where to capture the meaning of the same metafield of different types of discovery messages. |
| vivo |  | Alt2 is more simple for ASN.1 design but more description is needed.  If Alt 2 is preferred in RAN2, RAN2 should inform SA2 for confirmation as extra internal interaction is needed, e.g., to indicate which discovery message carries the matafield. |
| ZTE | Alt2 | We think the same information carried in different messages can have different meaning. And it is simple |
| Apple | Comments | Once again, RAN2 have never discussed ProSe discovery, this is not in our terms of reference. |
| Intel | Alt 2 | We think both options can work, but Alt-2 offers simpler design |
| LG | Alt2 | We don’t see significant benefit of separated format compared to unified format. For now, simple is better. |
| Xiaomi | Alt3 | Only one SLPP PDU format is needed for the metadata contents, and within the SLPP PDU, different optional fields are introduced for different discovery message type. |
| Lenovo | See Comments | SA2 can finally decide how the metafield is carried and structured. If we recommend a separate or unified structure, this can be notified via an LS to SA2. Metafield B is a solicitation message and Metafield C is a response to this solicitation and therefore somewhat related. A discovered UE cannot respond (using Metafield C) to the satisfied requirements outside of the scope of what was announced/requested (based on the received Metafield A or B). A unified structure (Alt.2) can therefore be applied to Metafields A and B, while Metafield C is just a subset or equivalent to what was requested in Metafield B. |
| Samsung | Alt. 3 | As for ProSe discovery procedure, specifying intention of the metafield in the SLPP specification seems better to understand what metafields do, and which message carries the metafield. The metafield could be three types which are listed in Alt. 1.  However, contents of three metafields would not be much different except its characteristic (e.g., announcement, required, satisfied) so Alt. 2. is preferred. But container (i.e., discovery message) dependency might be an issue since we rely on UE implementation for identifying discovery message type to determine additional contents of metafield implicitly.  We suggest the unified solution without container dependency i.e., Alt. 2 with the additional indicator such as "supported characteristics", "required characteristics", "satisfied characteristics". This approach is simple and may reduce additional discussion on the contents to be included within each metafield if we go with Alt. 1. |
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## 2.2 Issues related to UE roles

In the LS [1], SA2 expects RAN2 to include at least the supported UE roles (e.g. SL Reference UE, Located UE, SL Positioning Server UE) in the contents of this field. Note that SA2 distinguishes between SL Reference UE and Located UE roles, and hence sincerely asks RAN2 to specify how these roles (or an equivalent thereof) can be conveyed using the RSPP metadata field.

The definitions of reference UE, located UE and anchor UE are as follows:

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| **Located UE:** A SL Reference UE of which the location is known or is able to be known using Uu based positioning. A Located UE can be used to determine the location of a Target UE using Sidelink Positioning.  **SL Reference UE:** A UE, supporting positioning of target UE, e.g. by transmitting and/or receiving reference signals for positioning, providing positioning-related information, etc. using Sidelink.  NOTE 1: SL Reference UE is understood as "Anchor UE" in RAN WGs. |

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| **Anchor UE**: UE supporting positioning of target UE, e.g., by transmitting and/or receiving reference signals for positioning, providing positioning-related information, etc., over the SL interface. |

At RAN2 #121bis, the following were agreed regarding the UE roles in discovery:

Agreements:

RAN2 confirms that discovery messages will be used to carry information for targeted discovery and candidate selection of SL positioning UEs, including at least the indication of anchor UE, target UE. and server UE roles. FFS how much information is indicated about anchor UEs (e.g., knowledge of location).

From the moderator’s understanding, for the UE announced as anchor UE in the discovery, an indication of the availability of known location can be utilized to distinguish the Reference UE/Anchor UE from Located UE.

**Question 3: To distinguish the Reference UE/Anchor UE from Located UE, do companies agree that the UE announced as anchor UE in the RSPP metafield should also indicate the availability of known location?**

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| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | The question seems to imply that for different UE roles, the metadata fields are different. This may not be necessary from our point of view.  Then, on the question of whether the availability of known location is needed, SA2 has agreed that anchor UE selection can also be based on the location of the anchor UE. In S2-2311766. While the anchor UE selection should happen after the SLPP interaction, we think that including the known location in the SLPP message would be sufficient. Although we understand that include it earlier in the discovery message may provide some benefits, one thing we need to understand is that providing the location may take a lot of bits based on the current definition of GAD. It is a matter of tradeoff between signlaing overhead in discovery message and PC5 connection establishment. We prefer not to include it for the sake of progress. |
| OPPO | Yes | Availability of known location should be known by the network for anchor UE selection. Note that according to SA2 procedure, for absolute positioning, if the location of the selected anchor UE is unkown, additional procedure needs to be triggered for positioning of such anchor UE also, which takes time. |
| vivo | Yes | SA2 expects RAN2 to include at least the supported UE roles (e.g. SL Reference UE, Located UE, SL Positioning Server UE) in the metafield.  As RAN2 decided not to introduce located UE as a separate UE role, it is essential to indicate the availability of known location of anchor UE to distinguish Reference UE and Located UE. |
| ZTE | No | Even if RAN2 does not introduce located UE procedure, but we think in the meta data, field of UE role indication, UE should be able to include ‘located UE’ to avoid adding additional ‘known location or not’. a single field of UE role is preferred |
| Apple | No | This information should be in SLPP capabilities (can be implicit rather than explicit), not in discovery. In fact, this information WILL be in SLPP capabilities and therefore it is redundant and unnecessary in discovery. |
| Intel | Yes | As mentioned by Huawei above, several parameters (including absolute location information) would be nice to have as part of the discovery message. However, we have to consider each one carefully against the added cost in terms of signaling overhead. In our view, absolute location information is not critical to include in the RSPP metafield. |
| LG | No | We wonder if it is technically feasible for anchor UE to know the availability of acquire its location information. If GNSS is available, it is possible, otherwise, it is not guaranteed. In this case, availability of known location is useless until MO-LR service is successfully done. We think it is better to consider type of UE (i.e. stationary or movable in Q9) rather than indicate the availability of known location. |
| Xiaomi | Yes with comment | The UE role “located UE” in SA2 spec equals to anchor UE with known location or capable to have known location. The naming of this kind of UE is less important, we jsut need to clarify that the UE role in metadata contents should be able to different anchor UE with/without known location information. |
| Lenovo | No, with comment | Share the view that should strive to avoid signalling redundant information in SLPP and in the discovery message. The key issue is to agree whether “Located UE” is additionally part of the UE role information, if yes, then no need to indicate availability of location information. However, RAN2 has not aligned with SA2 on the Located UE concept since from RAN2 perspective it just an anchor UE with a known location. |
| Samsung | Yes with comment | According to the definitions, Located UE is subset of SL Reference UE/Anchor UE. The indication of known location in the RSPP metafield can be used to determine whether it is Located UE (of SL Reference UE/Anchor UE's kind) or SL Reference UE/Anchor UE (without location). |

Another valid issue related to the UE role was raised in [9], i.e., whether multiple UE roles can be indicated in the discovery message. As indicated in the definition of server UE, a UE may support anchor UE and server UE at the same time. Therefore, the support of the indication of multiple UE roles in the RSPP metafield is necessary.

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| **SL Positioning Server UE:** A UE offering method determination, assistant data distribution and/or location calculation functionalities for Sidelink Positioning and Ranging based service. It interacts with other UEs over PC5 as necessary in order to determine Ranging/SL Position method, distribute assistant data and calculate the location of the Target UE. Target UE or SL Reference UE can act as SL Positioning Server UE if any of the functionalities is supported. |

**Question 4: Do companies agree that multiple UE roles can be indicated in the RSPP metafield, e.g., anchor UE and server UE?**

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| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes |  |
| OPPO | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| Apple | Comments | Server UE for sure, everything else – what for? We don’t see how it is useful in discovery. The other roles should (will!) be indicated in SLPP capabilities (explicitly or implicitly). |
| Intel | Yes |  |
| LG | Yes |  |
| Xiaomi | Yes |  |
| Lenovo | Yes | From our understanding this addresses the two cases during the discovery procedure 1) a server UE is co-located with an anchor UE 2) a server UE is co-located with a target UE otherwise the UE may signal only a single UE role. |
| Samsung | Yes | Multiple UE roles are assumed to be colocated in a UE by its functionality according to the definition from SA2. |

Furthermore, during the previous discussion, some companies proposed that the SLPP support should be indicated in the RSPP metafield, while some companies thought that the SLPP support could be implicitly indicated by the UE role. In TS 23.586[3], SA2 also indicates the requirements of SLPP support for all the UE roles.

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| Any UE supporting Ranging/SL Positioning, e.g. Target UE, SL Reference UE, Sidelink Positioning Server UE, shall have a Ranging/SL Positioning layer, which is above the AS layer and handles service requests received from application layer to control the Ranging/SL Positioning operation. The Ranging/SL Positioning layer provides the support of authorization and provisioning as described in clause 5.1, the UE discovery and selection as described in clause 5.2, the Ranging/SL Positioning Protocol (RSPP) defined in TS 38.355 [12], and the protocols between UE and LMF for Ranging/SL Positioning. Ranging/SL Positioning layer supports the Ranging/SL Positioning service sessions for one time or periodic ranging, ranging for distance or direction measurement or both. The Ranging/SL Positioning layer provides the ranging parameters to AS layer, including one time or periodic ranging, ranging for distance or direction measurement or both.  NOTE 1: The Ranging/SL Positioning Protocol (RSPP) mention above corresponds to Sidelink Positioning Protocol (SLPP) in RAN. |

**Question 5: Do companies agree that the SLPP support can be implicitly indicated by the UE role in the RSPP metafield?**

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| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | SLPP Should be supported in all the cases for supporting ranging/sidelink positioning. Hence, there is no need to carry it. |
| OPPO | Yes | No need to capture unnecessary information in the metafield |
| vivo | Yes | No need to explicitly indicate the SLPP support in the RSPP metafiled. |
| ZTE | Yes | No need to explicitly indicate the SLPP support in the RSPP metafiled. |
| Ericsson | No | On the contrary, we do not need to advertise the UE roles in discovery. A target UE wants to identify other UEs which are SLPP capable. So, SLPP support can be adequate. |
| Apple | No | Because we don’t think UE roles besides Server UE are need in discovery, so “implicitly” wouldn’t work for UE which are not server UEs. |
| Intel | Yes | It is not clear how SLPP support is not linked to support of SL positioning/ranging. Anyway, each UE has some role to be indicated as part of the discovery and it should imply support of SLPP |
| LG | No | Same view with Apple. We understood SLPP support means anchor UE role. If target UE cannot support the functionalities of server UE, server UE should be discovered. |
| Xiaomi | Yes |  |
| Lenovo | No but | We have a different understanding. SLPP support has the option to be implicitly signalled via the announcement and solicitation discovery message based on the SL positioning application code contained within a SL discovery message. If there is a positive UE response to this application code then one may implicitly assume that the UE may potentially support SLPP but may not be definitive. Therefore, the traditional SLPP capability exchange procedure should not be disregarded for conveying such SLPP support information. |
| Samsung | See comment | It could be implicitly indicated by the UE role in RSPP metafield.  But we should consider that V2X service type or a ProSe identifier within PC5-D or PC5-S message is more reasonable and natural way to identify SLPP support implicitly.  **Ranging/SL Positioning Application Identifier:** A globally unique identifier identifying a specific Ranging/SL Positioning application, which can be mapped to a V2X service type or a ProSe identifier. |

## 2.3 Other potential information

In the RAN2#123bis meeting, there are the following proposals related to other potential information in RSPP metafield [6-15]:

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| R2-2309630  Huawei | Proposal8: No other information than UE role needs to be carried within the discovery message/DCR message. |
| R2-2309668  vivo | Proposal 8: Confirm that RAN2 is responsible for defining the structure of metafield in the discovery message, i.e., the structure of metafield is defined in SLPP specification.  Proposal 9: RAN2 to define the individual metafield structures separately for Announcement message, Solicitaion message and Response message.  Proposal 10: The SLPP metafield in Annoucement message may include:   * UE role * UE ID, e.g., Application ID * Coverage status, i.e., in coverage or not * Supported SL positioning method/measurement * Mobility status, stationary or movable * SL-PRS assistant data (e.g., sequence ID)   Proposal 11: The SLPP metafield in Solicitation message may include:   * Required UE role * Required UE ID, e.g., Application ID * Required coverage status, i.e., in coverage or not * Required SL positioning method/measurement * Required mobility status, i.e., Stationary or movable   Proposal 12: The SLPP metafield in Response message may include:   * UE role * UE ID, e.g., Application ID |
| R2-2309741  CEWiT | Proposal 9: The following parameters can be included in the metadata in the discovery message:  • SLPP support (Mandatory)  • Supported positioning methods (Optional)  • Coverage information (Optional)  • Associated PLMN (Optional) |
| R2-2309759  Xiaomi | Proposal 9 Support indicating multiple UE roles in the metafield of discovery message.  Proposal 10 To indicate the located UE role in metafield, at least the UE role “anchor UE” as well as the indication “whether the location of the anchor UE is known or able to be known” are needed.  Proposal 11 Requested UE role(s) can be indicated in the metafield of solicitation/Direct Communication Request message.  Proposal 12 Which role(s) of the requested UE role(s) are supported can be indicated in the metafield of Response/Direct Communication Response message.  Proposal 13 For discovery mode A, RAN2 to agree that at least the following information can also be included in the metafield of announcement message: supported SL positioning method(s), mobility state(stationary or not), in coverage or not, location accuracy, PLMN.  Proposal 14 For discovery mode B, RAN2 to agree that at least the following information can also be included in the metafield of solicitation/Direct Communication Request message: Requested SL positioning methods, Low Mobility required, In coverage required, LOS path required, Location accuracy requirement, PLMN.  Proposal 15 For discovery mode B, RAN2 to agree that at least the following information can also be included in the metafield of Response/Direct Communication Response message: Supported SL positioning methods. |
| R2-2310217  Intel Corporation | Proposal 6: In addition to the UE role, at least the supported positioning methods shall be included as part of the discovery messages metafield (for both model A and B). No other parameters need to be included. |
| R2-2310275  CMCC | Proposal 3: RAN2 to confirm that indication about knowledge of location could be carried by the discovery message.  Proposal 4: RAN2 to confirm that general UE capability (e.g., support of SLPP, supported positioning methods) could be carried by the discovery message. |
| R2-2310379  OPPO | Proposal 2: RAN2 to agree that the anchor UE role indication should be included in the discovery model A announcement message, and the required UE role, i.e., demand of the anchor UEs, should be included in the discovery model B solicitation message transmitted by the target UE.  Proposal 3: RAN2 to agree that the in-/out-of-coverage indication is provided in the discovery model A announcement message or the discovery model B solicitation response message transmitted by the candidate anchor UE.  Proposal 4: RAN2 to agree that the indication of the availability of the location of the anchor UE is provided in the discovery model A announcement message or the discovery model B solicitation response message transmitted by the candidate anchor UE.  Proposal 5: RAN2 to agree that the RSRP and the LOS/NOLS related information are not needed to be included in the discovery message for anchor UE selection.  Proposal 6: RAN2 to agree that the PLMN info should not be included in the Announcement message transmitted by the candidate anchor UE in discovery model A and the Solicitation msg transmitted by the target UE in the discovery model B.  Observation 3: if in the step of discovery of anchor UE, the anchor UEs could indicate it could play the role of the SL positioning server UE in the Solicitation response msg or the Announcement msg, the target UE could collect the information and only needs to perform selection of the SL Positioning Server UE in the following step.  Proposal 7: RAN2 to agree that the UE also indicates whether or not it is capable of serving as the SL Positioning Server UE in the discovery model A announcement msg or the discovery model B response msg for the anchor UE discovery procedure.  Proposal 8: RAN2 to agree that the candidate anchor UE AND the candidate SL positioning server UE indicates the supported positioning method and/or the supported positioning QoS requirement(s) as the SL positioning server UEin the discovery model A announcement msg.  Proposal 9: RAN2 to agree that the required positioning QoS requirement or the indication of the required SL positioning method(s) for selection of the SL positioning server UE should be considered to be embed in the discovery model B solicitation message transmitted by the target UE for the purpose of making selection of the qualified SL Positioning server UE. |
| R2-2310789  Lenovo | Proposal 4: RAN2 to support coverage status indication and UE mobility indication as part of the SLPP metadata message. SLPP support and PLMN may be implicitly supported via the structure of the discovery messages, i.e. based on the Application Code carried in a discovery message. |
| R2-2311032  Philips International B.V | Proposal 1: For discovery of UE roles, RAN2 needs to define the syntax for the roles to be included as part of RSPP metadata field during discovery, in line with the SA2 specs  Proposal 2: RAN2 to ask SA2 to clarify if PLMN information will be a separate field in the discovery messages or expected to be part of RSPP metadata field.  Proposal 3: An Anchor that has stable network coverage and that is/can be served by an LMF that supports Ranging/SL Positioning shall provide an In-coverage/Served by LMF indication in a Discovery Response message |
| R2-2311035  Philips International B.V | Proposal 2: An Anchor UE that determines that its location is sufficiently stable may include in a Discovery Response message an indication that it is a Located UE. |

It can be observed that the proposed information in the above contributions is still not converged compared to the suggested parameters in [2], including:

* 1) Supported sidelink positioning methods; [11]
* 2) In coverage or not; [9]
* 3) Location; [10]
* 4) PLMN; [10]
* 5) Stationary or movable; [7]

To promote progress, the moderator would focus on the suggested parameters in [2], other parameters will be treated with lower priority unless there is sufficient support.

**1) Sidelink positioning methods**

Sidelink positioning methods got the most support in [2]. Besides, the description in [3] also indicates that the anchor UE selection is based on the supported Sidelink Positioning methods. From the moderator’s understanding, the supported/required sidelink positioning methods of anchor UE can be included in the RSPP metafield to reduce unnecessary connection establishment.

|  |
| --- |
| **Section 5.2.2 of TS 23.586**  Multiple candidate Located UEs may be discovered, in that case, the Located UE(s) is selected from the candidate Located UE list. The Located UE(s) is selected based on:  - Candidate list of Located UE(s), if available  - Capabilities of the candidate Located UE(s), e.g. the supported Sidelink Positioning methods  - The required positioning QoS  - Whether the serving PLMN of candidate Located UE(s) is same with serving PLMN of Target UE |

**Question 6a: Do companies agree that the Sidelink positioning methods of anchor UE to be included in the RSPP metafield?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes | SA2 agreement is that the anchor UE selection can be based on the supported positioning method. It needs to be further discussed what is the reporting granularity. |
| OPPO | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| Ericsson | No | Capability is not part of discovery |
| Apple | No | Agree with E/// |
| Intel | Yes | In our view, indication of the supported SL positioning methods is the most important pieces of information to be included, since connection establishment afterwards relies on having this information beforehand. Otherwise, the UE has no real basis of selecting one anchor UE vs another after discovery message exchange |
| LG | Yes | RSPP metafield should include essential parameters for both session-based and session-less (considering session-less operation in next release). Due to that session-less operation does not require a mutual exchange of SLPP messages among UEs, anchor/server UE selection rely on discovery only. |
| Xiaomi | Yes | Without this information, target UE has to blindly establish sl connection with all the discovered UEs and exchange SLPP capability, which is extremly power consuming and should be avoided. |
| Lenovo | No | This is already part of the SLPP capability information exchange procedure, we should avoid redundant signalling across the layers. SL Pos. methods can anyway be considered when filtering the set of discovered UEs. |
| Samsung | Yes |  |

Furthermore, one contribution [12] proposed that the supported sidelink positioning methods of the server UE should also be indicated in the RSPP metafield. The moderator thinks the information may be valid, e.g., when server UE is only responsible for location calculation. Another approach is the server UE is assumed to support all the sidelink positioning methods. If so, the information is not needed for server UE.

**Question 6b: Do companies agree that the Sidelink positioning methods of Server UE to be included in the RSPP metafield?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes | SA2 agreement is that the anchor UE selection can be based on the supported positioning method. It needs to be further discussed what is the reporting granularity. |
| OPPO | Yes | We think that server UE may only support calculation for some positioning methods. It is obvious that distance-based and angle-based positioning method requires different positioning calculation capabilities. |
| vivo | No | Prefer the second approach, i.e., the server UE is expected to support all the capabilities/positioning methods. |
| ZTE | No | 23.586 does not say server UE selection should take methods into account. We should only define the most important and the exposed one at this stage |
| Ericsson | No | Capability and positioning method selection are not part of discovery. Discovery is to discover another SLPP capable UE- |
| Apple | Yes | This (besides general indication of SL positioning support) is pretty much the only information which is needed in discovery |
| Intel | Yes | We assume it may not be feasible for the server UE to support every SL positioning method |
| LG | Yes | See Q6a answer. |
| Xiaomi | Yes | We should not expect server UE to support all the positioning method, especially when new positioning methods are introdcued in later release. |
| Lenovo | No | A server UE is assumed to be a advanced/capable UE supporting all methods otherwise the label of “server” may defeat the purpose. |
| Samsung | Yes |  |

**2) In coverage or not, and 4) PLMN**

In the latest procedures for UE discovery in [3] (capture the agreed CR [4]), the serving PLMN of the Announcing UE and Discoverer UE has already been indicated in the discovery message, and outside the RSPP metadata information.

|  |
| --- |
| 1. The Announcing UE (UE-1) sends a Ranging/SL Positioning Announcement message. The Ranging/SL Positioning Announcement message includes the Type of Discovery Message, security protection element, RSPP metadata information, serving PLMN of Announcing UE, and the User Info ID of Announcing UE. |

From the moderator’s understanding, the serving PLMN can also implicitly indicate whether the UE is in coverage or not. Therefore, these two information may be not needed in the RSPP messages.

**Question 7: Do companies agree that the coverage status (in coverage or not) to be included in the RSPP metafield?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | There is agreement in SA2 last meeting. Anchor UE selection can be based on whether it is in coverage or out of coverage. S2-2311766. Can be put in the discovery message instead of the meta data field. This field is similar to PLMN and should be known in the SA2/CT aspects |
| OPPO | Yes | Firstly, serving PLMN does not necessarily mean that the UE is in-coverage. No such rule is made before. Secondly, S2-2311766 does not mention where SA2 has agreed to capture in-coverage or out-of-coverage indication. We think it could be included in the metafield. |
| vivo | No |  |
| ZTE | No |  |
| Ericsson | No |  |
| Apple | No |  |
| Intel | No |  |
| LG | No | Coverage status (in coverage or not) is not essential parameter but dynamic parameter. |
| Xiaomi | Yes | According to 23.586, whether to use UE only Mode is dependent on whether UE is in coverage or not：   |  | | --- | | UE-only Operation as specified in this clause is applied for the following cases:  - Neither Target UE nor SL Reference UE is served by NG-RAN.  - Network-based Operation is not supported by the 5GC network:  - When Network-based Operation is not supported by the 5GC network, indication on whether the UE is allowed to use UE-only operation to perform Ranging/ SL Positioning is included in the Policy/Parameter provisioned to UE as defined in clause 5.1.1.2, and is provisioned to the UE as defined in clause 5.1.1.1. The Target UE will take it into account to initiate UE-only operation procedure.  - SL-MO-LR request is rejected by the network. |   For us, it is ok whether it is put in discover message or metadata field. |
| Lenovo | Yes | Perhaps PLMN should not be mixed with the coverage status indication. From our side coverage status indication would be useful for discovering and filtering potential anchor UEs to reduce complexity of the SL positioning procedures. |
| Samsung | No, but please see comments | We have similar view on the in coverage indicator and serving PLMN as moderator's understanding.  However, there is a case that the UE is connected to network but the network does not support Ranging/SL Positioning. Since the EN says that RAN2 is required to determine where the indication places or whether the indication is required. We can discuss whether to specify the indication, and whether it is in discovery (could be metafield) or capability exchange for the scenario.   |  | | --- | | 5.2.3 SL Positioning Server UE Discovery & Selection  SL Positioning Server UE Discovery & Selection is performed by the Target UE, when it meets one or more of the following criteria:  - The Target UE and the discovered SL Reference UEs are currently not served by a network supporting Ranging/SL Positioning (e.g. because they are out-of-coverage or the serving network does not support Ranging/SL Positioning). The Ranging/SL Positioning Support is configured in the AMF according to network capabilities. If AMF receives Ranging/SL Positioning Capability from UE, AMF may include Ranging/SL Positioning Support indicator in the Registration Accept message to indicate that the serving network supports Ranging/SL Positioning. SL Reference UE and Target UE may indicate whether its serving network supports Ranging/SL Positioning or not to each other. The indication of serving network not supporting Ranging/SL Positioning can be reused to notify each other when UE has no NAS connection available.  Editor's note: Need to determine if such indication is provided during discovery or capability exchange, and whether or not it requires RAN WG2 involvement.  - The Target UE is not capable of performing SL Positioning Server UE functionalities.  - The SL Reference UEs are not capable of performing SL Positioning Server UE functionalities.  The discovery of SL Positioning Server UE follows the same principles as specified in clause 5.2.1. The UE can indicate its role “SL Positioning Server UE” in its list of supported roles during discovery, if it is authorized to be a SL Positioning Server UE in a given PLMN as per the Authorization and Provisioning for Ranging/SL positioning service as specified in clause 5.1.  The Target UE shall discover and select a SL Positioning Server UEs that are in the same or different serving PLMN of the Target UE and the SL Reference UE(s).  Editor's note: Other criteria for the selection of SL Positioning Server UE is FFS, and can be coordinated with RAN WGs. | |

**Question 8: Do companies agree that the PLMN to be included in the RSPP metafield?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, Hisilicon | No | SA2 has agreed that PLMN will be directly included in the discovery message not in the SLPP meta data. Tdoc number S2-2311768 |
| OPPO | No | Agree with Huawei |
| vivo | No |  |
| ZTE | No |  |
| Ericsson | No |  |
| Apple | No |  |
| Intel | No |  |
| LG | No |  |
| Xiaomi | No |  |
| Lenovo | No | Also share HW’s view. |
| Samsung | No |  |

**3) Location**

Addressed in Question 3.

**5) Stationary or movable**

The mobility status (Stationary or movable) got some support in [2]. The proponents thought the parameter is related to the QoS of the positioning, e.g., the server may select the stationary anchor UE to achieve higher positioning QoS.

**Question 9: Do companies agree that the mobility status (Stationary or movable) of anchor UE to be included in the RSPP metafield?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | SA2 has discussed but no agreement. Discussion should continue in SA2. |
| OPPO | No |  |
| vivo |  | OK to follow the majority. |
| ZTE | No |  |
| Ericsson | No |  |
| Apple | No |  |
| Intel | No |  |
| LG | Yes | It may not be essential information but we think it is useful at least for session-less operation, considering as type of UE (as static parameter), i.e., stationary is a fixed location (e.g. RSU), and movable is normal UE. |
| Xiaomi | No |  |
| Lenovo | Yes | “Movable” may not be the preferred wording. We would prefer mobility or further classification of mobility: low, medium, high mobility. |
| Samsung | Yes | If a UE is stationary and fixed such as RSU, Server UE or LMF may have the information. Selection of Anchor UE(s) will be done by Server UE or LMF considering parameters including its mobility status. However, we are not sure about Server UE or LMF have information of all stationary UEs and it is up to date. Acquiring mobility staus during discovery procedure may be helpful for Anchor UE selection by Server UE or LMF.  We don't agree this question if the mobility status represents current situation of a UE (i.e., dynamic information). We don't need to discuss about dynamic parameters in discovery which may affect after selection e.g., a UE is assumed to be same location until the session is finished when it has announced its mobility status as stationary in discovery message. |

**6) Others**

The following are proposed additional information:

a) location accuracy

b) LOS path in solicitation/Direct Communication Request

c) supported/required positioning QoS requirement(s) as the SL positioning server UE

**Question 10: Which information do companies agree to be included in the RSPP metafield?**

**a) location accuracy**

**b) LOS path in solicitation/Direct Communication Request**

**c) supported/required positioning QoS requirement(s) as the SL positioning server UE**

**d) Others, please clarify.**

Note: the above parameters will be treated with lower priority unless there is sufficient support.

|  |  |  |
| --- | --- | --- |
| Company | a/b/c/d | Comments |
| Huawei, HiSilicon | D | None |
| ZTE | D |  |
| Apple | None |  |
| Intel | D | None of these are crucial to include |
| LG | D | None in RSPP metafield. All parameters can be included in SLPP capability exchange msg for better selection. |
| Lenovo |  | These parameters can be deprioritized in this discovery discussion and be considered during the AS/SLPP discussions on filtering of discovered UEs. |
|  |  |  |
|  |  |  |
|  |  |  |

# Conclusion

xxx. TBD

# Reference

1. R2-2304651 Reply LS to LS to SA2 on Sidelink positioning procedure (S2-2305735; contact: Xiaomi)
2. R2-2309172 [AT123][430][POS] Discovery and selection for sidelink positioning (CATT)
3. TS 23.586 Architectural Enhancements to support Ranging based services and Sidelink Positioning
4. S2-2311768 Clarification on the discovery type for ProSe capable UE ZTE, Philips International B.V.
5. TS 24.554 Proximity-services (ProSe) in 5G System (5GS) protocol aspects; Stage 3
6. R2-2309630 Discussion on higher layer aspects for sidelink positioning Huawei, HiSilicon
7. R2-2309668 Remaining issues on higher layer aspects for sidelink positioning vivo
8. R2-2309741 Further discussion on SL positioning and ranging CEWiT
9. R2-2309759 Discussion on SL positioning Xiaomi
10. R2-2310217 Further considerations on sidelink positioning Intel Corporation
11. R2-2310275 Considerations on Sidelink positioning CMCC
12. R2-2310379 Further discussion on sidelink positioning OPPO
13. R2-2310789 SL Positioning Discussion Lenovo
14. R2-2311032 On sidelink positioning discovery and capabilities exchange Philips International B.V.
15. R2-2311035 On the stability of Anchor UE location Philips International B.V.

# Annex - Procedures for UE Discovery

6.4 Procedures for UE Discovery

6.4.1 General

The procedure for Ranging/Sidelink Positioning UE discovery with 5G ProSe capable UE uses both Model A discovery and Model B discovery as defined in clause 6.3.2 of TS 23.304 [7].

The procedure for Ranging/Sidelink Positioning UE discovery with V2X capable UE uses the procedures for V2X communication over PC5 reference point as defined in TS 23.287 [6].

NOTE: Application layer discovery is used for Ranging/Sidelink Positioning UE discovery with V2X capable UE that is out of scope of this specification.

6.4.2 Ranging/SL Positioning UE discovery with 5G ProSe capable UE

6.4.2.1 Ranging/SL Positioning UE direct discovery

As defined for the Model A and Model B discovery in TS 23.304 [7]:

- Model A uses a single discovery protocol message (Announcement).

- Model B uses two discovery protocol messages (Solicitation and Response).

Figure 6.4.2.1-1 illustrates the procedure for Ranging/SL Positioning UE discovery with 5G ProSe capable UE using Model A discovery.

****

**Figure 6.4.2.1-1: Ranging/SL Positioning UE discovery in Model A**

1. The Announcing UE (UE-1) sends a Ranging/SL Positioning Announcement message. The Ranging/SL Positioning Announcement message includes the Type of Discovery Message, security protection element, RSPP metadata information, serving PLMN of Announcing UE, and the User Info ID of Announcing UE.

NOTE 1: The content type value of the message indicates the Type of Discovery Message.

The Destination Layer-2 ID used to send the Ranging/SL Positioning Announcement message is configured in clause 5.2.

The Source Layer-2 ID to send the Ranging/SL Positioning Announcement message is self-assigned by the Announcing UE.

Announcing UE sends the Announcement message only if it is authorized to be the corresponding UE role in RSPP metadata information.

The User Info ID of Announcing UE is the Announcing UE's Application Layer ID.

A Monitoring UE determines the Destination Layer-2 ID for signalling reception based on the configuration in clause 5.2.

A Monitoring UE selects the Announcing UE based on the information received in step 1.

Editor's note: The RSPP metadata information (e.g. the role(s) of the Announcing UE) is included as the metadata in the Announcement message, which value is determined by RAN WG2.

Editor's note: How the RSPP metadata information is used to convey that a UE is a “Located UE” needs to be aligned with RAN WG2.

Figure 6.4.2.1-2 illustrates the procedure for Ranging/SL Positioning UE discovery with 5G ProSe capable in Model B discovery.

****

**Figure 6.4.2.1-2: Ranging/SL Positioning UE discovery in Model B**

1. The Discoverer UE (UE-1) sends a Ranging/SL Positioning Solicitation message. The Ranging/SL Positioning Solicitation message includes the Type of Discovery Message, security protection element, optionally User Info ID of Discoveree UE, User Info ID of Discoverer UE and optionally RSPP metadata information.

NOTE 2: The content type value of the message indicates the Type of Discovery Message.

The Destination Layer-2 ID used to send the Ranging/SL Positioning Solicitation message is configured in clause 5.2.

The Source Layer-2 ID to send the Ranging/SL Positioning Solicitation message is self-assigned by the Discoverer UE.

The User Info ID of Discoverer UE is the discoverer UE's Application Layer ID.

User Info ID of Discoveree UE is to identify a specific UE that the discoverer UE would like to discover, which is identified by Discoveree UE's Application Layer ID.

A Discoveree UE determines the Destination Layer-2 ID for signalling reception based on the configuration in clause 5.2.

Editor's note: The RSPP metadata information (e.g. the specific Role(s) to be discovered) is included as the metadata in the Solicitation message, which value is determined by RAN WG2.

2 The Discoveree UE that matches the Ranging/SL Positioning solicitation message (e.g. RSPP metadata information) responds to the Discoverer UE with the Ranging/SL Positioning Response message. The Ranging/SL Positioning Response message includes Type of Discovery Message, security protection element, RSPP metadata information, serving PLMN of Discoveree UE, user Info ID of the Discoveree UE.

NOTE 3: The content type value of the message indicates the Type of Discovery Message.

The Source Layer-2 ID used to send the Ranging/SL Positioning Response message is specified in clause 5.2.

The Destination Layer-2 ID is set to the Source Layer-2 ID of the received Ranging/SL Positioning Solicitation message.

The User Info ID of Discoveree UE is the Discoveree UE's Application Layer ID.

Discoveree UE sends the Response message only if it is authorized to be the corresponding UE role in the solicitation message.

The Discoverer UE selects the Discoveree UE based on the information received in step 2, when User Info ID of Discoveree UE is not included in Ranging/SL Positioning Solicitation message.

Editor's note: The RSPP metadata information (e.g. the role(s) of the Discoveree UE) is included as the metadata in the Announcement message, which value is determined by RAN WG2.

6.4.2.2 Ranging/SL Positioning group member discovery with 5G ProSe capable UE

Figure 6.4.2-1 illustrates the procedure for Ranging/SL Positioning group member discovery with 5G ProSe capable in Model A discovery.

****

**Figure 6.4.2.2-1: Ranging/SL Positioning group member discovery in Model A**

1. The Announcing UE sends a Ranging/SL Positioning Group member discovery Announcement message. The Announcement message includes the Type of Discovery Message, serving PLMN of Announcing UE, User info ID of the Announcer UE, Group ID and RSPP metadata information.

NOTE: The content type value of the message indicates the Type of Discovery Message.

The Destination Layer-2 ID used to send and receive the Ranging/SL Positioning Group member discovery Announcement message is described in clause 5.8.1.2 of TS 23.304 [7].

The Source Layer-2 ID used to send and the Ranging/SL Positioning Group member discovery Announcement message is self-assigned by the Announcing UE.

Announcing UE sends the Announcement message only if it is authorized to be the corresponding UE role in RSPP metadata information.

The User Info ID of Announcing UE is the Announcing UE's Application Layer ID.

Editor's note: The RSPP metadata information (e.g. the role(s) of the Announcing UE) is included as the metadata in the Announcement message, which value is determined by RAN WG2.

Figure 6.4.2.2-2 illustrates the procedure for Ranging/SL Positioning Group member discovery with 5G ProSe capable in Model B discovery.

****

**Figure 6.4.2.2-2: Ranging/SL Positioning Group member discovery in Model B**

1. The Discoverer UE (UE-1) sends a Ranging/SL Positioning Group member discovery Solicitation message. The Solicitation message includes the Type of Discovery Message, User Info ID of Discoverer, Group ID, optionally User Info ID of Discoveree UE and optionally RSPP metadata information.

NOTE: The content type value of the message indicates the Type of Discovery Message.

The Destination Layer-2 ID used to send and receive the Solicitation message is described in clause 5.8.1.2 of TS 23.304 [7].

The Source Layer-2 ID to send the Ranging/SL Positioning Solicitation message is self-assigned by the Discoverer UE.

The User Info ID of Discoverer UE is the Discoverer UE's Application Layer ID.

User Info ID of Discoveree UE is to identify a specific UE that the discoverer UE would like to discover, which is identified by Discoveree UE's Application Layer ID.

Editor's note: The RSPP metadata information (e.g. the specific Role(s) to be discovered) is included as the metadata in the Solicitation message, which value is determined by RAN WG2.

2 The Discoveree UE that matches the values of the parameters (including Group ID and User Info ID of Discoveree UE) contained in the Ranging/SL Positioning Group member discovery solicitation message, responds to the Discoverer UE with the Ranging/SL Positioning Group member discovery Response message. The Ranging/SL Positioning Response message includes Type of Discovery Message, serving PLMN of Discoveree UE, the User Info ID of Discoveree, the RSPP metadata information and the Group ID.

The Source Layer-2 ID used to send the Ranging/SL Positioning Group member discovery Response message is self-assigned.

The Destination Layer-2 ID is set to the Source Layer-2 ID of the received Ranging/SL Positioning Group member discovery Solicitation message.

Discoveree UE sends the Response message only if it is authorized to be the corresponding UE role in the solicitation message.

The User Info ID of Discoveree UE is the Discoveree UE's Application Layer ID.

Editor's note: The RSPP metadata information (e.g. the role(s) of the Discoveree UE) is included as the metadata in the Announcement message, which value is determined by RAN WG2.

6.4.3 Ranging/SL Positioning UE discovery with V2X capable UE

The procedure for Ranging/SL Positioning UE discovery and selection with V2X capable UE uses the procedures of Layer-2 link establishment over PC5 reference point in clause 6.3.3 of TS 23.287 [6] as basis with following differences and clarifications:

- The Service Type in Layer-2 link establishment procedure indicates "Ranging/Sidelink Positioning" service, the Policy/Parameter provisioning for "Ranging/Sidelink Positioning" service is defined in clause 5.2.

- In step3, the UE determines the destination Layer-2 ID based on the configuration in clause 5.2 for the RSPP transport. The V2X service info indicates "Ranging/Sidelink Positioning" in the Direct Communication Request message. The Direct Communication Request message may include the RSPP metadata information.

Editor's note: The RSPP metadata information (e.g. the specific Role(s) of to be discovered) is included as the metadata in the Direct Communication Request message, which value is determined by RAN WG2.

- In step 4, the QoS info is for the RSPP transport.

- In step 5, the Direct Communication Accept message includes the RSPP metadata information for the Ranging/Sidelink Service oriented Layer-2 link establishment.

Editor's note: The RSPP metadata information (e.g. the role(s) of the response UE) is included as the metadata in the Direct Communication Accept message, which value is determined by RAN WG2.