**SA WG2 Meeting #162 S2-2404663r01**

**15 - 19 April, 2024, Changsha, China (revision of S2-24xxxxx)**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **23.586** | **CR** | **0131** | **rev** | **-** | **Current version:** | **18.3.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | Update about the UE role in PC-5 service exposure scenario |
|  |  |
| ***Source to WG:*** | OPPO |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | Ranging\_SL |  | ***Date:*** | 2024-04-05 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | According to the LS (S2-2403915, SP-240497) from SA plenary and related CRs, the service exposure to client UE via 5GC is removed. It means for PC-5 service exposure, if the network based SL Positioning is to be used, UE1 can only trigger a SL-MO-LR to get its own positioning information (UE1 as target UE). So it is proposed to let the client UE only send the request to UE1 which will work as the target UE to avoid UE1 reselection.Currently, it is not aligned about the role of target UE and the UE receiving the SL positioning request when considering the UE discovery and SLPP message forwarding.It is specified in caluse 6.6 that to acquire absolute location of Target UE, the UE1 which receives the service request should be the same with the target UE. While in 5.6.2.2 6.7.1.1 and 6.8, the UE1 can be a SL reference UE/Located UE.It is proposed to align the whole specification to clarify that for PC-5 service exposure, UE1 can only be the target UE.According to the principle above, clause 5.11 should also be updated for the UE-only Operation to avoid extra complexity in PC-5 service exposure scenario. |
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| ***Summary of change:*** | Update clause 5.6.2.2, 5.11, 6.7.1.1, 6.8 to align that UE1 can only be the target UE. |
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| ***Consequences if not approved:*** | It is not aligned about the UE role in PC-5 service exposure scenario. |
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| ***Clauses affected:*** | 5.6.2.2, 5.11, 6.7.1.1, 6.8 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ... |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* \* First change \* \* \* \*

#### 5.6.2.2 Ranging/SL Positioning service exposure through PC5

For Ranging/SL Positioning service exposure to a UE through PC5 in the following way:

- SL Positioning Client UE discovers one of the two or more UEs described in clause 5.6.1, e.g. the SL Reference UE(s) or Target UE(s), using the Ranging/SL Positioning UE discovery procedure (refer to clause 6.4);

- SL Positioning Client UE invokes the Ranging/SL Positioning service request to the discovered UE, i.e. Target UE, with the attributes described in clause 5.6.1. For absolute location, this service request includes the SL Positioning Client UE's user info and Target UE's user info, and may also include the user info for a list of candidate Located UE(s). For relative location or ranging information, the service request includes the SL Positioning Client UE's user info, Target UE's user info, and SL Reference UE's user info. The Ranging/SL Positioning service request/response is conveyed by PC5-U and handled in the Ranging/SL Positioning layer. The Ranging/SL positioning service request/response is handled as application layer traffic by V2X layer or 5G ProSe layer.

- The UE which received a SL positioning service request from SL Positioning Client UE triggers the authorization of SL Positioning Client UE for the Ranging/SL Positioning exposure service invocation during PC5 link establishment as specified in TS 33.533 [13], performs the Ranging/SL positioning control between SL Reference UE and Target UE (as defined in clause 5.3), and returns the Ranging/SL positioning result to SL Positioning Client UE.

- UE privacy is based on the local configured privacy verification information to determine whether its location related information can be exposed to the peer UE or not. If the privacy profile allows location exposure, the UE accepts the request to expose its location related information and proceeds.

\* \* \* \* Next change \* \* \* \*

5.11 UE-only Operation for SL Positioning using Located UE

When LMF is not involved for SL Positioning/Ranging, e.g. the LMF in the serving network does not support SL Positioning, UE-only Operation SL Positioning is used, including Target UE as SL Positioning Server UE and Target UE not as SL Positioning Server UE.

When the Target UE acts as a SL Positioning Server UE, the following principles applies:

- The Target UE performs the Located UE's discovery and selection when absolute location is requested.

- For absolute location, the Target UE obtains the location of the Located UE(s), and the Located UE(s) may trigger a 5GC-MO-LR to retrieve its location. The Target UE uses the location of Located UE(s) together with the Ranging/SL positioning measurement data or result to estimate its own location.

- The Ranging/Sidelink positioning and the positioning of the Located UE(s) can be scheduled with the same scheduled location time (as per TS 23.273 [8]) to improve the Target UE positioning accuracy.

NOTE: Security and privacy aspects require confirmation from SA WG3.

When the Target UE does not act as SL Positioning Server UE, the following principles applies:

- The Target UE performs the SL Positioning Server UE's discovery and selection.

- The Target UE requests its absolute location from the SL Positioning Server UE.

- The SL Positioning Server UE interacts with the Target UE to exchange UE capabilities, assistance data, Ranging/SL positioning measurement data, location results and location of Located UE(s).

- The SL Positioning Server UE can optionally determine to use the location of Located UE(s) together with the Ranging/SL positioning measurement data or result to estimate the absolute location of Target UE.

- The Target UE performs the Located UE's discovery and selection, and obtains the location of the Located UE(s).

- The SL Positioning Server UE returns the Ranging/SL positioning result to the Target UE.

- The Ranging/Sidelink positioning and the positioning of the Located UE(s) can be scheduled with the same scheduled location time (as per TS 23.273 [8]) to improve the Target UE positioning accuracy.

When UE-only operation is triggered for the service request from a SL Positioning Client UE, the SL positioning client UE shouldsend the service request to the UE that will work as the Target UE.

\* \* \* \* Next change \* \* \* \*

#### 6.7.1.1 Procedures for Ranging/SL Positioning service exposure through PC5



Figure 6.7.1-1: Service exposure to SL Positioning Client UE via PC5

1. When a Ranging/SL Positioning service is triggered, SL Positioning Client UE may perform discovery procedure for the Ranging/SL Positioning service defined in clause 6.4 with following updates:

- When SL positioning service is triggered, the client UE tries to discover the target UE and/or one or more SL Reference UE(s)/Located UE(s). When Model B discovery used, in the Solicitation message, target UE's user info is included and role of target UE and role of SL Reference UE/Located UE are indicated in the RSPP metadata.

- When Ranging service is triggered, the client UE tries to discover UE1 and/or UE2. When Model B discovery used, in the Solicitation message, UE1's user info and UE2's user info are included and role of target UE is indicated in the RSPP metadata.

 During discovery for SL positioning service, the information of SL reference UE(s)/Located UE(s) is acquired.

2. If discovery procedure succeeds, the SL Positioning Client UE establishes a PC5 connection with the discovered UE.

3. The SL Positioning Client UE is informed of UE's status information indicating that UE has NAS connection or no NAS connection from the discovered UE(s).

Editor's note: Need to determine if such indication is provided during discovery or step 3, and whether or not it requires RAN WG2 involvement.

 The SL Positioning Client UE may receive a supplementary RSPP signalling message including list of SL Reference UE(s)/Located UE(s) from target UE over the PC5 connection.

4. Based on UE's status information, the SL Positioning Client UE may downselect UE(s) to perform SL Positioning operation and select a UE (here UE1) to receive SL Positioning Service Request. The SL Positioning Client UE sends a SL Positioning Service Request using supplementary RSPP signalling message which includes info of SL Positioning Client UE, info of Target UE and info of SL Reference UE(s)/Located UE(s).

 For absolute location, the SL Positioning Client UE sends a SL Positioning Service Request which includes info of SL Positioning Client UE, info of Target UE, and required positioning QoS. The Service Request may include info of list of candidate Located UE(s).

 For relative location, the SL Positioning Client UE sends a SL Positioning Service Request which includes info of SL Positioning Client UE, info of Target UE, info of SL Reference UE(s), and required positioning QoS.

 For ranging, the SL Positioning Client UE sends a SL Positioning Service Request which includes info of SL Positioning Client UE, info of UE1, info of UE2, and required positioning QoS.

 For ranging, if UE1 and UE2 are not in proximity, the SL Positioning Service Request is responded with reject by the receiving UE (either UE1 or UE2) and remaining steps are not performed.

5. Authorization check of the SL Positioning Client UE for the service request may be performed via SL Positioning Server UE or 5GC or internally by UE1 (i.e. target UE).

6. The UE which received SL Positioning Service Request (here UE1) selects LMF or SL Positioning Server UE based on its status whether UE has NAS connection. Ranging/SL Positioning operation is performed as described in clause 6.8 among target UE, SL Reference UE(s)/Located UE(s) and SL Positioning Server UE or LMF.

7. The Ranging/SL Positioning result is provided to the SL Positioning client UE by UE1.

\* \* \* \* Next change \* \* \* \*

## 6.8 Procedures of Ranging/Sidelink Positioning control

Either UE-only Operation or Network-based Operation is applied in the Ranging/Sidelink Positioning control procedures.

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 as described in clause 5.2.3.

- Response to SL-MO-LR request allows the UE only operation for a period of time by the network due to congestion.

For any other cases, Network-based Operation as specified in clauses 6.20 of TS 23.273 [8] is applied.



Figure 6.8.1-1: Procedures for Ranging/Sidelink Positioning control (UE-only operation)

1. UE1 (i.e. Target UE) may receive a Ranging/SL Positioning Service request from:

1a. SL Positioning Client UE over PC5 during procedures for Ranging/SL Positioning service exposure through PC5 as defined in clause 6.7.1.1.

 For absolute location, the service request includes the SL Positioning Client UE's user info and Target UE's user info, and required positioning QoS and may also include the user info for a list of candidate Located UE(s).

 For relative location or ranging information, the service request includes the SL Positioning Client UE's user info, Target UE's user info, SL Reference UE's user info (UE2/.../UEn), and Ranging/SL Positioning QoS information.

1b. RSPP application layer.

 The service request includes type of the result (i.e. absolute location, relative location or ranging information) and the required QoS.

2. UE1 discovers UE2/.../UEn (i.e. SL Reference UEs/Located UEs and optionally whether they support SL Positioning Server UE role) as defined in clause 6.4, if needed.

NOTE 1: Details of security related procedures during UE discovery are developed by SA WG3.

3. If none of UE1/.../UEn are served by NG-RAN or the serving network does not support Ranging/SL Positioning, UE-only Operation is applied.

4. UE1 and UE2/.../UEn perform capability exchange using SLPP messages. Step 4 may be performed during step 7 with coordination of SL Positioning Server UE.

 Before the step4, UE1 establishes the secure PC5 link with UE2/.../UEn.

 In addition, if UE1 acts as SL Positioning Server, UE1 may also request for the absolute location of UE2/.../UEn from UE2/.../UEn using the supplementary RSPP signalling message, and absolute location of UE2/.../UEn is transferred by UE2/.../UEn to UE1 by the supplementary RSPP signalling message; and

 UE1 selects the Located UEs (e.g. UEx/…/UEy) from UE2/.../UEn for the subsequent SL positioning/ranging operation (e.g., based on information received during discovery, Ranging/SL Positioning capability of UE1/UE2/.../UEn, the absolute location of UE2/.../UEn).

5. If UE1 does not support SL Positioning Server functionalities or UE1 opts to select a SL Positioning Server UE different from UE1, a SL Positioning Server UE (either co-located with a SL Reference UE/Located UE, or operated by a separate UE) is discovered (if not yet discovered in step 2) and selected. If a SL Positioning Server UE is co-located with a SL Reference UE/Located UE or operated by a separate UE, UE1 discovers and selects the SL Positioning Server UE as described in clauses 5.2.3 and 6.4. UE1 establishes the secure PC5 link with the selected SL Positioning Server UE.

NOTE 2: UE1 may be able to perform the selection of the SL Positioning Server UE based on information obtained in step 2.

 If the Located UE is served by NG-RAN, it may use 5GC-MO-LR procedure to retrieve its absolute location.

NOTE 3: Details of security and privacy related procedures during SL Positioning Server UE discovery and operation are developed by SA WG3.

NOTE 4: Steps 5a, 5b, 6, 7, 8a, 9, 11, 13 are performed only when SL Positioning Server UE is different from UE1.

6. If a SL Positioning server UE is selected, UE 1 sends a Ranging/SL positioning request using supplementary RSPP signalling message to the selected SL Positioning Server UE. This request indicates the other UEs 2 to n using the Application layer ID and indicates the Ranging/SL positioning result types needed (e.g. absolute locations, relative locations or distances and directions between pairs of UEs). The required QoS for Ranging/SL positioning is also indicated.

7. The SL Positioning Server UE sends requests to UE1 for capability of UE1 using the SLPP message and for the capabilities of UE2/.../UEn using the supplementary RSPP signalling (e.g. including SLPP containers that may contain Sidelink Positioning capability request for UE2/…/UEn) message with the corresponding Application Layer ID of UE2/.../UEn. UE1 responds to the SL Positioning Server UE with its own capability using SLPP message and the capabilities of UE2 to n using the supplementary RSPP signalling message (e.g. including SLPP containers that may contain Sidelink Positioning capability of UE2/…/UEn) with the corresponding Application Layer ID of UE2/.../UEn. If step 4 did not occur, UE1 retrieves capabilities from UE2/…/UEn using SLPP messages during this step.

 The SL Positioning Server UE may downselect the UEs (e.g. UEx/…/UEy) from UE2/.../UEn for the subsequent SL positioning/ranging operation (e.g., based on UE capability).

8. The SL Positioning Server UE provides the Sidelink Positioning assistance data to UE1.

8a. For the Sidelink Positioning assistance data used by UE1, it is transmitted by SLPP message.

8b. For the Sidelink Positioning assistance data used by UEx/…/UEy, it is transmitted using the supplementary RSPP signalling messages (e.g. including SLPP containers that may contain Sidelink Positioning assistance data for UEx/…/UEy) with the corresponding Application Layer ID of UEx/…/UEy and then UE1 sends the assistance data to each UE (UEx/…/UEy) by SLPP messages.

9. The SL Positioning Server UE sends requests to UE1 for SL measurement information of UE 1 and UEx/…/UEy, if the SL Positioning Server UE performs the result calculation. For the SL measurement information of UE1, the request uses the SLPP message. For the SL measurement information of UEx/…/UEy, the request uses the supplementary RSPP signalling message (e.g. including SLPP container that may contain Sidelink Positioning location measurements request for UEx/…/UEy) with the corresponding Application Layer ID of UEx/…/UEy. In addition, the SL Positioning Server UE may also request for the absolute location of UEx/…/UEy from UE1 using the supplementary RSPP signalling message with the corresponding Application Layer ID of UEx/…/UEy.

10. If a SL Positioning Server UE different from UE1 is selected in step 5, SL-PRS measurement is performed between UE1 and UEx/…/UEy and possibly also amongst UEx/…/UEy. The UE1 requests for the SL measurement information from UEx/…/UEy by the SLPP messages and/or the absolute locations of UEx/…/UEy from UEx/…/UEy by supplementary RSPP signalling messages if requested in step9 by SL Positioning Server UE. The SL-PRS measurement data is transferred to UE1 using SLPP messages.

11. SL-PRS measurement data of UE1 is transferred by SLPP message to the SL Positioning Server UE and SL-PRS measurement data of UEx/…/UEy is transferred by UE1 using the supplementary RSPP signalling message (e.g. including SLPP container that may contain SL-PRS measurement data of UEx/…/UEy) with the corresponding Application Layer ID of UEx/…/UEy to the SL Positioning Server UE if requested in step 9 in order to perform result calculation. Absolute location of UEx/…/UEy is transferred by UE1 to the SL Positioning Server UE by the supplementary RSPP signalling message with the corresponding Application Layer ID of UEx/…/UEy if requested in step9.

12. Based on the result types requested in step 6, absolute location, relative location or ranging information is calculated at the SL Positioning Server UE.

NOTE 5: Details of step 4-12 are developed by RAN WGs.

NOTE 6: The supplementary RSPP signalling message mentioned above is conveyed by PC5-U and handled in the Ranging/SL Positioning layer, whose detailed design is left to stage 3.

NOTE 7: The privacy aspects of transferring the location of Located UE via UE1 to the Server UE are developed by SA WG3.

13. The SL Positioning Server UE selected in step 5 sends a Ranging/SL positioning response using supplementary RSPP signalling message to UE1 including the result that is required in step 6.

14. Ranging/SL Positioning result is transferred to:

14a. SL Positioning Client UE over PC5 during procedures for Ranging/SL Positioning service exposure through PC5 as defined in clause 6.7.1.1;

14b. Application layer.

\* \* \* \* End of changes \* \* \* \*