**3GPP TSG-WG SA2 Meeting #159 *S2-2310294***

**Xiamen, China, Oct 9 – 13, 2023 (revision of S2-2309039)**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **23.273** | **CR** | **0421** | **rev** | **1** | **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 on 5GC-MT-LR Procedure using SL positioning |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | Ranging\_SL |  | ***Date:*** | 2023-09-29 |
|  |  |  |  |  |
| ***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:*** | The procedure is not completed, and some agreed featurs are missing.For example, LMF shall be able to determine whether the located UE needs to be involved in the positioning or not, and which entity (i.e., LMF or Target UE) is responsible for selecting the Located UE.Correcting the alternative method of estimating the relative location between UE1 and the undiscovered UEs to limit the case to when the absolute location of UE1 is know by the LMF in step 17. The LMF may not have the absolute location of UE1 if the initial request in step 1 didn’t include the request for the absolute location of UE1, and in that case this optional method will not work.In LS S2-2306316 (R1-2304152) from RAN1, SA2 was informed that relative velocity w.r.t. another UE can be estimated. Therefore these should be added to the list of results that the procedure can provide.In radar application ‘range’ is the distance between a radar site and object. In TS 23.586 range is defined as a straight line between target UE and another UE. Range is used 6 times in TS 23.586 including the paragraph that defines range. In clause 3 in TS 23.586, Ranging is defined and the output is: the distance between two UEs or more UEs and/or the direction of one UE (i.e. Target UE) from another UE. Distance is used 21 times in TS 23.586. As Ranging in rel-19 is not using radar to acquire the distance (range) and distance is a more general word, it is suggested to use ‘distance’ instead of ‘range’.Also some terms have been aligned with definitions in TS 23.586. According to TS 38.355, SLPP messages include Capabilities Request/Response, Assistance Data Request/Response and Location Information Request/Response. The RAN2 agreement stated in S2-2310118 implies that the assistance information provided from LMF to UE over SLPP does not need to be defined by SA2.It is proposed that any SA2 defined information provided from LMF to UE is not transmitted over SLPP as the assistance information. For the SA2 defined information, if it is not related to capability, assistance data and location information, it is transmitted within supplementary services message to be developed by CT1.No procedure to support local coordiante concept.Procedures of SL-MT-LR involving LMF in clause 6.20 has the following issues:1. The LCS Client or the AF may have the information of Apps applying Ranging/Sidelink Positioning location results, the UE location, UE capability, UE roles (e.g. target UE, reference UE), etc, so it may know which UE is more suitable to be the initiator UE that initiates the Ranging/SL Positioning.
2. When (H)GMLC selects the initiator UE that initiates the Ranging/SL Positioning, if the selected UE is not reachable, the following steps cannot be performed successfully.

For the the relative locations or distances and/or directions related to the UEs, it can obtained through the Ranging/SL Positioning provedure or through their absolute locations. But now the creteria is not clear. |
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| ***Summary of change:*** | 1. LMF decides that target UE or LMF selects Located UE.2. LMF performs the Located UE selection based on the the obtained information of all the discovered Located UEs, and sends Application layer ID of the selected Located UEs to the UE1 in step 16.3. To clarify the Application layer ID of the selected Located UEs is used.Correcting the alternative method to estimate the relative location between UE1 and the undiscovered UEs.Adding velocities and relative velocities to the list of results.Change Sideling positioning/Ranging to Ranging/Sidelink positioning to align the term with TS 23.586Change ‘range’ in to ‘distance’ Adding the correct reference in the figure, and chance the capture of step 20 to LCS Service Response.Clarify that application layer ID and the SL-MT-LR request are transmitted within supplementary services message.It is proposed to add “local coordiante” for sidelink absolute positioning.1. Propose target UE ID can be either either a SUPI or a LCS Correlation identifier
2. An initiator UE indication may be included to help (H)GMLC select the corresponding UE as the initiator UE.
3. If the UE is not reachable, the (H)GMLC does not select it as the initiator UE.
4. The LMF determins to obtain the relative locations or distances and/or directions related to the UEs through the Ranging/SL Positioning provedure or through their absolute locations, based on the UE capabilities of supported positioning method (SL, or Uu, or both), supported algrithms, accuracy, delay, etc.
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| ***Consequences if not approved:*** | The procedure is not completed. |
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| ***Clauses affected:*** | 6.20.5, 6.20.3 |
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|  | **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 \* \* \* \*

### 6.20.5 5GC-MT-LR Procedure using SL positioning

The procedure is used to estimate the location of a UE by using the location of one or more Located UEs and the distance and/or direction between the UE and the Located UE(s). The procedure may be triggered by GMLC, if the location result of Target UE determined by NR positioning cannot fulfil the required accuracy.

Procedure of Figure 6.1.2-1 can be reused, with step 12 of Figure 6.1.2-1 replaced by the step 10-16 of Figure 6.20.3-1 with the following adaptations:

- UE1 is the target UE, and UEs 2 to n are Located UEs.

- In step 1, LCS Client or the AF (via NEF) may also send the GPSI or SUPI of the Located UE(s), and the required location results indicating “absolute location”.

- In step 10, the types of required location results is absolute solution, and the other UEs 2 to n are the candidate Located UE(s) if included. After LMF determines that the assistance of Located UE is needed for Target UE Positioning, LMF decides that target UE or LMF selects Located UE, and SL-MT-LR request also includes the indication of Target UE/LMF selecting Located UE.

- In step 14, if UE1 receives the indication of LMF selecting Located UE in step 11, SL-MT-LR response includes the obtained information of all the discovered Located UEs. LMF performs the Located UE selection based on the the obtained information of all the discovered Located UEs, and sends Application layer ID of the selected Located UEs to the UE1 in step 16. If UE1 receives the indication of Target UE selecting Located UE in SL-MT-LR request, UE1 performs the Located UE selection, and SL-MT-LR response includes Application layer ID of the selected Located UEs.

\* \* \* \* Second change \* \* \* \*

### 6.20.3 Procedures of SL-MT-LR involving LMF

The SL-MT-LR procedure is used to estimate the relative locations or distances and/or directions between the UEs.

Figure 6.20.3-1 illustrates a procedure to enable an LCS Client or AF to obtain Ranging/Sidelink Positioning location results for a group of n UEs (n≥2), i.e. UE1, UE2, ..., UEn. In the procedure, the GMLC determines a UE among the n UEs to be designated UE1 (i.e. Target UE in TS 23.586 [40]) and one or more other UEs designated UE2, UE3, ..., UEn (n≥2) (i.e. Reference/Located UEs in TS 23.586 [40]). The Ranging/Sidelink Positioning location results may include absolute locations, relative locations or distance and directions related to the UEs, velocities and relative velocities based on the service request. The Ranging/Sidelink Positioning location results may be represented by a Geographic Coordinate or Local Coordinate.

Procedure for periodic and event triggered SL-MT-LR is defined in clause 6.20.4.



Figure 6.20.3-1: SL-MT-LR Procedure

**Precondition:** At least one of the n UEs is in coverage and registered with a serving PLMN that supports Ranging/Sidelink Positioning.

1. The LCS Client or the AF (via NEF) sends an LCS service request to the (H)GMLC for Ranging/Sidelink Positioning location results for the n UEs which may each be identified by an Application Layer ID, a GPSI or a SUPI. The request may include the required QoS, the required location results (e.g. absolute locations, relative locations or distances and/or directions related to the UEs, velocities and relative velocities), and the SL reference UE(s) in case of relative locations, distance, or direction, local coordinate identified by a coordinate ID. An initiator UE indication may be included to help (H)GMLC select the corresponding UE as the initiator UE. The (H)GMLC or NEF authorizes the LCS Client or the AF for the usage of the LCS service. If the authorization fails, the remaining steps are skipped and the (H)GMLC or NEF responds to the LCS Client or the AF with the failure of the service authorization.

 Local coordinate is used to indicate the location result (only applicable to absolute location) should be determined by local coordinate format.

 In addition, an Application Layer ID shall be used for each of the n UEs to enable discovery of the UEs at step 12. The Application Layer ID(s) is transmitted within supplementary services messages. If only GPSI is provided to the (H)GMLC, it can query the NEF for the mapping Application Layer ID as specified in clause 4.3.9 of TS 23.586 [40].

2. The (H)GMLC invokes a Nudm\_SDM\_Get service operation towards the UDM of each of the n UEs to get the privacy settings of the UE identified by its GPSI or SUPI. The UDM returns the UE Privacy setting of the UE. The (H)GMLC checks the UE LCS privacy profile.

3. The (H)GMLC invokes a Nudm\_UECM\_Get service operation towards the UDM of each of the n UEs (for which GPSI or SUPI is available), one at a time, using the GPSI or SUPI of each UE. The (H)GMLC selects the UE (e.g. which is treated as UE1 in following steps) that initiates the Ranging/SL Positioning and selects the corresponding serving AMF, based on UE subscription and UE reachability. If the UE is not reachable, the (H)GMLC does not select it as the initiator UE.

NOTE: The UDM is aware of the serving AMF address at UE registration on an AMF as defined in clause 4.2.2.2.2 of TS 23.502 [19]. The UDM is aware of a serving (V)GMLC address at UE registration on an AMF as defined in clause 4.2.2.2.2 of TS 23.502 [19].

4. For a non-roaming case, this step is skipped. In the case of roaming, the (H)GMLC may receive an address of a (V)GMLC (together with the network address of the current serving AMF) from the UDM in step 3, otherwise, the (H)GMLC may use the NRF service in the (H)PLMN to select an available (V)GMLC in the (V)PLMN, based on the (V)PLMN identification contained in the AMF address received in step 3. The (H)GMLC then sends the location request to the (V)GMLC by invoking the Ngmlc\_Location\_ProvideLocation service operation towards the (V)GMLC. In the cases when the (H)GMLC did not receive the address of the (V)GMLC, or when the (V)GMLC address is the same as the (H)GMLC address, or when both PLMN operators agree, the (H)GMLC sends the location service request message to the serving AMF. In this case, step 4 is skipped. The (H)-GMLC also provides the LCS client type of AF, if received in step 1, or LCS client type of LCS client and other attributes to be sent to AMF in step 5.

5. In the case of roaming, the (V)GMLC first authorizes that the location request is allowed from this (H)GMLC, PLMN or from this country. If not, an error response is returned. The (H)GMLC or (V)GMLC invokes the Namf\_Location\_ProvidePositioningInfo service operation towards the AMF serving UE1 to request Ranging/Sidelink positioning location results of the n UEs. The service operation includes the SUPI of UE1, Application layer IDs of the UEs, the client type and may include the required LCS QoS, the required location results (e.g. relative locations i.e., distances and/or and directions between pairs of UEs) and other attributes as received or determined in step 1.

6. If UE1 is in CM-IDLE state, the AMF initiates a network triggered Service Request procedure to establish a signalling connection with UE1.

 If signalling connection establishment fails, steps 7-17 are skipped.

7-8. If the indicator of privacy check indicates an action is needed, then same operation as that of step 7-8 of clause 6.1.2 is carried out.

9. The serving AMF selects an LMF serving UE1 (e.g. an LMF that supports Ranging/Sidelink Positioning) and sends an Nlmf\_Location\_DetermineLocation service operation towards the LMF with the information received at step 5 e.g. required location results (e.g. relative locations i.e., distances and/or directions between pairs of UEs, velocities and relative velocities), SL reference UE(s) in case of relative locations, Application layer IDs of the UEs if received in step 5. The service operation may include either a SUPI or a LCS Correlation identifier to identify the target UE. The SL reference UE(s) is identified by by a GPSI or a SUPI, and used to indicate the LMF to use the SL reference UE to assist the positioning of the target UE, either absolute or relative location to the reference UE.

10. The LMF sends an SL-MT-LR request to the serving AMF as a supplementary services message, using the Namf\_Communication\_N1N2MessageTransfer service operation, and the session ID parameter is set to the LCS Correlation identifier.

The SL-MT-LR request may include the Application Layer IDs of the other UEs 2 to n, the types of required location results (e.g. relative locations or distances and/or directions) and SL reference UE(s) in case of relative locations.

11. The serving AMF forwards the SL-MT-LR request and a Routing identifier equal to the LCS Correlation identifier to UE1 using a DL NAS TRANSPORT message.

12. UE1 attempts to discover the other UE 2 to n using their Application Layer ID(s) if not already discovered using procedure defined in clause 6.4 of TS 23.586 [40].

13. UE1 obtains the sidelink positioning capabilities of the discovered UEs via the SLPP if not already obtained.

14. UE1 returns a supplementary services SL-MT-LR response to the serving AMF in an UL NAS TRANSPORT message and includes the Routing identifier received in step 11.

The SL-MT-LR response indicates which of UEs 2 to n have been discovered and the sidelink positioning capabilities of the discovered UEs.

15. The serving AMF forwards the SL-MT-LR response to the LMF indicated by the Routing identifier received at step 14 and includes a LCS Correlation identifier equal to the Routing identifier.

16. The LMF determins to obtain the relative locations or distances and/or directions related to the UEs through the Ranging/SL Positioning provedure or through their absolute locations, based on the UE capabilities of supported positioning method (SL, or Uu, or both), supported algrithms, accuracy, delay, etc. If the Ranging/SL Positioning procedure is selected, the Ranging/Sidelink Positioning of UE1 and the other discovered UEs occurs as for an SL-MO-LR as described for steps 10-19 of clause 6.20.1 with the difference that Ranging/Sidelink Positioning location measurement data or results are always returned to the LMF and the LMF indicates to UE1 at step 13 or step 14 of clause 6.20.1 whether the Ranging/Sidelink Positioning location results will be calculated by the LMF (at step 19) or by UE1 (at step 17). If the absolute locations are selected to obtain the relative locations or distances and/or directions related to the UEs, especially for some undiscovered UEs among the other UEs 2 to n, the LMF interacts with GMLC using the Application Layer ID to initiate the 5GC-MT-LR procedure for the undiscovered UE(s) to get their absolute locations, and calculates the relative locations or distances and/or directions between the pairs of UE1 and these undiscovered UE(s).

17-20. The LMF returns the Ranging/Sidelink positioning location results to the AMF as in steps 13-15 and step 24 of clause 6.1.2. The results also include failure information of the UE(s) that was not discovered.

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