**3GPP TSG-WG SA2 Meeting #159 *S2-2310492***

**Xiamen, CN, October 9 – 13, 2023 (revision of S2-2308992)**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.273** | **CR** | **0416** | **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:*** | SL-MO-LR for Ranging and Sidelink Positioning corrections | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Sony, Philips, Vivo, Interdigital | | | | | | | | | |
| ***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 can be 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | SA3 has concluded that V2x and 5G ProSe security mechanisms for unicast mode and groupcast mode and included the solutions in TS 33.533. Therefore the Editor’s Note can be replaced by a new paragraph.  RAN2 agreement in R2-2306671    Therefore the part of the EN under step 5 related to capability exchange between UE can be removed (i.e. step 5 is deleted).  In several places it is mentioned that if the LMF is also serving UE2-n then the LMF may interact with them. However, there is an important missing functionality to support this. The LMF receivs (from UE1) the Application layer ID of UE2-n and based on the Application layer ID the LMF needs to derive the active LCS sessions with UE2-n. For an active LCS session the LMF only have the Correlation ID and the ID of the serving AMF. There is no linkage between the Application layer ID and the correlation ID in the LMF. Therefore the LMF is not able to interact with UE2-n even if the LMF have active LCS sessions with UE2-n. Related text should be removed.  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’.  In addition references to steps have been added to simplify the understanding of the procedure. Also terms have been aligned for TS 23.586.  From S2-2309038  1. It was agreed that in the LMF functionality of clause 4.3.8, LMF determined the required QoS for Located UE positioning. So it proposes that LMF uses the QoS requirement for the target UE positioning to derive the required QoS for Located UE(s) positioning.  2. For Target UE's absolute positioning, it was agreed that the Ranging/SL positioning and the positioning of the Located UE(s) can be scheduled with the same time using the scheduled location time. So if scheduled location time is received from the Target UE, then LMF does not need to provide scheduled location time to UE. If scheduled location time is not received, then LMF needs generate a scheduled location time and provide it to UE.  From S2-2309312  Per LMF’s functionality in TS 23.586 clause 4.3.8, LMF may determine ranging/SL positioning method based on the positioning QoS requirements and UE’s ranging/sidelink Positioning capability. Based on the decided SL positioning method, the list of SL reference UEs may be updated by LMF. But, in current SL-MO-LR operation, it is not reflected.  From S2-2309399  In the current description it is not clear how the Target UE obtains the location of Located UEs for absolute position calculation. RAN1 has concluded (see RP-231092) that the location of Located UE could be part of assistance data for sidelink positioning.  **Agreement**  *For provision of assistance information for absolute SL positioning, the anchor UE location information can be provided to LMF or UE.*  *FFS: which UEs can receive the anchor UE location information (note: which may be decided by other WGs)*  *FFS on quality information of anchor UE location information.*    This means that the LMF should obtain the location of Located UE before it can send the assistance information. If the location of the Located UEs is not known (e.g. provided by AF), then the location has to be fetched from the GMLC (which may initiate 5GC-MT with the Located UEs) or the Located UEs should be requested to initate 5GC-MO procedure. In the current procedure this is done too late, hence these steps should be moved earlier in the procedure. Also the text should be clarified that the location of the Located UEs may be provided as assistance information.  Furthermore, some of the other steps need to be clarified. This includes:   * In step 13, the statement of calculating the position should refer to step 17 instead of step 16. * In step 14 the statement that “if scheduled location time is received at step 14” is confusing. This should be step 8. * In step 16 it is not always necessary for the UE1 (i.e. Target UE)to trigger the SL-MO-LR for Located UE(s). For example, the Located UE(s) may trigger this themselves based on a location request from the LMF, or the Target UE may select another Located UE, or the Target UE may prefer network based sidelink position calculation rather than UE-based sidelink position calculation. In step 16 it is also not clear whether the location of the Located UE will be shared with the Target UE. * In step 18 it is not clear why the location of the Located UEs needs to be provided by UE1, since the LMF was involved in obtaining the respective location of the Located UE, and hence already knows the location. This can be further clarified in step 20. | | | | | | | | |
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| ***Summary of change:*** | | Change Sidelink positioning/Ranging to Ranging/Sidelink positioning to align the term with TS 23.586.  Removing NOTE 1 as it is a precondition that the serving PLMN supports Ranging/Sidelink Positioning feature.  Align to SA3 conclusions that V2x and 5G ProSe security mechanisms for both unicast mode and groupcast mode.  Remove text and EN that refer to that the LMF may interact with UE2-n.  Adding velocities and relative velocities to the list of results.  Change ‘ranges’ in to ‘distance’.  Adding references to steps in multiple places.  From 9038  1. LMF uses the QoS requirement for the target UE positioning to derive the required QoS for Located UE(s) positioning, and includes the required QoS for Located UE positioning in the request.  2. LMF generates a scheduled location time if not receiving from the Target UE.  3. To clarify that step 16 only performed in the case of UE based SL Positioning.  From 9312  After capability negotiation with UEs, LMF may down-select list of UEs for SL positioning operation and perform following operation with those down-selected UEs.  From 9399   * Move fetching/obtaining the location of Located UEs of step 19 to an earlier step in the procedure and updated the figure accordingly. * Clarify step 13 (now step 14) that the assistance information may include the location of Located UEs. * Change “step 16” to “step 18” (i.e. step 17 in the original numbering) in step 13 (now step 14). * Change “received at step 14” to “received at step 8” in step 14 (now step 15). * Changed step 16 (now 17) to make the trigger sent by UE1 to initiate SL-MO-LR for Located UE(s) optional, and clarified sharing of the resulting location. Also clarified the wording in the figure. * Removed part on UE1 providing the Located UE’s location in step 18 (now step 19), and clarified this aspect in step 20. | | | | | | | | |
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| ***Consequences if not approved:*** | | The specification provides the wrong impression that the LMF is able to derive an active LCS session with a UE using an application layer ID received by another UE in another LCS session.  9038: The procedure is not algined with the agreed principles.  9312: SL positioning operation will not work properly and radio resource will be wasted.  9399: In the current procedure obtaining the location of Located UE is done too late | | | | | | | | |
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| ***Clauses affected:*** | | 2, 6.20.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.071: "Technical Specification Group Systems Aspects; Location Services (LCS)".

[3] 3GPP TS 22.261: "Service requirements for the 5G system; Stage 1".

[4] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".

[5] 3GPP TS 43.059: "Functional Stage 2 description of Location Services in GERAN".

[6] Void.

[7] 3GPP TS 36.305: "Stage 2 functional specification of User Equipment (UE) positioning in E-UTRAN".

[8] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[9] 3GPP TS 38.305: "Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".

[10] 3GPP TS 23.167: "IP Multimedia Subsystem (IMS) emergency sessions".

[11] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[12] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[13] OMA MLP TS: "Mobile Location Protocol", [http://www.openmobilealliance.org].

[14] Void.

[15] 3GPP TS 38.455: "NG-RAN; NR Positioning Protocol A (NRPPa)".

[16] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[17] 3GPP TS 25.305: "Stage 2 functional specification of User Equipment (UE) positioning in UTRAN".

[18] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[19] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[20] 3GPP TS 37.355: "LTE Positioning Protocol (LPP)".

[21] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

[22] Void.

[23] ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

[24] 3GPP TS 23.222: "Common Application Programming Interface (API) framework for 3GPP northbound APIs".

[25] RFC 2396: "Uniform Resource Identifiers".

[26] RFC 3261: "SIP: Session Initiation Protocol".

[27] 3GPP TS 23.228: "IP multimedia subsystem (IMS)".

[28] 3GPP TS 23.003: "Numbering, addressing and identification".

[29] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[30] 3GPP TS 32.271: "Telecommunication management; Charging management; Location Services (LCS) charging".

[31] 3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) parameter description".

[32] Void.

[33] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[34] Void.

[35] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

[36] 3GPP TS 24.571: "5G System (5GS); Control plane Location Services (LCS) procedures; Stage 3".

[37] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[38] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[39] 3GPP TS 22.104: "Service requirements for cyber-physical control applications in vertical domains".

[40] 3GPP TS 23.586: "Architectural Enhancements to support Ranging based services and Sidelink Positioning".

[41] 3GPP TS 23.503: "Policy and charging control framework for the 5G System (5GS); Stage 2".

[42] 3GPP TS 23.632: "User data interworking, coexistence and migration; Stage 2".

[43] 3GPP TS 29.563: "Home Subscriber Server (HSS) services for interworking with Unified Data Management (UDM); Stage 3".

[xx] 3GPP TS 33.536: "Security aspects of 3GPP support for advanced Vehicle-to-Everything (V2X) services".

[yy] 3GPP TS 33.503: "Security Aspects of Proximity based Services (ProSe) in the 5G System (5GS)".

[zz] 3GPP TS 33.533: "Security aspects of ranging based services and sidelink positioning".

\* \* \* \* next change \* \* \* \*

### 6.20.1 Procedures of SL-MO-LR involving LMF

Figure 6.20.1-1 illustrates a procedure to enable a UE to obtain Ranging/Sidelink Positioning location results using one or more other UEs with the assistance of an LMF in a serving PLMN for UE1.

The Ranging/Sidelink Positioning location results may include absolute locations, relative locations i.e., distances and/ordirections from other UEs, velocities and relative velocities depending on the service request.

If the Target UE decides to initiate SL-MO-LR procedure, it includes one or multiple SL reference UE(s) / Located UE (s) in the service request. See TS 23.586 [40] for more information on how this generic procedure can be used.



Figure 6.20.1-1: SL-MO-LR Procedure

**Precondition:** UE1 is in coverage and registered with a serving PLMN that supports Ranging/Sidelink Positioning. UEs 2 to n may or may not be in coverage and, if in coverage, may or may not be registered with the same serving PLMN as UE1.

1. The procedures and signalling specified in clause 6.2 of TS 23.586 [40] may be used to provision the Ranging/Sidelink positioning service authorization and policy/parameter provisioning to UEs 1 to n, when in coverage.

2. Based on a trigger of service request (e.g. received from the application layer), which includes UE1/.../UEn, UE discovery is performed for Ranging/Sidelink positioning as specified in clause 6.4 of TS 23.586 [40]:

- If UE1 is the target UE, UE1 discovers UEs 2 to n

- If UE1 is the Located UE, the target UE (i.e. one of the UEs 2 to n) discovers UE1 (and other Located UEs in the set of UEs 2 to n).

LMF may be involved in the discovery process to decide:

- Whether discovery is needed and the following steps (including ongoing the discovery process) should be continued or not.

- Whether and which of the nearby Located UE(s) should (acknowledge to) be discovered and participate the following steps or not

3. Secure groupcast and/or unicast links are established between UEs 1 to n as defined in clause 5.3 of TS 23.586 [40] to enable UE1 to exchange Ranging and Sidelink Positioning Protocol (RSPP) messages over PC5-U reference point with each of UEs 2 to n and possibly enabling UEs 2 to n to exchange RSPP over PC5-U between each other.

Security mechanisms defined for V2X unicast mode communication in TS 33.536 [xx] and for 5G ProSe unicast mode Direct Communication in TS 33.503 [yy] are reused. The Security procedures for RSPP signalling using groupcast mode is specified in TS 33.533 [zz].

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4. UE1 and UEs 2 to n may communicate over PC5 for authorization of Ranging/Sidelink positioning and receiving QoS parameters if needed. Each of UEs verifies that Ranging/Sidelink positioning is permitted, including whether Ranging/Sidelink positioning results may be transferred to an LCS Client or AF if this is used, according to any service authorization and policy/parameter provisioning received at step 1. QoS requirements for the Ranging/Sidelink positioning may be also provided based on QoS requirements in the service request.

5. UE1 may obtain the Sidelink positioning capabilities of UEs 2 to n using the groupcast and/or unicast links established in step 3.

Step 4 and 5 may be performed to transfer the information of UE2 to n to the LMF in step 11.

NOTE 2: UE2/.../UEn is not assumed to be served by the same LMF serving UE1.

Editor's note: It needs to be verified that RAN2 will provide support for steps 4.

6. Based on the Sidelink positioning capabilities of UE1/.../UEn, the target UE determines SL-MO-LR is to be performed. If UE1 is the Located UE (i.e. when the target UE is one of UE2/.../UEn and does not have NAS connection), the target UE initiates SL-MO-LR service request to UE1.

7. If UE1 is in CM-IDLE state, UE1 instigates a UE triggered Service Request in order to establish a signalling connection with the serving AMF of UE1.

8. UE1 sends a supplementary services SL-MO-LR request to the serving AMF in an UL NAS TRANSPORT message. The SL-MO-LR request indicates the other UEs 2 to n (using application layer ID and/or GPSI), indicates any assistance data needed, indicates whether location calculation assistance is needed, and indicates whether location results should be transferred to an LCS client or AF. The message shall include the identity of the LCS client or the AF and may include the address of the GMLC through which the LCS client or AF (via NEF) should be accessed. In addition, a Service Type indicates which MO-LR service of the LCS Client is requested by the UE may be included. For location calculation assistance from the LMF, the preferred type of Ranging/Sidelink positioning location results (e.g. absolute locations, relative locations or distances and directions between pairs of UEs, velocities and relative velocities) and the required QoS are included. If UE1 is Located UE and one of UE2/.../UEn is the target UE that does not have NAS connection, the supplementary services SL-MO-LR request includes an indication that one of UE2/.../UEn is the target UE instead of UE1.

Editor's note: It is FFS whether indication about the need of assistance data from UE, which will be aligned with RAN WGs.

Editor's note: Whether GPSI of other UE can be obtained will be further aligned with SA WG3.

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 from the SL-MO-LR Request. The service operation includes a LCS Correlation identifier.

10. The LMF may send a request to UE1 for the capabilities of UEs 1 to n.

NOTE 3: UE2/.../UEn is not assumed to be served by the same LMF serving UE1.

Editor's note: It is FFS the update when the LMF also serves UE2/.../UEn with alignment with RAN.

11. UE 1 returns its capabilities to the LMF. UE1 may additionally return the capabilities of the UEs obtained at step 5 if requested by the LMF at step 10. After checking the capabilities of the UEs, LMF may downselect the UEs (so called, down-selected list of UEs) for SL positioning operation.

12. If Target UE's absolute location information is required at step 8, LMF can either retrieved the location of the Located UE(s) locally if available or triggers 5GC-MT-LR procedure to the GMLC to acquire the absolute location of the Located UE(s) using Application Layer ID or GPSI of the Located UE(s). LMF uses the QoS requirement for Target UE's positioning received at step 8 to derive the required QoS for Located UE(s) positioning and includes the required QoS for Located UE positioning in the request to GMLC. If scheduled location time is used in step 15, LMF includes the scheduled location time in the request to GMLC.

13. UE1 may send a request for specific assistance data to the LMF.

14. LMF sends the requested assistance data to UE1and optionally a down-selected list of UEs, and UE1 forwards the assistance data received from LMF to UE2/.../UEn (or the indicated downselection thereof). The assistance data may assist UEs 1 to n (or the indicated downselection thereof) to obtain Sidelink location measurements at step 16 and/or may assist UE1 to calculate Ranging/Sidelink positioning location results at step 18 and may include the location of Located UE(s) in case the LMF determines to use UE based calculation and if absolute location information is requested in step 8 and if sharing the location is allowed by the Located UE(s) privacy profile.

NOTE 4: Steps 10 and 11 can be omitted if UE1 includes a message containing the capabilities of UEs 1 to n in the SL-MO-LR request at step 8. Step 13 can be omitted if UE1 includes a message containing the request for specific assistance data in the SL-MO-LR request at step 8.

15. If the SL-MO-LR request at step 8 indicated location calculation assistance is needed and/or indicated transfer of Ranging/Sidelink positioning location results to an LCS Client or AF, the LMF sends a request for location information to UE1. If LMF determines to apply UE based Sidelink Positioning, LMF includes in the request the indication of UE based Sidelink Positioning. LMF may also provide the list of candidate Located UE(s), if absolute location is requested at step 8. If scheduled location time is received at step 9, LMF generates a scheduled location time, e.g. based on response time, and include a scheduled location time in the request.

Editor's note: It needs to be aligned with RAN WG2 if the list of candidate Located UE(s) is provided in step 13 or step 14.

16. UE1 instigates a Ranging/Sidelink positioning procedure among UEs 1 to n (or the indicated downselection thereof) in which UEs obtain Sidelink location measurements and UEs 2 to n (or the indicated downselection thereof) transfer their Sidelink location measurements to UE 1 and/or to the LMF (depending on the assistance requested). If scheduled location time is received at step 15, Sidelink positioning/ranging is performed at the scheduled location time.

17. For the case of UE based SL Positioning (i.e., the indication of UE based SL Positioning is received in step 15), If Target UE's absolute location information is required at step 8 and if absolute location of Located UE(s) is not available, the Target UE may send a request to the Located UE(s) to trigger 5GC-MO-LR procedure to let the Located UE(s) acquire their own absolute location, after which a Located UE may provide the location of the Located UE to the Target UE if allowed by its privacy profile. The QoS requirement for Target UE's positioning, is used by the Target UE to derive the required QoS for Located UE(s) positioning. The required QoS for Located UE(s) positioning is included in the request from Target UE.

18. If LMF determined in step 15 to use UE based calculation, at least one of UE1/.../UEn calculates Ranging/Sidelink positioning location results based on the Sidelink location measurements obtained at step 16 and possibly using assistance data received at step 14. The Ranging/Sidelink positioning location results can include absolute locations, relative locations i.e, distance and/or directions related to the UEs.

19. If UE1 received a request for location information at step 15, UE1 sends a response to the LMF and includes the Sidelink location measurements obtained at step 16, and the Ranging/Sidelink positioning location results obtained at step 18 if step 18 was performed.

20. The LMF calculates Ranging/Sidelink positioning location results for UEs from the Sidelink location measurements received at step 19 and absolute location of Located UE(s) at step 12 or step 16. The Ranging/Sidelink positioning location results can include absolute locations, relative locations i.e, distance and/or directions related to the UEs, depending on the location request received in step 8.

21. The LMF returns an Nlmf\_Location\_DetermineLocation service operation response to the AMF and includes the Ranging/Sidelink positioning location results received at step 19 or calculated at step 20.

22. If Ranging/Sidelink positioning location results were received at step 21, the AMF performs steps 7-12 of clause 6.2 to send the Ranging/Sidelink positioning location results to the GMLC and to an AF or LCS Client if this was requested at step 8. The Ranging/Sidelink positioning location results include the identities for the respective UEs received at step 8.

NOTE 5: Sending location results and global identities for UEs to an AF or LCS Client may require privacy verification from UEs and/or from the HPLMNs of UEs.

23. The LMF returns a supplementary services SL-MO-LR response to UE1 in a DL NAS TRANSPORT message and includes any Ranging/Sidelink positioning location results calculated at step 20 if step 20 was performed. If UE1 is Located UE, and the target UE is one of the UEs 2 to n and does not have NAS connection, then UE1 may transfer the Ranging/Sidelink positioning location results to the target UE.

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