**3GPP TSG-SA WG6 Meeting #64 S6-245508**

**Orlando, USA, 18th – 22th Nov 2024 (revision of S6-244735,5163)**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.434** | **CR** | **0329** | **rev** | **4** | **Current version:** | **19.3.0** |  |
|  | | | | | | | | |
| *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:*** | Location services for multiple UEs that sharing the same location | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT, Samsung | | | | | | | | | |
| ***Source to TSG:*** | SA6 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eLSAPP | | | | |  | ***Date:*** | | | 2024-11-08 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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:** | | According to the TR 23.700-72 v1.2.0, the KI#6 for Supporting of location services for multiple USIMs/UEs sharing the same location has been concluded as follows:  *Solution #10 addressing the KI#6 can be considered in the normative work. The related function and procedure will be specified in 3GPP TS 23.434 to support the solution. And the detailed APIs and information flows can be discussed in the normative phase.*  So it’s needed to specify the functions, procedures and information flows for the KI#6 and Sol#10 in TR 23.434 for the normative work.  ========================================================  Additional changes:   1. Resolve the following EN.   The procedure 9.3.x.2 is triggered from SEAL LMS to ask if LMC1 and LMC2 are sharing the same location. Some steps of 9.3.x.2 can reuse the procedure of 9.3.x.3. There is no need to merge the two procedures but describe clearly how to associate the procedures between them.  Editor's Note: Whether the procedure 9.3.x.2 and 9.3.x.3 can be merged or not is FFS.   1. Add the conclusion of Sol#10 in TR 23.700-72.   When multiple UEs are associated with each other and sharing the same location, how LMS select the proper one or more UE(s) among multiple associated UEs should be considered. According to conclusion of the Sol#10 in TR 23.700-72, the LM Server may select the associated UE(s) based on the requested LCS QoS (e.g., the higher requested LCS QoS has higher selected priority), and the operator's policies, etc. So how the LMS select the proper UE among multiple associated UEs should be added in the normative work. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add functions of LM server identifying multiple UEs that sharing the same location.  ========================================================  Additional changes:   1. Add the texts in clause 9.3.9 to explain how the LMS select the proper UE among multiple associated UEs when they are associated and share the same location. 2. Remove the left EN. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | If the solution can’t be performed for multiple UEs, the energy and power consumption for these UEs will increase greatly. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 9.3.15,9.3.x(new),9.3.x.1(new),9.3.x.2(new), 9.3.x.3(new),9.3.9, 9.3.2.23, 9.3.2.36, 9.3.2.3,9.3.2.e(new), 9.3.2.f(new),9.3.2.x(new),9.3.2.y(new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \* \* \* \*

### 9.3.15 Location service registration procedure

Before the Location Management Server requesting the location information for the target UE, the Location Management Client may register the available location services to the LM Server to report the UE's location capabilities.

Figure 9.3.15-1 illustrates the procedure of client-triggered location service registration.



Figure 9.3.15-1: Location service registration procedure

1. The LM Client of a VAL UE sends location service registration request to the LM Server, with the identifier of the UE (e.g. GPSI) and UE-based location capabilities, the associated ID with other UEs, etc.2. The LM Server checks authorization for the VAL UE's registration request.

3. After successful authorization, LM Server sends location service registration response to the LM Client and stores the UE’s information received in step 1.

\* \* \* Next Change \* \* \* \*

### 9.3.x Optimization location service for multiple UEs that sharing the same location

#### 9.3.x.1 General

If multiple VAL UEs share the same location area with each other, when the VAL server requests the location information for each UE among them, the LM Server will select one or several of them to obtain the location data instead of triggering all of UE's positioning procedure, which could reduce the signaling messages, save energy and power consumption, etc.

The following are the procedures to describe the related functions for such scenario.

#### 9.3.x.2 Procedure of LM Server identifying if the UEs sharing the same location

Figure 9.3.x.2-1 describes the procedure that how LM server identifies the UEs that sharing the same location.

Pre-condition:

- The VAL UE1 and VAL UE2 are associated and may belong to the same user or different users.

- The LM Client 1(in VAL UE1) and LM Client 2(in VAL UE2) have reported the location capabilities (e.g. associated ID) for VAL UE1 and VAL UE2 to LM server respectively as defined in clause 9.3.15.

NOTE: The associated ID for VAL UE1 and VAL UE2 is same.



Figure 9.3.x.2-1: Procedure of LM Server identifying the UEs that sharing the same location

1. The LM Server identifies the registered LM Client1 and LM Client 2 are associated and may share the same location with each other based on the received location service registration information (e.g. same associated ID as defined in clause 9.3.15). Then it further verifies if they are sharing the same location at present.
2. The LM Server initiates the verify location sharing request to the LM Client 1 with the user ID of LM Client 2 to verify if they are sharing the same location.

NOTE: The step 2 may occur after the LM Server receives the location request to the LM Client 2 from the VAL server.

3. The LM Client 1 checks if the LM Client 2 is close enough and shares the same location via the following ways.

- The LM Client 1 may trigger the location reporting to the LM Client 2 via some positioning capabilities (e.g., Prose) and receive off-network location report from the LM Client 2 and determines that the VAL UE2 is within allowed proximity range of the VAL UE1 as specified in step 1 of clause 9.3.x.3.

- The LM Client 1 may ask the VAL user to check if VAL UE1 and VAL UE2 are in the same location. If the answer is yes, the VAL user may inform the LM Client 1 that the VAL UE1 and VAL UE2 are in the same location area.

4. The LM Client 1 sends the verify location sharing response to the LM Server with the confirmation of sharing same location with LM Client 2, and the validity timer is also included to indicate the valid duration for the confirmation .

Before the validity timer expired, if the LM Client 1 discovers the LM Client 2 is far away from itself and they are not able to share the same location, the LM Client 1 will inform the LM Server they are no long sharing the same location as specified in step 2(disable) of clause 9.3.x.3.

If the response is negative (e.g. the LM Client 1 confirms the LM Client 2 is not close with LM Client 1 or the LM Client 1 can’t confirm whether both of UEs are closing enough), the LM Server will not reuse the stored UE1’s location for UE2.

#### 9.3.x.3 Location reuse request

Figure 9.3.x.3-1 illustrates the procedure of client-triggered enable location reuse request.

Pre-condition:

1. All UEs in the association are registered to share the location.

2. UE has configured other UEs in the association to received offline location reports as specified in clause 9.5.3.

3. The VAL UE1 and VAL UE2 are associated and may belong to the same user or different users.

4. The LM Client 1(in VAL UE1) and LM Client 2(in VAL UE2) have reported the location capabilities (e.g. associated ID) for VAL UE1 and VAL UE2 to LM server respectively as defined in clause 9.3.15.



Figure 9.3.x.3-1: Location reuse procedure

1. The SEAL LMC-1 (in UE-1) receives off-network location report from the SEAL LMC-2 (in UE-2). Based on location report, if UE-2 is within certain range of UE-1, the SEAL LMC-1 determines that the UE-2 is within allowed proximity range of the UE-1 (i.e. UE-1 and UE-2 are close enough) and so UE-1's location can be used by SEAL LMS instead of UE-2's location.

Based on location report, if UE-2 is out of certain range of UE-1, the SEAL LMC-1 determines that the UE-2 is outside allowed proximity range of the UE-1 (i.e. UE-1 and UE-2 are not close enough) and so UE-1's location can not be used by SEAL LMS instead of UE-2's location.

2. The SEAL LMC-1 (in UE-1) sends location reuse request message to the SEAL LMS to enable reuse of location of UE-1 for UE-2. If both UE1 and UE2 are close enough (i.e. within allowed proximity range), the request includes indication to enable reuse of location of UE-1 for UE-2. If both UE1 and UE2 are not close enough (i.e. outside allowed proximity range), the request includes indication to disable reuse of location of UE-1 for UE-2. The request message also includes VAL user’s identity, identity of VAL UE-1, identity of UE-2 and latest location report of UE-1.

3. The SEAL LMS authenticates and authorizes the user. If authorized, the SEAL LMS identifies that if SEAL LMC-1 and SEAL LMC-2 are associated (e.g. same associated ID) or not based on the received registration information of SEAL LMC-1 and SEAL LMC-2, and if reusing of location is allowed of not.

4. If both UE-1 and UE-2 are assocaited and reusing of location is allowed (as determined in step-3), then the SEAL LMS stores the location of UE-1. If the request includes indication to enable reuse of location of UE-1, the SEAL LMS enables reuse of location of UE-1 for UE-2. If the request includes indication to disable reuse of location of UE-1, the SEAL LMS disables reuse of location of UE-1 for UE-2. The SEAL LMS sends response back to the SEAL LMC-1.

When location reuse is enabled, if location request for UE-2 is received from VAL server, the SEAL LMS reuses and provides the location of UE-1 (instead of location of UE-2) to the VAL server. When location reuse is disable, if location request for UE-2 is received from VAL server, the SEAL LMS provides the location of UE-2 only (instead of reusing location of UE-1) to the VAL server.

\* \* \* Next Change \* \* \* \*

9.3.9 On-demand usage of location information procedure

The VAL server can request UE location information at any time by sending a location information request to the location management server, which may trigger location management server to immediately send the location report.

Figure 9.3.9-1 illustrates the high level procedure of on demand usage of location information. The same procedure can be applied for location management client and other entities that would like to subscribe to location information of VAL user or VAL UE.

Pre-condition:

- The LM Server has confirmed the target UE is associated with other UEs and they are sharing the same location.

- The LM Server has obtained the UE’s location who is associated with the target UE.

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**Figure 9.3.9-1: On-demand usage of location information procedure**

1. VAL server sends a location information request to the location management server to request locations for one or more VAL UEs or VAL user(s) which may include the location QoS that contains the location accuracy, response Time and QoS class as defined in clause 4.1b of TS 23.273 [50].

2. The location management server checks if there is stored and valid UE location report (e.g. the timer for the stored UE location report is not expired) for the target UE. If available, it reuses the stored UE location information and reports it to the VAL server. If there isn’t, it acquires the latest location of the UEs being requested, by triggering an on-demand location report procedure as described in subclause 9.3.4, or from PLMN operator, and checks if the obtained location of the VAL UE could meet the location QoS requirements (if any).

If the LM Server identified that target UE is associated with other UE(s) and they are sharing the same location as specified in clause of 9.3.x.2 or 9.3.x.3, it determines to reuse the associated UE’s location data instead of obtaining the target UE's location data directly. The LM Server may select the associated UE(s) based on the requested LCS QoS, and the operator's policies, etc. But if the LM Server doesn’t store the associated UE's location data or the stored location data is invalid (e.g. the valid timer for the confirmation of sharing location information is expired, or the verify location sharing response is negative), the LM Server will ask the target UE to report the UE location data as described in clause 9.3.4.

3. Then, location management server immediately sends the location information report including the latest location information of associated UE(s) or acquired of target one or more VAL users or VAL UEs. The Location management server may report the location to the VAL server considering the location information received via non-3GPP positioning technologies (e.g. GNSS, Bluetooth), for instance, to improve the location accuracy.

4. VAL server may further share this location information to a group or to another VAL user or VAL UE.

NOTE: For other entities, the step 4 can be skipped if not needed.

\* \* \* Next Change \* \* \* \*

#### 9.3.2.23 Location service registration request

Table 9.3.2.23-1 describes the information flow from the location management client to the location management server for registration of the location service.

Table 9.3.2.23-1: Location service registration request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| Identity | M | Identity of the VAL user or identity of the VAL UE. |
| VAL service ID | O | Identity of the VAL service for which the location service is registered. |
| Location capability | O | The information of location capability of VAL UE for which the location service is registered. |
| > Location access type  (NOTE 2) | O  (NOTE 1) | Identifies the available location access type of the VAL UE. E.g. as described in TS 23.273[50] and TS 29.572[51]. |
| >Positioning method | O  (NOTE 1) | Identifies the available positioning methods of the VAL UE. E.g. as described in TS 23.273[50] and TS 29.572[51]. |
| List of association IDs | O  (NOTE 3) | Identifies list of associations with other UEs may share the location information when they are at the same location. |
| NOTE 1: At least one of these rows shall be present.  NOTE 2: The non-3GPP access as defined in TS 23.273[50] and TS 29.572 [51] is out of scope of the present specification.  NOTE 3: The association IDs are known to the UE based on offline methods and are out of scope of this specification. The requestor can be part of multiple associations and one association can have two or more UEs. | | |

\* \* \* Next Change \* \* \* \*

#### 9.3.2.36 Location service registration update request

Table 9.3.2.36-1 describes the information flow from the location management client to the location management server for update the registered location service.

Table 9.3.2.36-1: Location service registration update request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| Identity | M | Identity of the VAL user or identity of the VAL UE. |
| VAL service ID | O | Identity of the VAL service for which the location service is updated. |
| Location capability | O | The information of location capability of VAL UE for which the location service is updated. |
| >Location access type  (NOTE 2) | O  (NOTE 1) | Identifies the updated location access type of the VAL UE. E.g. as described in TS 23.273[50] and TS 29.572[51]. |
| >Positioning method | O  (NOTE 1) | Identifies the updated positioning methods of the VAL UE. E.g. as described in TS 23.273[50] and TS 29.572[51]. |
| List of association IDs | O  (NOTE 3) | Identifies list of associations with other UEs may share the location information when they are at the same location. |
| NOTE 1: At least one of these rows shall be present.  NOTE 2: The non-3GPP access as defined in TS 23.273[50] and TS 29.572[51] is out of scope of the present specification.  NOTE 3: The association IDs are known to the UE based on offline methods and are out of scope of this specification. The requestor can be part of multiple associations and one association can have two or more UEs. | | |

\* \* \* Next Change \* \* \* \*

#### 9.3.2.3 Location information request

Table 9.3.2.3-1 describes the information flow from the VAL server to the location management server and/or from the location management server to the location management client for requesting an immediate location information report.

Table 9.3.2.3-1: Location information request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| Identity list | M | List of VAL users or VAL UEs whose location information is requested |
| VAL service ID | O | Identity of the VAL service for which the location information is requested. |
| Requested location information | O | Identifies what location information is requested |
| Requested location access type  (NOTE 4) | O  (NOTE 1) | Identifies the location access type for which the location information is requested, e.g. as described in TS 23.273[50] and TS 29.572[51]. |
| Requested positioning method | O  (NOTE 1) | Identifies the positioning method for which the location information is requested, e.g. as described in TS 23.273[50] and TS 29.572[51]. |
| Location QoS | O  (NOTE 3) | Definition of the location Quality of Service for which the location information is requested (see NOTE 2). |
| List of association IDs | O  (NOTE 5) | Identifies list of associations with other UEs may share the location information when they are at the same location. |
| NOTE 1: This e element is only applicable for request sent from the LM server to the LM client.  NOTE 2: The definition of location QoS has been defined in clause 4.1b of TS 23.273 [50] and the clause 6.1.6.2.13 of TS 29.572 [51].  NOTE 3: The element is only applicable for the information flow from the VAL server to the location management server.  NOTE 4: The non-3GPP access as defined in TS 23.273[50] and TS 29.572[51] is out of scope of the present specification.  NOTE 5: The association IDs are known to the UE based on offline methods and are out of scope of this specification. The requestor can be part of multiple associations and one association can have two or more UEs. | | |

Editor's Note: It's FFS the security aspects for LM-Uu and LM-S in relation to the VAL service ID that need to be coordinated with SA3.

\* \* \* Next Change \* \* \* \*

#### 9.3.2.e Verify location sharing request

Table 9.3.2.e-1 describes the information flow from the location management server to the location management client to verify if it is sharing the same location with other UEs.

Table 9.3.2.e-1: Verify location sharing request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| Identity | M | Identity of the requested VAL user or VAL UE. |
| VAL service ID | O | Identity of the VAL service that is requested. |
| Identity of sharing location | O | Indicates the list of identities of VAL UEs who share the same location with the requested VAL UE. |

\* \* \* Next Change \* \* \* \*

#### 9.3.2.f Verify location sharing response

Table 9.3.2.f-1 describes the information flow from the location management client to the location management server to respond if it is sharing the same location with other UEs.

Table 9.3.2.f-1: Verify location sharing response

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| Identity | M | Identity of the requesting VAL user or VAL UE. |
| Request status | M | Indicates the request result. |
| Validity timer | O | Indicates the time duration when the response will be invalid. |

\* \* \* Next Change \* \* \* \*

#### 9.3.2.x Location reuse request

Table 9.3.2.x-1 describes the information flow from the location management client to the location management server for enabling or disabling location reuse.

Table 9.3.2.x-1: Location reuse request

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| Identity | M | Identity of the requestor VAL UE. |
| VAL service ID | O | Identity of the VAL service for which the location service is registered. |
| Identity of UE-2 | M | Identity of the VAL UE-2 who will reuse the location of UE-1. |
| Location reuse | M | Indicates whether to enable or disable reuse of location |
| Current location report | O | Location report of the UE-1 (as specified in Table 9.3.2.2-1) |

#### 9.3.2.y Location reuse response

Table 9.3.2.y-1 describes the information flow from the location management server to the location management client for the location reuse response.

Table 9.3.2.y-1: Location reuse response

|  |  |  |
| --- | --- | --- |
| Information element | Status | Description |
| Result | M | Indicates success or failure of the request |

\* \* \* End of Changes \* \* \* \*