Technical Specification Group Services and System Aspects
Meeting #22, Maui, Hawaii, USA, 15-18 December 2003

TSGS#22(03)0779

Source: TSG SA WG2
Title: CRs on 23.271 (LCS Stage 2)
Agenda Item: 7.2.3

The following Change Requests (CRs) have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #22.

Tdoc #	Title	Spec	CR #	cat	Version in	REL	WI	S2 meeting	Clauses affected
S2-033646	Addition of Position Method Used, to attributes returned with location estimate	23.271	225	F	5.8.0	5	LCS2	S2-35	7.1.2, 9.1.2, 9.1.5, 9.1.6
S2-034389	Enhanced LDR reference number in R5	23.271	228r2	F	5.8.0	5	LCS2	S2-36	3.1, 5.5.2, 9.1.8.1, 9.1.8.2, 9.1.8.3, 9.1.8.4
S2-033467	H-GMLC for last known location	23.271	223r2	F	6.5.0	6	LCS2	S2-35	9.1.4.3
S2-033621	Update of reference to SIP RFC	23.271	224	F	6.5.0	6	LCS2	S2-35	2.1
S2-034154	Clarification of the format of V-GMLC address	23.271	232	F	6.5.0	6	LCS2	S2-36	6.3.5, 6.3.7
S2-034155	Correction to the way that PPR handles the pseudo external Ids, during the LCS authorization process, when the visited MSC/SGSN is pre Rel-6	23.271	233	F	6.5.0	6	LCS2	S2-36	9.1.1.1
S2-034169	Cell ID and SAI	23.271	226r3	B	6.5.0	6	LCS2	S2-36	9.1.5, 9.1.5A, 9.1.7
S2-034391	Combined S2-033470(CR214r1), S2-034390(CR213r4) and S2-034388(CR230r3) on LCS2	23.271	236	F	6.5.0	6	LCS2	S2-36	S2-033470: 5.5.1 5.6.1 9.1.8.4 9.1.9.1 S2-034390: 9.1.8.4 9.1.9.1 (The change in 9. (figure 9.8) was excluded from this combined document, the new figure in S2-034055 is not visible.) S2-034388: 9.1.8.4
S2-034392	Combined S2-034056(CR234r1), S2-034353(CR229r2) and S2-033469(CR220r1) on LCS2	23.271	237	F	6.5.0	6	LCS2	S2-36	S2-034056: 9.1.1 9.1.1A 9.1.2 9.1.5 9.1.5A 9.1.6 9.1 9.1.8 9.1.9 9.2.1 9.2.2 S2-034353: 3.1 5.5.2 9.1.8.1 9.1.8.2 9.1.8.3 9.1.8.4 9.1.9 9.1.9.1 Annex F S2-033469: 5.6.1 9.1.8 9.1.9

Note 1: S2-034391 and S2-034392 were presented for information at first time in SA plenary and assigned CR numbers and S2 tdoc numbers after the approvals of related 6 CRs. Accordingly, S2-033470, S2-034390, S2-034388, S2-034056, S2-034353 and S2-033469 were deleted in the above list.

3GPP TSG-SA2 Meeting #35 **S2-033646**
Bangkok, Thailand, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **225** ⌘ **rev** **-** ⌘ Current version: **5.8.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☒ Core Network ☒

Title:	⌘	Addition of Position Method Used, to attributes returned with location estimate.
Source:	⌘	AT&T Wireless Services, Ericsson, Nortel Networks
Work item code:	⌘	LCS2
Date:	⌘	14 Oct. 03
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	To maintain consistency with latest RAN Stage-2 TS 25.305. Rel-5 CR 181 approved at 3GPP SA#21 plenary applied only to the case when the access network is GERAN in the A/Gb mode. However, RAN approved a Rel-5 CR to 25.305 which applied to both GERAN in A/Gb and Iu mode and UTRAN in Iu mode.
Summary of change:	⌘	In the Location Report the postioning method is included if the access network is either GERAN in the A/Gb mode, GERAN in the Iu mode or UTRAN in the Iu mode Remove restriction that positioning method may be returned only "if access network is GERAN in the A/Gb mode".
Consequences if not approved:	⌘	Inconsistency with RAN Stage 2 25.305.

Clauses affected:	⌘	7.1.2, 9.1.2, 9.1.5, 9.1.6

Other specs affected: ⌘	Y	N		⌘
		X	Other core specifications	
		X	Test specifications	
		X	O&M Specifications	

Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

**** First Modified Section ****

7.1.2 Location Report

The access network reports the location of the Target UE to the core network entities. The location report may contain the following information as defined in the corresponding location request:

- the geographical co-ordinates of the Target UE;
- the positioning method used to obtain the location estimate, if the access network is either GERAN in the A/Gb mode, GERAN in the Iu mode or UTRAN in the Iu mode;
- the service area in which the Target UE is located;
- achieved quality level of the location estimate.

**** Next Modified Section ****

9.1.2 Circuit Switched Mobile Terminating Location Request (CS-MT-LR)

Figure 9.2 illustrates general network positioning for LCS clients external to the PLMN. In this scenario, it is assumed that the target UE is identified using either an MSISDN or IMSI.

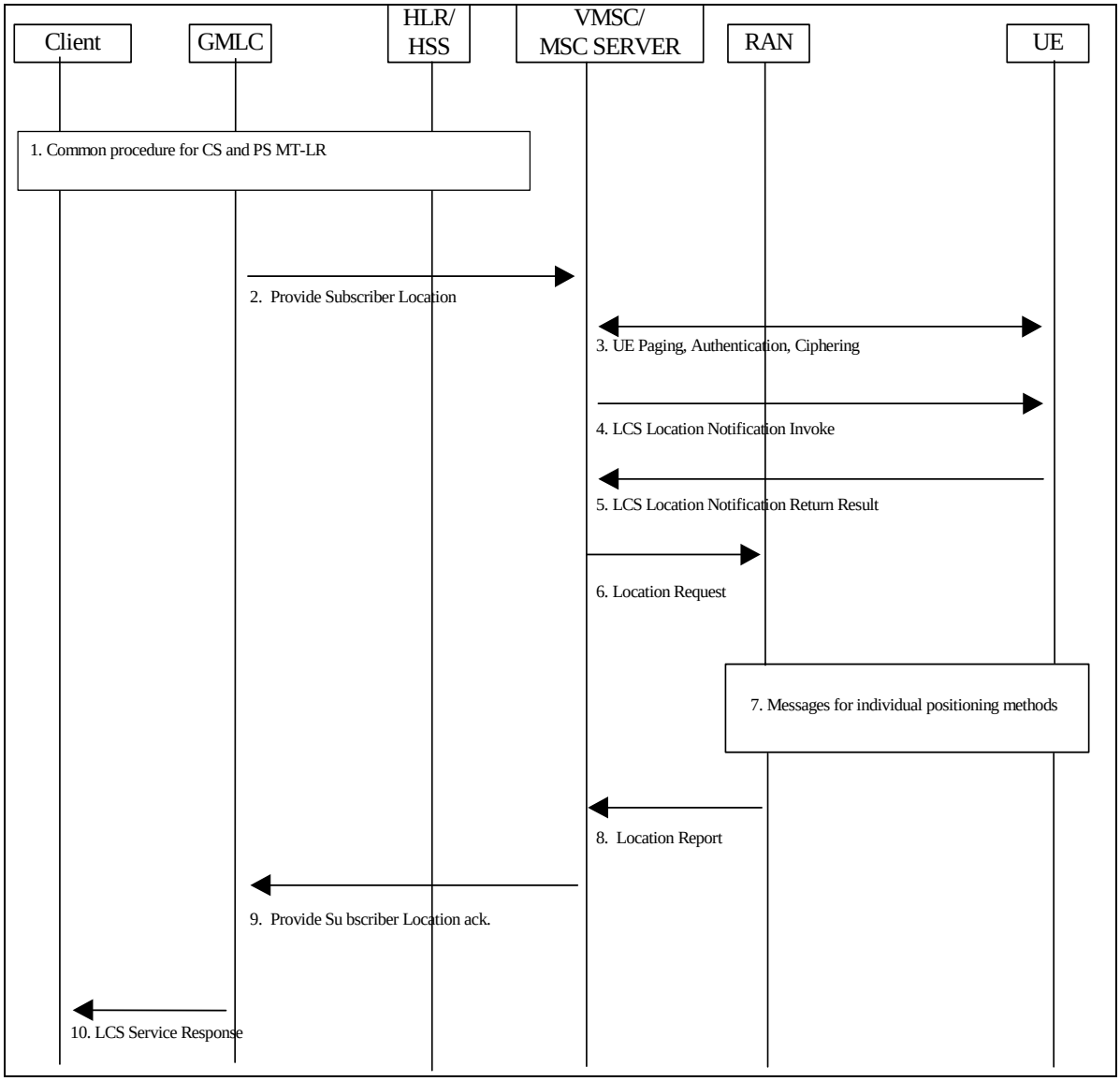

Figure 9.2: Network Positioning for a CS-MT-LR

9.1.2.1 Location Preparation Procedure

1) Common PS and CS MT-LR procedure as described in 9.1.1.

2) The GMLC sends a PROVIDE_ SUBSCRIBER _LOCATION message to the MSC/MSC server indicated by the HLR/HSS. This message carries the type of location information requested (e.g. current location), the UE subscriber's IMSI, LCS QoS information (e.g. accuracy, response time) and an indication of whether the LCS client has the override capability. For a call related location request, the message also carries the LCS client's called party number. For a value added LCS client, the message shall carry the client name, the external identity of the LCS client and the Requestor Identity (if that is both supported and available). For a PLMN operator LCS client, the message shall carry the internal identity of the LCS client. Moreover the message may also carry the Service Type**.** If the target UE's codeword handling information indicates that the codeword shall be sent to the UE user for checking, the message may carry also the codeword received from the LCS client. For a PLMN operator LCS client, the message shall carry the internal identity of the LCS client. If the Requestor Identity is provided, the GMLC shall send it as separate information. In addition, in order to display the requestor identity in case of pre rel-5 network elements (i.e. MSC and/or UE), the requestor identity may be also added to the LCS client name by the GMLC. When the Requestor identity is added to the LCS client name the practise described in the Annex C should be followed.

3) If the GMLC is located in another PLMN or another country, the VMSC/MSC server first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The VMSC/MSC server then verifies LCS barring restrictions in the UE user's subscription profile in the MSC server. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC. Otherwise, if the UE is in idle mode, the Core Network performs paging, authentication and ciphering. The MSC will page a GPRS attached UE either through A/Iu or Gs interface, depending on the presence of the Gs interface (see Note).The UE will inform the network about its LCS capabilities, as described in chapter 6.3.4.. If the UE is instead in dedicated mode, the VMSC/MSC server will already have UE classmark information. In GSM this is supported by controlled early classmark sending.

[Note 1: In GSM, if the target UE has an established circuit call other than speech, the location request may be denied and an error response is then returned to the GMLC. If the location request is allowed for a non-speech circuit call, it shall be up to RAN to decide, on the basis of the applicable position methods and requested QoS, whether positioning is possible. This is FFS]

Note: In some network mode of operation, a GPRS capable UE may not receive the CS paging. In addition, upon receipt of a CS paging, a GPRS capable UE may immediately answer to the Paging Request or delay the answer, as defined in 3GPP TS 22.060 and 23.060. A GPRS UE in class B mode may also suspend its GPRS traffic, sending a GPRS Suspension Request to the network.

4) If the location request comes from a value added LCS client and the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS (according to the UE Capability information), an LCS Location Notification Invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client, the Requestor Identity (if that is both supported and available) and whether privacy verification is required. Moreover, the message may carry also the service type and the codeword.

   [FFS: For a call related location request, the LCS client identity shall be set to the LCS client's called party number if no separate LCS client identity was received from the GMLC.] Optionally, the VMSC/MSC server may after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 6 without waiting for a LCS Location Notification Return Result message in step 5.

NOTE 2: This step is for further study, it should be investigated e.g. which client identities to include in the Privacy Notification message to be shown to the end-user.

5) The target UE notifies the UE user of the location request. If privacy verification was requested, the target UE indicates to the UE user whether the location request will be allowed or not allowed in the absence of a response and waits for the user to grant or withhold permission. The UE then returns an LCS Location Notification Return Result to the VMSC/MSC server indicating, if privacy verification was requested, whether permission is granted or denied. Optionally, the LCS Location Notification Return Result message can be returned some time after step 4, but before step 9. If the UE user does not respond after a predetermined time period, the VMSC/MSC server shall infer a "no response" condition. The VMSC/MSC server shall return an error response to the GMLC

if privacy verification was requested and either the UE user denies permission or there is no response with the UE subscription profile indicating barring of the location request in the absence of a response.

6) The MSC/MSC server sends a Location Request message to RAN. This message includes the type of location information requested and requested QoS and, in GSM, the UE's location capabilities.

9.1.2.2 Positioning Measurement Establishment Procedure

7) RAN determines the positioning method and instigates the particular message sequence for this method, as specified in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

9.1.2.3 Location Calculation and Release Procedure

8) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the MSC/MSC server in a Location Report message. The information about the positioning method used may be returned with the location estimate ~~if the access network is GERAN in the A/Gb mode~~. If a location estimate could not be obtained, RAN returns a Location Report message containing a failure cause and no location estimate.

9) The MSC/MSC server returns the location information and its age to the GMLC, if the VMSC/MSC server has not initiated the Privacy Verification process in step 4. If step 4 has been performed for privacy verification, the VMSC/MSC server returns the location information, only if it has received a LCS Location Notification Return Result indicating that permission is granted. In these cases, the information about the positioning method used may be sent with the location information. If a LCS Location Notification Return Result message indicating that permission is not granted is received, or there is no response, with the UE subscription profile indicating barring of location in the absence of a response, the VMSC/MSC server shall return an error response to the GMLC. If RAN did not return a successful location estimate, but the privacy checks in steps 4 - 5 were successfully executed, the VMSC/MSC server may return the last known location of the target UE if this is known and the LCS client is requesting the current or last known location. The MSC server may then release the Mobility Management connection to the UE, if the UE was previously idle, and the MSC/MSC server may record billing information.

10) The GMLC returns the UE location estimate to the requesting LCS client as described in chapter 9.1.1. The LCS Service Response from the GMLC to the LCS client may contain the information about the positioning method used.

**** Next Modified Sections ****

9.1.5 Network Induced Location Request (NI-LR)

Figure 9.4 illustrates positioning for an emergency service call.

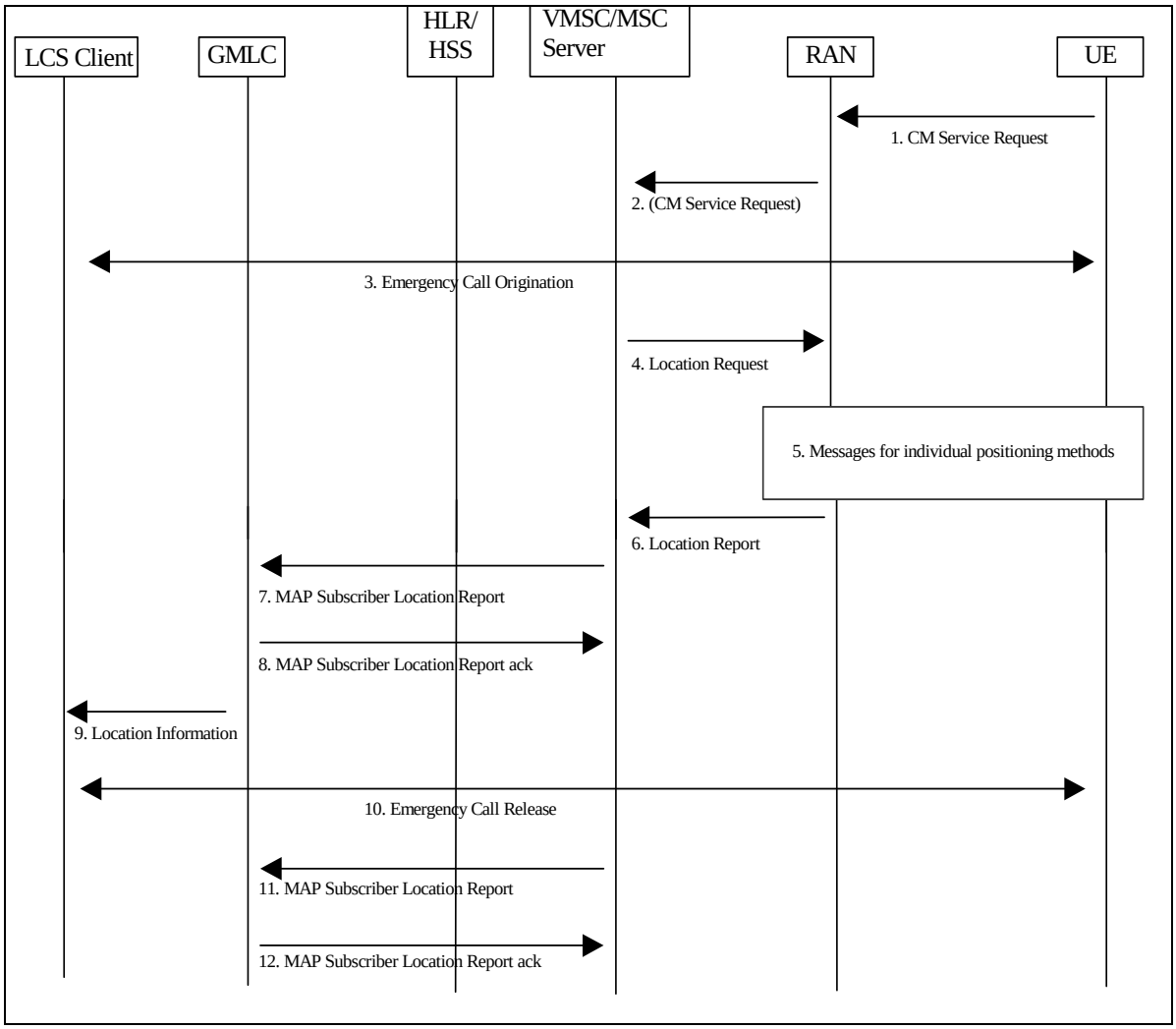

Figure 9.4: Positioning for a NI-LR Emergency Service Call

9.1.5.1 Location Preparation Procedure

1) An initially idle UE requests radio connection setup indicating a request for an Emergency Service call to the VMSC/MSC server via RAN.

2) RAN shall convey the CM service request to the core network. (Before having a CM connection there must be a radio connection.) The UE may identify itself using a TMSI, IMSI or IMEI.

3) The emergency call procedure is applied. The VMSC/MSC server, RAN and UE continue the normal procedure for emergency call origination towards the appropriate emergency services client. Depending on local regulatory requirements, the sending of call setup information into the PSTN may be delayed until either the UE's location has been obtained or the location attempt has failed or a PLMN defined timer has expired before location was obtained. Call setup information sent into the PSTN may include the UE location (if already obtained) plus information that will enable the emergency service provider to request UE location at a later time (e.g. NA-ESRD and NA-ESRK in North America).

4) At any time after step 1, the VMSC/MSC server may initiate procedures to obtain the UE's location. These procedures may run either in parallel with the emergency call origination or while emergency call origination is suspended to delay sending of call setup information into the PSTN according to step 3. The VMSC/MSC server

sends a Location Request message to RAN associated with the UE's current location area (see step 6 for a MT-LR). This message includes the QoS required for an emergency call.

9.1.5.2 Positioning Measurement Establishment Procedure

5) RAN determines the positioning method and instigates the particular message sequence for this method, as specified in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

9.1.5.3 Location Calculation and Release Procedure

6) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the VMSC/MSC server in a Location Report. The information of the positioning method used may be returned with the location estimate ~~if the access network is GERAN in the A/Gb mode~~. If a location estimate could not be obtained, the RAN returns a location response containing a failure cause and no location estimate.

7) Depending on local regulatory requirements, the VMSC/MSC server may send a MAP Subscriber Location report to a GMLC associated with the emergency services provider to which the emergency call has been or will be sent. This message shall carry any location estimate returned in step 6, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling UE, and the information about the positioning method used. In North America, any NA-ESRD and any NA-ESRK that may have been assigned by the VMSC/MSC server shall be included. The message shall also indicate the event that triggered the location report. If location failed (i.e. an error result was returned by RAN in step 6), an indication of failure rather than a location estimate may be sent to the GMLC: the indication of failure is conveyed by not including a location estimate in the MAP Subscriber Location Report.

8) The GMLC acknowledges receipt of the location information. For a North American Emergency Services call, the GMLC shall store the location information for later retrieval by the emergency services LCS client.

9) The GMLC may optionally forward the information received in step 8 to the emergency services LCS client. For a North American emergency services call the client is expected to obtain the location information by requesting it from the GMLC. The information about the positioning method used may be sent with the location information from the GMLC to the LCS client.

10) At some later time, the emergency services call is released.

11) For a North American Emergency Services call, the MSC/MSC server sends another MAP Subscriber Location Report to the GMLC. This message may include the same parameters as before except that there is no position estimate and an indication of emergency call termination is included.

12) The GMLC acknowledges the MSC/MSC server notification and may then release all information previously stored for the emergency call.

Editorial Note: The procedure for Network Induced Location Request (NI-LR and PS-NI-LR) for a Target UE in dedicated mode should be defined in UTRAN system stage 2 [1] and GERAN Stage 2 specifications [16].

9.1.6 Packet Switched Mobile Terminating Location Request (PS-MT-LR)

Figure 9.5 illustrates the general network positioning for LCS clients external to the PLMN for packet switched services. In this scenario, it is assumed that the target UE is identified using an MSISDN or IMSI.

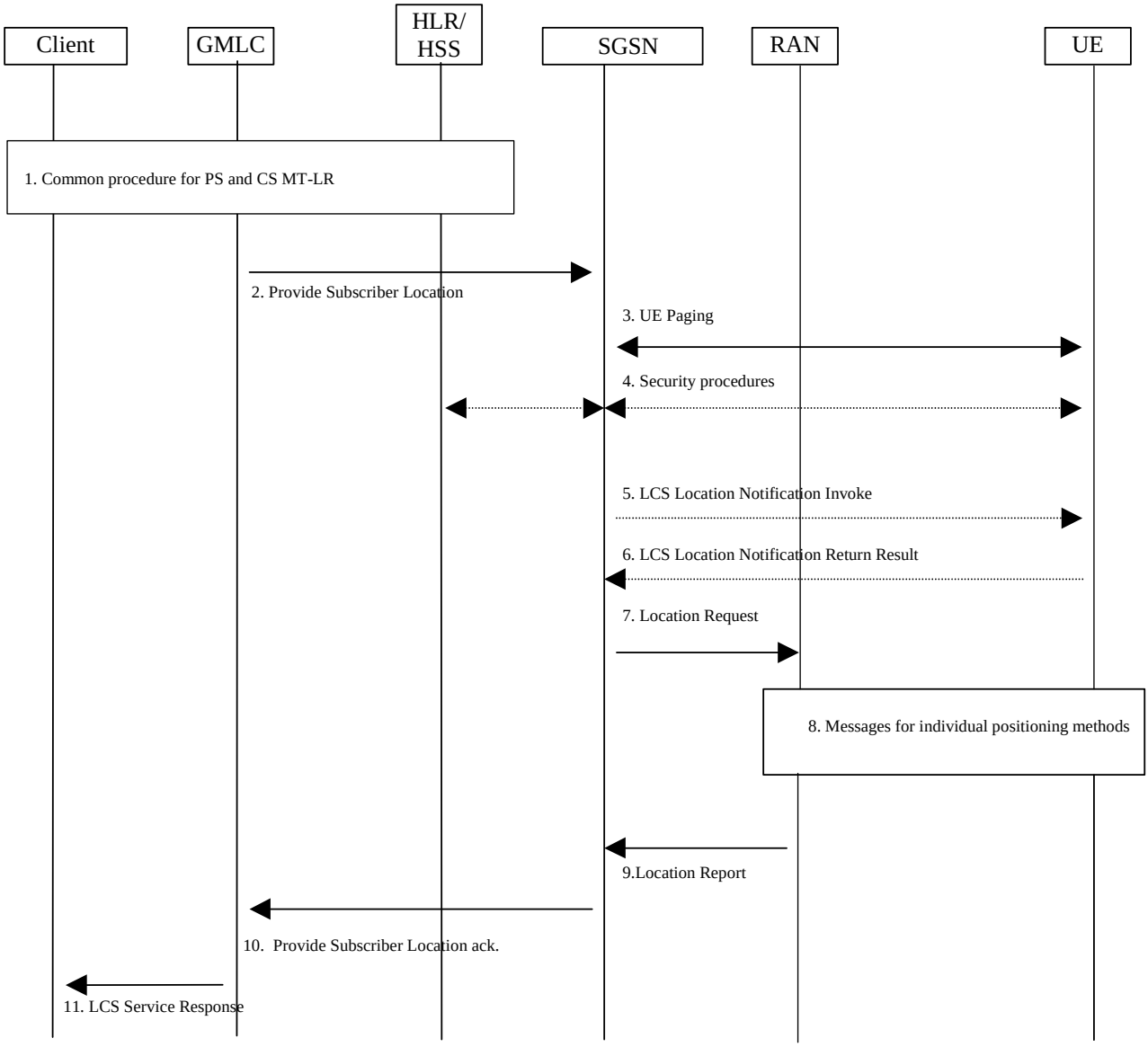

Figure 9.5: General Network Positioning for Packet Switched MT-LR

9.1.6.1 Location Preparation Procedure

1) Common PS and CS MT-LR procedure as described in 9.1.1.

2) GMLC sends a Provide Subscriber Location message to the SGSN indicated by the HLR/HSS. This message carries the type of location information requested (e.g. current location), the UE subscriber's IMSI, LCS QoS information (e.g. accuracy, response time) and an indication of whether the LCS client has the override capability. For a session related location request, the message also carries the APN-NI to which the user has established the session. For a value added LCS client, the message shall carry the client name, the external identity of the LCS client and the Requestor Identity (if that is both supported and available), optionally the message may also carry the Service Type. If the target UE's codeword handling information indicates that the codeword shall be sent to the UE user for checking, the message may carry also the codeword received from the LCS client. For a PLMN operator LCS client, the message shall carry the internal identity of the LCS client. If the Requestor Identity is provided, the GMLC shall send it as separate information. In addition, in order to display the requestor identity in case of pre rel-5 network elements (i.e. SGSN and/or UE), the requestor identity

may be also added to the LCS client name by the GMLC. When the Requestor identity is added to the LCS client name the practise described in the Annex C should be followed.

3) If the GMLC is located in another PLMN or another country, the SGSN first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The SGSN then verifies LCS barring restrictions in the UE user's subscription profile in the SGSN. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC.
Otherwise, if the UE is in idle mode, the SGSN performs paging. The paging procedure is defined in TS 23.060[15].

   FFS: The UE may be paged for location services even when in UMTS a signaling connection between mobile station and the network is established and in GSM when in Ready Mode. This makes it possible for the UE to start preparing an anticipated location service coming later by e.g. starting to measure GPS signals.

4) Security functions may be executed. These procedures are defined in TS 23.060 [15].

5) If the location request comes from a value added LCS client and the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS, a notification invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client and the Requestor Identity (if that is both supported and available), whether privacy verification is required. Moreover, the message may carry also the service type and the codeword. Optionally, the SGSN may after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 7 without waiting for a LCS Location Notification Return Result message in step 6.

6) The target UE notifies the UE user of the location request and, if privacy verification was requested, waits for the user to grant or withhold permission. The UE then returns a notification result to the SGSN indicating, if privacy verification was requested, whether permission is granted or denied. Optionally, this message can be returned some time after step 5, but before step 10. If the UE user does not respond after a predetermined time period, the SGSN shall infer a "no response" condition. The SGSN shall return an error response to the GMLC if privacy verification was requested and either the UE user denies permission or there is no response with the UE subscription profile indicating barring of the location request.

7) The SGSN sends a Location Request message to the RAN. This message includes the type of location information requested, the requested QoS and any other location information received in paging response.

9.1.6.2 Positioning Measurement Establishment Procedure

8) If the requested location information and the location accuracy within the QoS can be satisfied based on parameters received from the SGSN and the parameters obtained by the RAN e.g. cell coverage and timing information (i.e. RTT or TA), the RAN may send a Location Report immediately. Otherwise, the RAN determines the positioning method and instigates the particular message sequence for this method in UTRAN Stage 2 TS 25.305 and in GERAN Stage 2 TS 43.059. If the position method returns position measurements, the RAN uses them to compute a location estimate. If there has been a failure to obtain position measurements, the RAN may use the current cell information and, if available, RTT or TA value to derive an approximate location estimate. If an already computed location estimate is returned for an UE based position method, the RAN may verify consistency with the current cell and, if available, RTT or TA. If the location estimate so obtained does not satisfy the requested accuracy and sufficient response time still remains, the RAN may instigate a further location attempt using the same or a different position method. If a vertical location co-ordinate is requested but the RAN can only obtain horizontal co-ordinates, these may be returned.

9.1.6.3 Location Calculation and Release Procedure

9) When location information best satisfying the requested location type and QoS has been obtained, the RAN returns it to the SGSN in a Location Report message. The information about the positioning method used may be returned with the location information ~~if the access network is GERAN in the A/Gb mode~~. If a location estimate could not be obtained, the RAN returns a Location Report message containing a failure cause and no location estimate.

10) The SGSN returns the location information and its age to the GMLC, if the SGSN has not initiated the Privacy Verification process in step 5. If step 5 has been performed for privacy verification, the SGSN returns the location information, only, if it has received a LCS Location Notification Return Result indicating that permission is granted. In these cases, the information about the positioning method used may be sent with the location information. If a LCS Location Notification Return Result message indicating that permission is not granted is received, or there is no response, with the UE subscription profile indicating barring of location, the SGSN shall return an error response to the GMLC. If the SGSN did not return a successful location estimate, but the privacy checks were successfully executed, the SGSN may return the last known location of the target UE if this is known and the LCS client is requesting the current or last known location. The SGSN may record billing information.

11) The GMLC returns the UE location information to the requesting LCS client. If the LCS client requires it, the GMLC may first transform the universal location co-ordinates provided by the SGSN into some local geographic system. The GMLC may record billing for both the LCS client and inter-network revenue charges from the SGSN's network. The LCS Service Response from the GMLC to the LCS client may contain the information about the positioning method used.

Tdoc ⌘ S2-034389
(Revised S2-034276, 4127)

CR-Form-v7

CHANGE REQUEST

⌘ 23.271 CR 228 ⌘rev 2 ⌘ Current version: 5.8.0 ⌘

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Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Enhanced LDR reference number in Rel 5
Source:	⌘	Huawei, China Mobile
Work item code:	⌘	LCS2
Date:	⌘	8.12.2003
Category:	⌘	F
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change: ⌘[H14]		In the current specification, the LDR reference number is only contained inside the LCS Server. However, in stage 3 specification, the LDR reference number is deliverd to the LCS Client to identify the correspondence of the request and the response. Furthermore, in stage 3 specification, when the LCS Client initiates a cancellation procedure to cancel a previous outstanding deferred request, the LDR reference number is concluded in the cancel request as an unique identity to indicate which outstanding LDR shall be cancelled. These misalignment between stage 2 and stage 3 should be corrected.
Summary of change:	⌘	A definition of LDR reference number is added, and LDR reference number is also added as an optional parameter in the LCS Service Response message sent from LCS Server to LCS Client. In addition, the affected procedures are updated.
Consequences if not approved:	⌘	The stage 2 specification can't align with stage 3 specification, and a important function will be incomplete in stage2 TS..

Clauses affected:	⌘	3.1, 5.5.2, 9.1.8.1, 9.1.8.2, 9.1.8.3, 9.1.8.4			
Other specs Affected:	⌘	Y	N	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	No impacts to current stage3 specifics. This revision was made after the SA2 meeting to show changes in clause 5.5.2 against version 5.8.0 of TS 23.271.			

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< First changed clause >>

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

CAMEL: CAMEL is a network functionality, which provides the mechanisms of Intelligent Network to a mobile user

Call Related: any LCS related operation which is associated with an established call in CS domain and a session via an active PDP context in PS domain.

Codeword: access code, which is used by a Requestor or LCS Client in order to gain acceptance of a location request for a Target UE. The codeword is part of the privacy information that may be registered by a Target UE user.

Current Location: after a location attempt has successfully delivered a location estimate and its associated time stamp, the location estimate and time stamp is referred to as the "current location" at that point in time

Deferred location request: location request where the location response (responses) is (are) not required immediately

Global Positioning System: Global Positioning System (GPS) consists of three functional elements: Space Segment (satellites), User Segment (receivers), and Control Segment (maintenance etc.). The GPS receiver calculates its own position based on the received time differences for several satellites

Immediate location request: location request where a single location response only is required immediately

Initial Location: in the context of an originating emergency call the location estimate and the associated time stamp at the commencement of the call set-up is referred to as "initial location"

Last Known Location: current location estimate and its associated time stamp for Target UE stored in the LCS Server is referred to as the "last known location" and until replaced by a later location estimate and a new time stamp is referred to as the "last known location"

LCS (LoCation Services): LCS is a service concept in system (e.g. GSM or UMTS) standardization. LCS specifies all the necessary network elements and entities, their functionalities, interfaces, as well as communication messages, due to implement the positioning functionality in a cellular network. Note that LCS does not specify any location based (value added) services except locating of emergency calls

LCS Client: software and/or hardware entity that interacts with a LCS Server for the purpose of obtaining location information for one or more Mobile Stations. LCS Clients subscribe to LCS in order to obtain location information. LCS Clients may or may not interact with human users. The LCS Client is responsible for formatting and presenting data and managing the user interface (dialogue). The LCS Client may reside in the Mobile Station (UE)

LCS Client Access barring list: optional list of MSISDNs per LCS Client where the LCS Client is not allowed to locate any MSISDN therein

LCS Client Subscription Profile: collection of subscription attributes of LCS related parameters that have been agreed for a contractual period of time between the LCS client and the service provider

LCS Feature: capability of a PLMN to support LCS Client/server interactions for locating Target UEs

LCS Server: software and/or hardware entity offering LCS capabilities. The LCS Server accepts requests, services requests, and sends back responses to the received requests. The LCS server consists of LCS components, which are distributed to one or more PLMN and/or service provider

LDR reference number: Unique identity of a Location Deferred Request, which is assigned and maintained by the GMLC and circulated between the LCS Client, GMLC and MSC/SGSN. In addition, in a Periodical Immediate/deferred LCS Service Request, the LDR reference number is exclusive.

Local Service: service, which can be exclusively provided in the current serving network by a Value added Service Provider

Local Information: information related to a given location, or general information, which is made available in a given location

Location (Based) Application: location application is an application software processing location information or utilizing it in some way. The location information can be input by a user or detected by network or UE. Navigation is one location application example

Location Based Service (LBS): service provided either by teleoperator or a 3rd party service provider that utilizes the available location information of the terminal. Location Application offers the User Interface for the service. LBS is either a pull or a push type of service (see Location Dependent Services and Location Independent Services). In ETSI/GSM documentation of SoLSA, LBS is called "Location Related Service". ETSI and/or 3GPP -wide terminology harmonization is expected here

Location Dependent Service: service provided either by teleoperator or a 3rd party service provider that is available (pull type) or is activated (push type) when the user arrives to a certain area. It doesn't require any subscription in advance, but the push type activation shall be confirmed by the user. The offered service itself can be any kind of service (e.g. a public Xerox machine or the discount list in a store)

Location Estimate: geographic location of an UE and/or a valid Mobile Equipment (ME), expressed in latitude and longitude data. The Location Estimate shall be represented in a well-defined universal format. Translation from this universal format to another geographic location system may be supported, although the details are considered outside the scope of the primitive services

Location Independent Service: service provided either by teleoperator or a 3rd party service provider that is available and therefore can be activated anywhere in the network coverage. It is activated by the user's request or by other user's activated service, and therefore it requires a subscription in advance (pull type). The offered service itself can be any kind of service (e.g. MMS, SWDL, or LBS!)

Mobile Assisted positioning: any mobile centric positioning method (e.g. IPDL-OTDOA, E-OTD, GPS) in which the UE provides position measurements to the network for computation of a location estimate by the network. The network may provide assistance data to the UE to enable position measurements and/or improve measurement performance

Mobile Based positioning: any mobile centric positioning method (e.g. IPDL-OTDOA, E-OTD, GPS) in which the UE performs both position measurements and computation of a location estimate and where assistance data useful or essential to one or both of these functions is provided to the UE by the network. Position methods where an UE performs measurements and location computation without network assistance data are not considered within this category

Mobile Station: mobile station (MS) consists of Mobile or User Equipment (ME or UE) with a valid SIM or USIM attached. The abbreviation "UE" in this specification refers both to MS and User Equipment, see below.

PLMN Access barring list: optional list of MSISDN per PLMN where any LCS Client is not allowed to locate any MSISDN therein except for certain exceptional cases

Positioning (/location detecting): positioning is a functionality, which detects a geographical location (of e.g. a mobile terminal)

Positioning method (/locating method): method or technical solution, which is used to get an estimate of the target mobile's geographical location. For example positioning methods based on radio cell coverage, GPS or Assisted GPS methods, which are based on the Time-Of-Arrival (TOA) algorithm, and OTDOA or E-OTD methods, which are based on the Time-Difference-Of-Arrival (TDOA) algorithm. The positioning methods are further described in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

Predefined area: geographical area, which is not related to cell or radio coverage. The mobile may take special action when it recognises it has entered or left a predefined area

Privacy Class: list of LCS Clients defined within a privacy exception class to which permission may be granted to locate the target UE. The permission shall be granted either on activation by the target UE or permanently for a contractual period of time agreed between the target UE and the service provider

Privacy Exception List: list consisting of various types of privacy classes (i.e. operator related, personal etc.). Certain types of classes may require agreement between the service provider and the target UE

Prohibited area: area where the mobile must not activate its transmitter. The Prohibited area may be a Predefined area described above or related to radio cell(s)

Requestor: the originating entity which has requested the location of the target UE from the LCS client.

Requestor Identity: This identifier is identifying the Requestor and can be e.g. MSISDN or logical name.

Service Type: attribute of specific location based service provided by the LCS client, as defined in TS 22.071.

Subscription Profile: profile detailing the subscription to various types of privacy classes

Target UE: UE being positioned

User Equipment: term 'User Equipment', or 'UE', should for GSM be interpreted as 'MS', as defined in GSM TS 04.02 [19]. UE in this specification may also refer to a Mobile Equipment or User Equipment used for emergency calls, that do not have valid SIM or USIM

Further UMTS related definitions are given in 3G TS 22.101.

<< Next changed clause >>

5.5 Information Flows between Client and Server

Other types of national specific information flows may be supported in addition to the information flow specified here.

Any of the information flows here indicated may not be externally realized if the information does not flow over an open interface. On the other hand, if a flow goes over an open interface, it shall abide to a well-defined protocol, which will be further specified in other relevant specifications.

5.5.1 Location Service Request

Via the Location Service Request, the LCS client communicates with the LCS server to request for the location information of one or more than one UE within a specified quality of service. There exist two types of location service requests:

- Location Immediate Request (LIR); and
- Location Deferred Request (LDR).

The attributes for the information exchange between the LCS Client and the LCS Server have not been standardized for GSM. This information exchange may be standardized in later releases.

The following generic attributes are identified for the Location Service Request information flow:

- Target UE identity;
- LCS Client identity;
- Number dialled by the target mobile user or APN-NI, if the request is call or session related ;
- Event (applicable to LDR requests only);
- Timing information (applicable for periodical requests only);
- Requested Quality of Service information, if needed;
- Type of location, i.e. current location or last known location;
- Priority, if needed;

Local coordinate reference system, if needed;

Some of the information may be stored in GMLC and the LCS client does not need to include such information in the location service request.

5.5.2 Location Service Response

The LCS server (GMLC) sends the Location Service Response to the LCS client either as an:

- Immediate Response; or a

- Deferred Response, these deferred responses can be either single or periodic.

The following attributes are identified for the Location Service Response information flow:

- Location indication of UE in geographical coordinates expressed as a shape as defined in TS 23.032 or local coordinate system;
- The information about the positioning method used to obtain the location estimate of the UE, if it is available at the LCS server and if needed;
- Indication when UE enters or leaves the Geographical area, if needed;
- Acknowledgement for a deferred location request, if needed.
- LDR reference number, if needed.

In addition the information attributes of the location service request may be used also in the location service response.

<< Next changed clause >>

9.1.8 Mobile Terminating Deferred Location Request

Figure 9.6a illustrates the procedures for a Deferred Location Request, where the Location Report is returned based on a event.

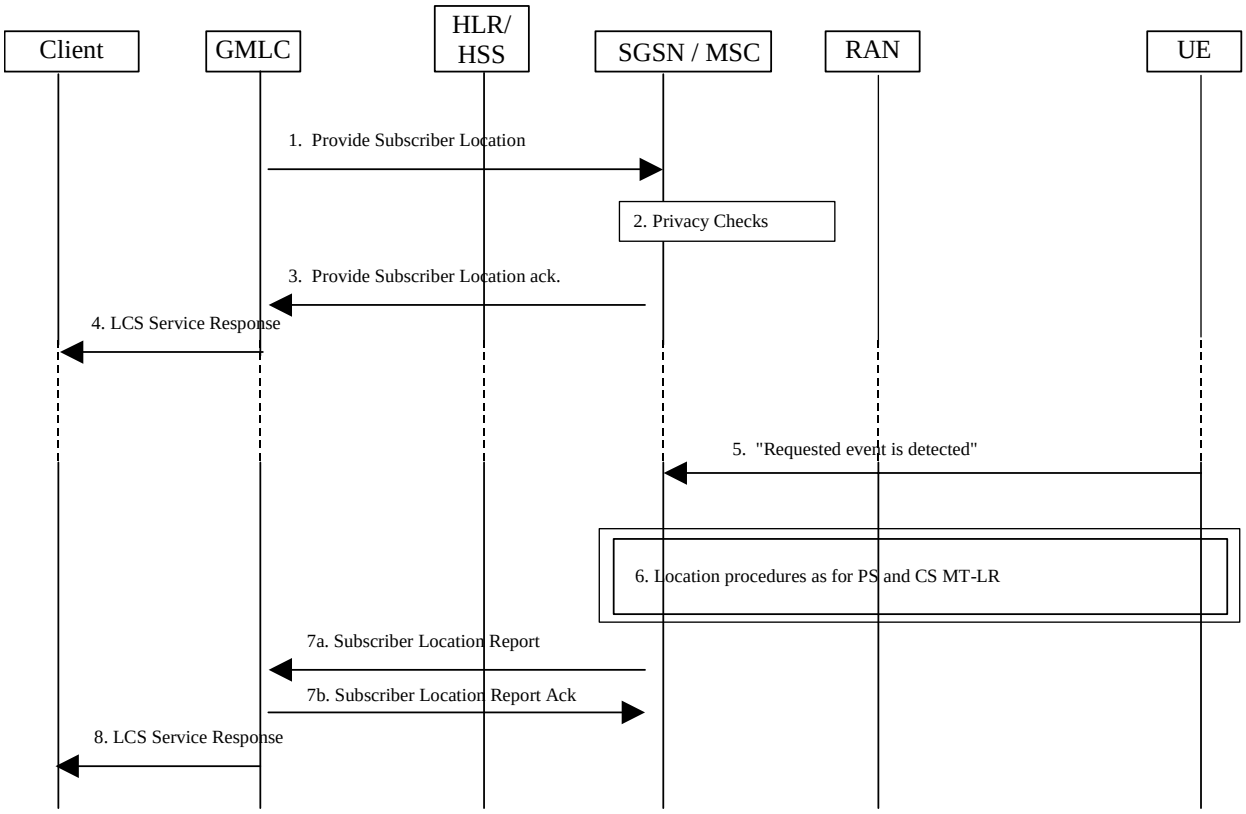

Figure 9.6a: General Network Positioning for a Deferred MT-LR

9.1.8.1 Deferred Location Request Procedure

1) GMLC assigns a reference number to Provide Subscriber Location. Provide Subscriber Location is received in SGSN/MSC as described in 9.1.2/9.1.6. In addition, the Deferred Location Request includes the reference number and the event that shall trigger the sending of Location Report.

Note: The GMLC shall send the Provide Subscriber Location for the UE regardless of the ongoing previous MT-LR for the same UE.

2) If the SGSN/MSC cannot support the deferred location request for the specified event (for temporary or permanent reasons), a Provide Subscriber Location return error shall be returned in step 3 with a suitable cause.The SGSN/MSC verifies that the LCS client is allowed to position the requested UE according to subscription information (no interaction at this stage with the UE). If not, a Provide Subscriber Location return error is returned in step 3.

3) If the SGSN/MSC can support the deferred location request for the specified event and the privacy checks in step 2 are satisfied, a Provide Subscriber Location ack. shall be returned to the GMLC without a location estimate.

4) The GMLC then returns the LCS Service Response to the LCS Client to notify whether the request was successfully accepted or not. The LDR reference number assigned by the GMLC shall be included in the response.

9.1.8.2 Location Report Procedure

5) Immediately following step 3, the SGSN/MSC shall verify if the requested event is already satisfied (e.g. UE available inferred from a current transaction) or can be invoked immediately (e.g. by paging the UE and receiving a page response). If requested event is not existing the SGSN/MSC waits until it has occurred or until some maximum time has expired.

=> In case the SGSN/MSC receives an indication that the UE has moved to another SGSN/MSC while it is waiting for the requested event to happen, a Subscriber Location Report is directly sent to the GMLC with the reference number that was included in the Provide Subscriber Location and the information that MT-LR must be re-initiated against the new SGSN/MSC. The adress of the new SGSN/MSC is included in Subscriber Location Report if available. (If new SGSN/MSC adress was included, the GMLC continues at step 1 above, otherwise it continues with an interrogation against HLR as described in 9.1.1.)

6) When the requested event is detected, the SGSN/MSC will proceed with the location request as described in 9.1.2/9.1.6.

If either security or privacy checks fails, a Subscriber Location Report with the reference number that was included in the Provide Subscriber Location is returned with appropriate error cause indicating termination of the deferred location request.

7) When location information has been obtained from the RAN, the SGSN/MSC returns the Subscriber Location Report. The report shall include the reference number that was included in the Provide Subscriber Location and an indication that this is a response to a previously sent deferred location request.

If the location information could not be obtained, or the SGSN/MSC for some other reason decides to not wait any longer for the requested event to occur (ex. timer expires), the Subscriber Location Report with the reference number that was included in the Provide Subscriber Location will be returned with an appropriate error cause indicating termination of the deferred location request.

8) GMLC then returns the LCS Service Response to the LCS Client as in 9.1.2/9.1.6. The LDR reference number that was sent to the LCS Client in step 4 shall be included in the response.

<< Next changed clause >>

9.1.8.3 Combined Periodical/Deferred Mobile Terminating Location Request

Figure 9.6b illustrates the procedures for a Combined Periodical/Deferred Mobile Terminating Location Request, where the response to the LCS client is returned periodically and based on the event.

Note: In the current specification, it is assumed the LCS client issues the Periodical/Deferred MT-LR with only the location estimate type of “current location”.

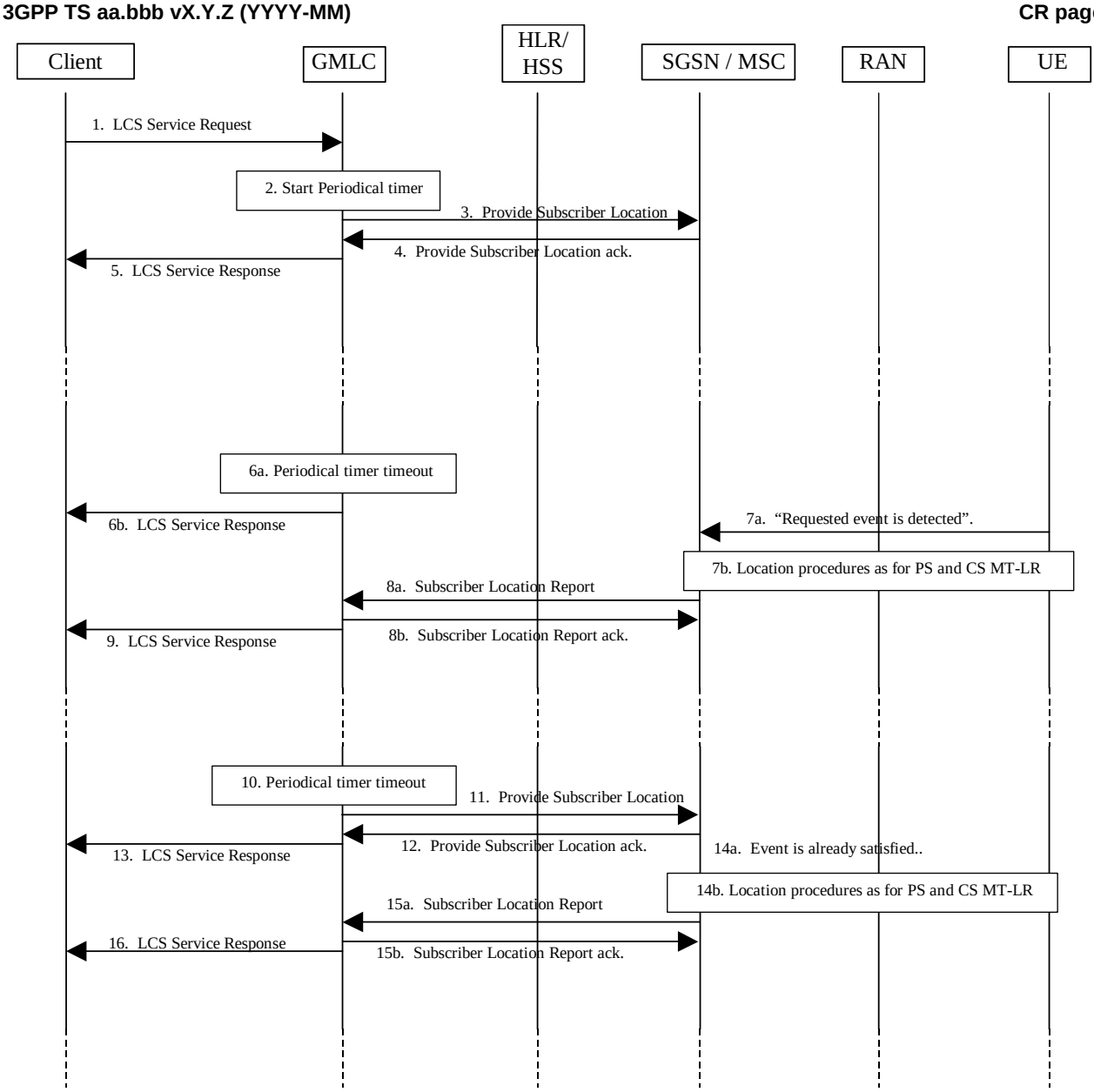

Figure 9.6b: General Network Positioning for a Combined Periodical/Deferred MT-LR

1) When a GMLC receives a LCS Service Request from a LCS client, the GMLC verifies the identity of the LCS client as described in 9.1.1.

2) The GMLC starts the periodical timer, sends a Send Routing Info for LCS to the home HLR/HSS of the target UE and gets SGSN/MSC addresses from the HLR/HSS as described in 9.1.1.

3) The GMLC sends a Deferred Location Request to the SGSN/MSC by means of Provide Subscriber Location as described in 9.1.2/9.1.6. In addition, the Deferred Location Request includes the reference number assigned by the GMLC and the event that shall trigger the sending of Subscriber Location Report.

Note: The GMLC shall send the Provide Subscriber Location for the UE regardless of the ongoing previous MT-LR for the same UE

4) If the SGSN/MSC cannot support the deferred location request for the specified event or the LCS client is not allowed to position the requested UE according to subscription information, a Provide Subscriber Location error is returned to the GMLC. If the SGSN/MSC can support the deferred location request for the specified event and the privacy checks are satisfied, a Provide Subscriber Location ack shall be returned to the GMLC without a location estimate.

5) The GMLC then returns the LCS Service Response to the LCS Client to notify whether the request was successfully accepted or not. The LDR reference number assigned by the GMLC shall be included.

6) When the periodical timer expires, if the GMLC is still waiting for the event, the GMLC shall send a LCS Service Response to the LCS client, indicating that the location is not available at that moment. The LDR reference number that was sent to the LCS Client in step 5 shall be included in the response.

7) When the requested event is detected, the SGSN/MSC will proceed with the location request as described in 9.1.2/9.1.6.

8) When location information has been obtained from the RAN, the SGSN/MSC returns the Subscriber Location Report. The report shall include the reference number included in the previously sent Provide Subscriber Location and an indication that this is a response to a previously sent deferred location request.

If the location information could not be obtained, or the SGSN/MSC for some other reason decides to not wait any longer for the requested event to occur (ex. timer expires), the Subscriber Location Report with the reference number included in the previously sent Provide Subscriber Location will be returned with an appropriate error cause indicating termination of the deferred location request.

9) GMLC then returns the LCS Service Response to the LCS Client as in 9.1.2/9.1.6. The LDR reference number that was sent to the LCS Client in step 5 shall be included in the response.

10) When the timer expires, if the GMLC is not waiting for the event, the GMLC sends a Send Routing Info for LCS to the home HLR/HSS of the target UE and receives SGSN/MSC addresses from the HLR/HSS as described in 9.1.1. The GMLC should use the same LDR reference number assigned in the step 3, should NOT assign a new LDR reference number.

11) Same as step 3.

12) Same as step 4.

13) Same as step 5.

14) If the requested event is already satisfied, the SGSN/MSC will proceed with the location request as described in 9.1.2/9.1.6.

15) Same as step 8.

16) Same as step 9.

<< Next changed clause >>

9.1.8.4 Cancellation of a Deferred Location Request

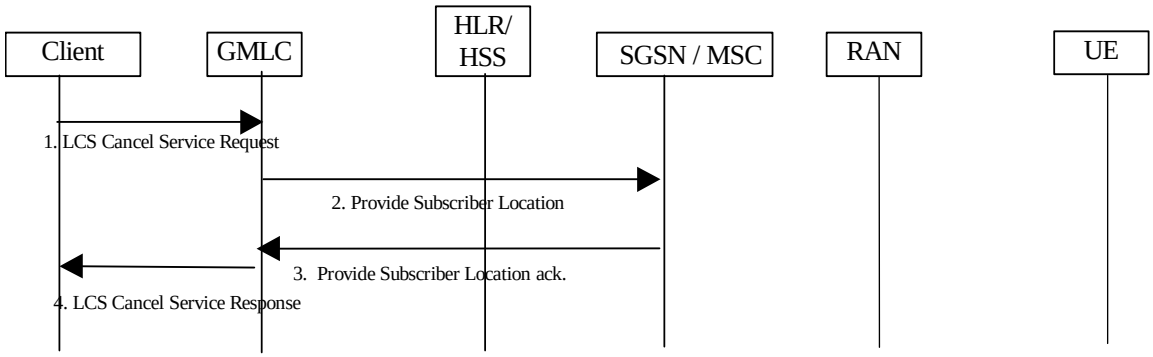

Figure 9.6c: Cancellation of a Deferred MT-LR procedure

1) The LCS Client requests the cancellation of a previously requested Deferred Location Request. The LDR reference number that was included in the previous LCS Service Response sent by the GMLC shall be included in the request to indicate which outstanding LDR should be cancelled. The cancellation could be initiated by the GMLC itself for some reasons (e.g. implementation dependent timer in the GMLC expired, or the UE's Codeword stored in the GMLC was changed and the Deferred Location Request is not allowed any more.). The event type to cancel must be indicated in the Cancellation procedure.

2) The GMLC will indicate this cancellation request in the Provide Subscriber Location toward the SGSN/MSC. The Provide Subscriber Location shall include the reference number specified by LCS Client in the LCS Cancel Service Request. ~~that was included in the previously sent Provide Subscriber Location.~~

3) When the SGSN/MSC completes the cancellation procedure, it notifies it to the GMLC in the Provide Subscriber Location Ack (with no location estimate included).

4) The GMLC informs the LCS Client that the cancellation procedure has been successfully completed.

<< End of changed clause >>

3GPP TSG SA WG2 meeting #35
Bangkok, Thailand, 27th – 31st October 2003

Tdoc ⌘S2-033467
revised S2-033620, S2-033714

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **223** ⌘ **rev** **2** ⌘ Current version: **6.5.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	H-GMLC for last known location
Source:	⌘	Siemens
Work item code:	⌘	LCS2
Date:	⌘	29/10/2003
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Other GMLCs than H-GMLC, like R-GMLC or V-GMLC, or the MSC/SGSN may store different last known locations for the same target UE due to previous procedures – e.g. last location request was initiated from a different R-GMLC, after inter PLMN roaming, last location request was anonymously, MO-LR, etc
Summary of change:	⌘	The H-GMLC should be the only GMLC in roaming cases, that may store the last known location information.
Consequences if not approved:	⌘	Privacy cannot be fullfilled in case the last known location information is stored in R-GMLC.

Clauses affected:	⌘	9.1.4.3

		Y	N		
Other specs affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< Changed section >>

9.1.4.3 Last known Location

Depending on national regulations, t~~T~~he current location estimate and its associated time stamp ~~are~~ may be stored in MSC/VLR, MSC Server, SGSN, or in H-GMLC and until replaced by a later location estimate and a new time stamp is referred to as the *"last known location"*. The last known location may be distinct from the initial location - i.e. more recent.

<< End of changed sections >>

3GPP TSG SA WG2 meeting #35
Bangkok, Thailand, 27th – 31st October 2003

Tdoc ⌘S2-033621

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **224** ⌘ **rev** **-** ⌘ Current version: **6.5.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Update of reference to SIP RFC
Source:	⌘	Siemens
Work item code:	⌘	LCS2
Date:	⌘	21/10/2003
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The RFC reference to SIP is out of date
Summary of change:	⌘	The RFC reference has been updated to 3261
Consequences if not approved:	⌘	The correct reference could not be identified by a reader

Clauses affected:	⌘	2.1

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments: ⌘

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< Changed section >>

2.1 Normative references

[1] 3G TS 25.305: "Stage 2 functional specification of UE positioning in UTRAN".

[2] GSM 01.04 (ETR 350): "Abbreviations and acronyms".

[3] 3G TS 21.905: "UMTS Abbreviations and acronyms".

[4] 3G TS 22.071: "Technical Specification Group Systems Aspects; Location Services (LCS); Stage 1".

[5] (void)

[6] 3G TS 48.008: "Mobile-services Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification".

[7] 3G TS 22.100: "UMTS phase 1 (Release 1999)".

[8] 3G TS 22.101: "Service principles".

[9] 3G TS 22.105: "Services and Service Capabilities".

[10] 3G TS 22.115: "Charging and Billing".

[11] 3G TS 23.032 (GSM 03.32): "Universal Geographical Area Description (GAD)".

[12] 3G TS 22.121: "The Virtual Home Environment".

[13] 3G TS 23.110: "UMTS Access Stratum Services and Functions".

[14] 3G TS 25.413: "UTRAN Iu Interface RANAP signaling".

[15] 3G TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[16] 3G TS 43.059: "Functional Stage 2 description of Location Services in GERAN".

[17] 3G TS 23.003: "Numbering, addressing and identification".

[18] 3G TS 29.002: "Mobile Application Part (MAP) Specification".

[19] GSM 04.02: "GSM Public Land Mobile Network (PLMN) access reference configuration".

[20] 3G TS 23.002: "Network architecture".

[21] 3G TS 23.078: "Customised Applications for Mobile network Enhanced Logic (CAMEL) - stage 2".

[22] 3G TS 23.011: "Technical realization of Supplementary Services".

[23] 3G TS 23.007: "Restoration procedures".

[24] 3G TS 24.008: "Mobile Radio Interface - Layer 3 MM/CC Specification".

[25] 3G TS 25.331 "RRC protocol specification".

[26] 3G TS 23.127 "Virtual Home Environment/Open Service Access".

[27] 3G TS 29.198-1: “Open Service Access (OSA); Application Programming Interface (API); Part 1; Overview”.

[28] 3G TS 29.198-2: “Open Service Access (OSA); Application Programming Interface (API); Part 2; Common Data”.

[29] 3G TS 29.198-3: “Open Service Access (OSA); Application Programming Interface (API); Part 3; Framework”.

[30] 3G TS 29.198-6: "Open Service Access (OSA); Application Programming Interface (API); Part 6: Mobility".

[31] LIF TS 101 "Mobile Location Protocol Specification" (Location Interoperability Forum) [Available at http://www.openmobilealliance.org/tech/LIF/]

[32] ANSI J-STD-036A: “Enhanced Wireless 9-1-1 Phase 2”

[33] RFC 2396: “Uniform Resource Identifiers”.

[34] ~~RFC2543~~RFC 3261: “SIP: Session Initiation Protocol”.

[35] 3G TS 23.228: "IP multimedia subsystem (IMS)"

<< End of changed sections >>

CR-Form-v7

CHANGE REQUEST

⌘ 23.271 CR 232 ⌘rev - ⌘ Current version: 6.5.0 ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Clarification of the format of V-GMLC address.
Source:	⌘	Ericsson
Work item code:	⌘	LCS2
Date:	⌘	12.11.2003
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The TS 23.271 needs to be updated in order to state clearly in which format the address of V-GMLC should be sent.
Summary of change:	⌘	Clauses 6.3.5 and 6.3.7 are modified in order to indicate that the IP address of V-GMLC is transferred towards HLR/HSS via the MAP UPDATE LOCATION and the MAP UPDATE GPRS LOCATION messages.
Consequences if not approved:	⌘	TS 23.271 would be misleading for the reader.

Clauses affected:	⌘	6.3.5, 6.3.7

Other specs Affected:	Y	N		
⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments:	⌘	-

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< First changed clause >>

6.3.5 MSC/VLR

The MSC/VLR contains functionality responsible for UE subscription authorization and managing call-related and non-call related positioning requests of LCS. The MSC is accessible to the GMLC via the Lg interface. The LCS functions of MSC are related to charging and billing, LCS co-ordination, location request, authorization and operation of the LCS services. If connected to SGSN through the Gs interface, it checks whether the UE is GPRS attached to decide whether to page the UE on the A/Iu or Gs interface.

The MSC/VLR may inform HLR/HSS about the UE's LCS Capabilities and may include the IP address of the V-GMLC associated with the MSC/VLR in the MAP UPDATE LOCATION message, during Registration and Inter MSC Update Location procedures.

<< Next changed clause >>

6.3.7 SGSN

The SGSN contains functionality responsible for UE subscription authorization and managing positioning requests of LCS. The SGSN is accessible to the GMLC via the Lg interface. The LCS functions of SGSN are related to charging and billing, LCS co-ordination, location request, authorization and operation of the LCS services.

The SGSN may inform HLR/HSS about the UE's LCS Capabilities for GPRS and may include the IP address of the V-GMLC associated with the SGSN in the MAP UPDATE GPRS LOCATION message, during Attach and Inter SGSN Routing Area Update procedures.

The SGSN forwards the circuit-~~swiched~~switched paging request received from the Gs interface to the BSS/RNC.

CR-Form-v7

CHANGE REQUEST

⌘ 23.271 CR 233 ⌘rev - ⌘ Current version: 6.5.0 ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network X

Title:	⌘	Correction to the way that PPR handles the pseudo external IDs, during the LCS authorization process, when the visited MSC/SGSN is pre Rel-6.
Source:	⌘	Ericsson
Work item code:	⌘	LCS2
Date:	⌘	14.11.2003
Category:	⌘	F
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	According to clause 9.1.1.1, for LCS Authorization request, when the visited MSC/SGSN is pre Rel-6, then the PPR shall convert the external LCS client ID into a pseudo external ID. This is wrong; there is no conversion of any kind, but only selection of the proper pseudo external ID, according to Table C.1 in annex C. Annex C is very detailed and states clearly that the pseudo external ID is selected and not converted.
Summary of change:	⌘	In the last paragraph of clause 9.1.1, it should be stated that PPR shall "select" a pseudo external ID, instead of "convert" the LCS client ID into a pseudo external ID.
Consequences if not approved:	⌘	TS 23.271 would be faulty and may lead to incorrect implementations.

Clauses affected:	⌘	9.1.1.1			
		Y	**N**		
Other specs Affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	-			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< Changed clause >>

9.1.1.1 LCS Authorisation request

If the UE subscribers LCS privacy information is kept in the PPR the GMLC (H-GMLC) shall send a LCS Authorisation request to PPR, see figure 9.1B.

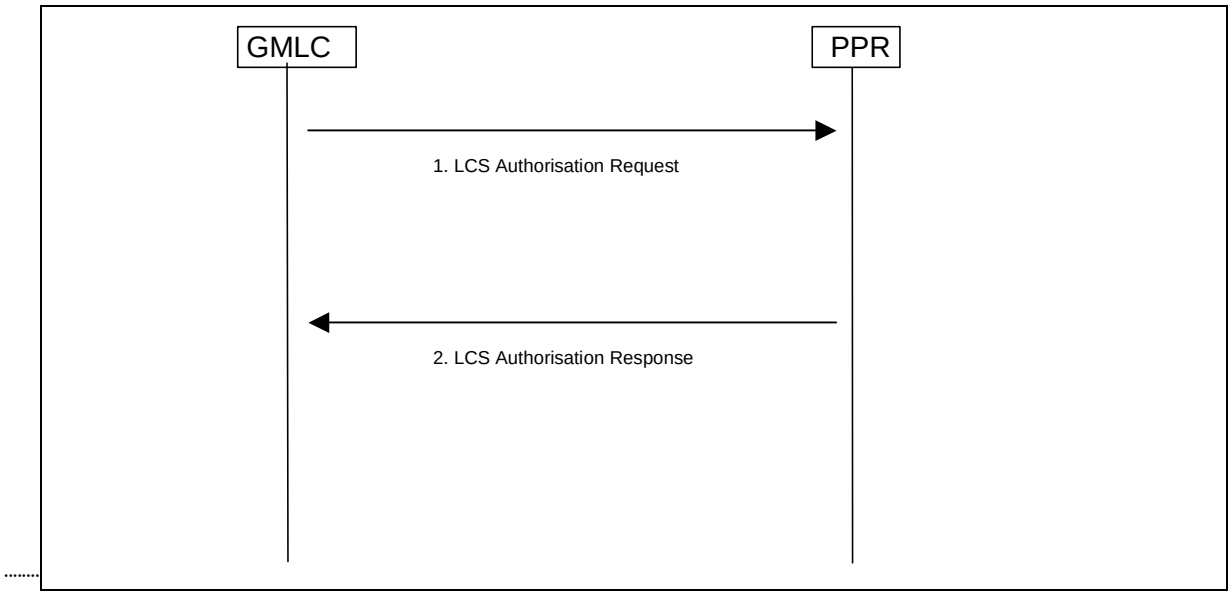

Figure 9.1B: LCS authorisation in PPR

1) The GMLC sends the LCS authorisation request to the PPR. The LCS authorisation request carries the type of location information requested (e.g. current location), the LCS client type, the UE subscriber's identity and indication whether the request is call/session related or call/session unrelated. The UE subscriber's identity can be one or both of MSISDN and IMSI. If PMD functionality is integrated in PPR, the LCS authorization request may carry the pseudonum of the target UE, instead of the verinym. In case GMLC received the LCS client's called party number or the APN-NI of the target mobile's session, GMLC shall request both call/session related and call/session unrelated privacy checks in PPR. In case GMLC did not receive the LCS client's called party number or the APN-NI of the target mobile's session, GMLC requests only a call/session unrelated privacy check in PPR. For a value added LCS client, the message shall carry the client's name, the external identity of the LCS client and the requestor identity (if that is both supported and available). Moreover the message may also carry the Service Type and the Codeword. This message shall also carry the LCS capabilities of the SGSN or VMSC/MSC server.

   In case the additional privacy check was requested to be performed after the positioning procedure the LCS Authorisation Request shall also include the location estimate.

2) If the LCS authorization request contains the pseudonym of the target UE, the PPR with PMD functionality seeks to determine the verinym of the target UE. PPR performs the privacy check based on the target UE's privacy profile. The result of that privacy check is sent to GMLC in the LCS Authorisation response. If the location request is to be barred, the PPR shall send an indication of this within the LCS Authorisation response and no other indicators. If requested by the GMLC the PPR shall include two privacy check results for the LCS Authorisation response, both call/session related and call/session unrelated privacy check results. The response may also contain information if an additional privacy check is needed when the GMLC has received the location information of the target UE (e.g. if the target UE allows its location information to be given to the LCS client only when it is located in certain areas).

   If the LCS authorisation request contains the pseudonym of the target UE and the PPR has integrated PMD functionality, the PPR shall return the target UE's IMSI and/or MSISDN corresponding to the pseudonym in the LCS authorisation response.

   If PPR received information that the visited MSC/SGSN is pre Rel-6 it shall ~~convert the external LCS client ID into~~ select a pseudo external ID which shall carry the response of the privacy check. For more information on

pseudo external Ids, see Annex C.
In case the subscriber changed his privacy information the LCS authorisation response shall be also used to indicate this to the GMLC.

3GPP TSG-SA2#36 ***Tdoc ⌘S2-034169***

New York, U.S.A. 24th – 28th November, 2003 (revised S2-033801, S2-033472, S2-033651)

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **226** ⌘ **rev** **3** ⌘ Current version: **6.5.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Cell ID and SAI
Source:	⌘	Nokia, Nortel Networks, Siemens
Work item code:	⌘	LCS2
Date:	⌘	18.11.2003
Category:	⌘	**B**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	The current 3GPP specifications do not allow the option of sending the serving cell id or SAI from the MSC to GMLC. In North America this information (serving cell id or SAI) is required to be passed to the emergency centers (PASPs) as part of the FCC E911 phase 1 mandate. It is needed with or without the phase 2 latitude/longitude location information. The cell id or SAI is needed because the NA-ESRD (which is used to provide the phase1 information) is not always sent by the MSC to GMLC, and if an NA-ESRK is sent, the GMLC only has the phase2 information (lat/long) and not phase1 information (cell id, SAI or ESRD).
Summary of change:	⌘	Added the option for emergency calls to allow MSC, SGSN and GMLC to forward the serving cell id or SAI with the location information.
Consequences if not approved:	⌘	Emergency Call Location Information will not be available to phase 1 PSAPs.

Clauses affected:	⌘	9.1.5, 9.1.5A, 9.1.7

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications		*TS 29.002*
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	This CR is a revision of S2-033801, which was approved in SA2#35.

How to create CRs using this form:

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2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

***** First modified clause *****

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

CAMEL: CAMEL is a network functionality, which provides the mechanisms of Intelligent Network to a mobile user

Call Related: any LCS related operation which is associated with an established call in CS domain and a session via an active PDP context in PS domain.

Codeword: access code, which is used by a Requestor or LCS Client in order to gain acceptance of a location request for a Target UE. The codeword is part of the privacy information that may be registered by a Target UE user.

Current Location: after a location attempt has successfully delivered a location estimate and its associated time stamp, the location estimate and time stamp is referred to as the "current location" at that point in time

Deferred location request: location request where the location response (responses) is (are) required after a specific event has occurred. The event may or may not occur immediately

Global Positioning System: Global Positioning System (GPS) consists of three functional elements: Space Segment (satellites), User Segment (receivers), and Control Segment (maintenance etc.). The GPS receiver calculates its own position based on the received time differences for several satellites

Immediate location request: location request where a single location response only is required immediately

Initial Location: in the context of an originating emergency call the location estimate and the associated time stamp at the commencement of the call set-up is referred to as "initial location"

Last Known Location: current location estimate and its associated time stamp for Target UE stored in the LCS Server is referred to as the "last known location" and until replaced by a later location estimate and a new time stamp is referred to as the "last known location"

LCS (LoCation Services): LCS is a service concept in system (e.g. GSM or UMTS) standardization. LCS specifies all the necessary network elements and entities, their functionalities, interfaces, as well as communication messages, due to implement the positioning functionality in a cellular network. Note that LCS does not specify any location based (value added) services except locating of emergency calls

LCS Client: software and/or hardware entity that interacts with a LCS Server for the purpose of obtaining location information for one or more Mobile Stations. LCS Clients subscribe to LCS in order to obtain location information. LCS Clients may or may not interact with human users. The LCS Client is responsible for formatting and presenting data and managing the user interface (dialogue). The LCS Client may reside in the Mobile Station (UE)

LCS Client Access barring list: optional list of MSISDNs per LCS Client where the LCS Client is not allowed to locate any MSISDN therein

LCS Client Subscription Profile: collection of subscription attributes of LCS related parameters that have been agreed for a contractual period of time between the LCS client and the service provider

LCS Feature: capability of a PLMN to support LCS Client/server interactions for locating Target UEs

LCS Server: software and/or hardware entity offering LCS capabilities. The LCS Server accepts requests, services requests, and sends back responses to the received requests. The LCS server consists of LCS components, which are distributed to one or more PLMN and/or service provider

Local Information: information related to a given location, or general information, which is made available in a given location

Local Service: service, which can be exclusively provided in the current serving network by a Value added Service Provider

Location (Based) Application: location application is an application software processing location information or utilizing it in some way. The location information can be input by a user or detected by network or UE. Navigation is one location application example

Location Based Service (LBS): service provided either by teleoperator or a 3rd party service provider that utilizes the available location information of the terminal. Location Application offers the User Interface for the service. LBS is either a pull or a push type of service (see Location Dependent Services and Location Independent Services). In ETSI/GSM documentation of SoLSA, LBS is called "Location Related Service". ETSI and/or 3GPP -wide terminology harmonization is expected here

Location Dependent Service: service provided either by teleoperator or a 3rd party service provider that is available (pull type) or is activated (push type) when the user arrives to a certain area. It doesn't require any subscription in advance, but the push type activation shall be confirmed by the user. The offered service itself can be any kind of service (e.g. a public Xerox machine or the discount list in a store)

Location Estimate: geographic location of an UE and/or a valid Mobile Equipment (ME), expressed in latitude and longitude data. The Location Estimate shall be represented in a well-defined universal format. Translation from this universal format to another geographic location system may be supported, although the details are considered outside the scope of the primitive services

Location Independent Service: service provided either by teleoperator or a 3rd party service provider that is available and therefore can be activated anywhere in the network coverage. It is activated by the user's request or by other user's activated service, and therefore it requires a subscription in advance (pull type). The offered service itself can be any kind of service (e.g. MMS, SWDL, or LBS!)

Mobile Assisted positioning: any mobile centric positioning method (e.g. IPDL-OTDOA, E-OTD, GPS) in which the UE provides position measurements to the network for computation of a location estimate by the network. The network may provide assistance data to the UE to enable position measurements and/or improve measurement performance

Mobile Based positioning: any mobile centric positioning method (e.g. IPDL-OTDOA, E-OTD, GPS) in which the UE performs both position measurements and computation of a location estimate and where assistance data useful or essential to one or both of these functions is provided to the UE by the network. Position methods where an UE performs measurements and location computation without network assistance data are not considered within this category

Mobile Station: mobile station (MS) consists of Mobile or User Equipment (ME or UE) with a valid SIM or USIM attached. The abbreviation "UE" in this specification refers both to MS and User Equipment, see below.

Non-dialable call back number: In case of a SIM-less emergency call, a non-dialable callback number shall be used to identify the target UE. The format and structure of the non-dialable callback number is according to national or regional regulations.

PLMN Access barring list: optional list of MSISDN per PLMN where any LCS Client is not allowed to locate any MSISDN therein except for certain exceptional cases

Positioning (/location detecting): positioning is a functionality, which detects a geographical location (of e.g. a mobile terminal)

Positioning method (/locating method): method or technical solution, which is used to get an estimate of the target mobile's geographical location. For example positioning methods based on radio cell coverage, GPS or Assisted GPS methods, which are based on the Time-Of-Arrival (TOA) algorithm, and OTDOA or E-OTD methods, which are based on the Time-Difference-Of-Arrival (TDOA) algorithm. The positioning methods are further described in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

Predefined area: geographical area, which is not related to cell or radio coverage. The mobile may take special action when it recognises it has entered or left a predefined area

Privacy Class: list of LCS Clients defined within a privacy exception class to which permission may be granted to locate the target UE. The permission shall be granted either on activation by the target UE or permanently for a contractual period of time agreed between the target UE and the service provider

Privacy Exception List: list consisting of various types of privacy classes (i.e. operator related, personal etc.). Certain types of classes may require agreement between the service provider and the target UE

Privacy Profile Register, PPR: The PPR stores privacy information of the target mobile. The PPR also executes privacy checks and sends the privacy check results to other network elements using the Lpp interface. PPR may be a standalone network entity or the PPR functionality may be integrated in H-GMLC.

Prohibited area: area where the mobile must not activate its transmitter. The Prohibited area may be a Predefined area described above or related to radio cell(s)

Pseudo-external identity: The pseudo-external identity is not the identity of real external LCS client but the identity, which is used for notifying the result of the enhanced privacy check. The pseudo-external identity shall keep the compatibility with pre Rel-6 privacy mechanisms, which does not understand privacy check result made by H-GMLC/PPR. Each operator defines its own the pseudo-external identities.

Pseudonym: A fictitious identity, which may be used to conceal the true identity (i.e. MSISDN and IMSI) of a target UE from the requestor and the LCS client.

Pseudonym mediation device: functionality that verifies pseudonyms to verinyms

Request id: identity which is used to identify the correspondence of a location request to multiple responses when the Response method is ASYNC. Each receiving GMLC (R-GMLC or V-GMLC or H-GMLC) allocates and maintains the Request id to identify each ASYNC location request, and includes it in the responses to the source entity of the location request (i.e. LCS client or GMLC).

Requestor: the originating entity which has requested the location of the target UE from the LCS client.

Requestor Identity: This identifier is identifying the Requestor and can be e.g. MSISDN or logical name.

Response method: method how a GMLC, which receives a location request message from another entity (i.e. LCS client or GMLC), responds to the location request. There are two methods, synchronous (SYNC) and asynchronous (ASYNC). When the requesting entity wishes multiple responses (either about one or several target UE's location) to a single location request the procedure is ASYNC and when the requesting entity wishes a single response the procedure is SYNC. The source entity of the location request (i.e. LCS client or GMLC) can choose a preferred method and informs the method to the receiving GMLC. However, the selection of the method used is made by the receiving GMLC and when the ASYNC method is selected the Request id is notified to the source entity. The receiving GMLC can turn a SYNC request into an ASYNC procedure, e.g. in an overload situation, and the source entity (i.e. LCS client or GMLC) should be able to receive multiple responses even though the request was SYNC.

Service Area Identifier (SAI): information, which is used to identify an area consisting of one or more cells belonging to the same Location Area, see ref. [14]. Such an area is called a Service Area and can be used for indicating the location of a UE to the CN. For this specification, only a Service Area that is defined to be applicable to the PS and CS domains shall be used.

Service coverage: a list of country codes where an LCS client offers its location services.

Service Type: attribute of specific location based service provided by the LCS client, as defined in TS 22.071.

Serving cell identity: the Cell Global Identification (CGI), see ref [17], of the cell currently used by the target UE, e.g. for an emergency call in A-mode.

Subscription Profile: profile detailing the subscription to various types of privacy classes

Target area: geographical area which is used for change of area type deferred location request. The target area is defined by LCS client and is expressed as geographical area using a shape defined in TS 23.032, as a geographical area using local coordinate system, as a country code, as a PLMN identity or as a geopolitical name of the area (e.g. London).

Target UE: UE being positioned

User Equipment: term 'User Equipment', or 'UE', should for GSM be interpreted as 'MS', as defined in GSM TS 04.02 [19]. UE in this specification may also refer to a Mobile Equipment or User Equipment used for emergency calls, that do not have valid SIM or USIM

Verinym: True identity, i.e. MSISDN or IMSI, of the target UE

Further UMTS related definitions are given in 3G TS 22.101.

***** Next modified clause *****

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

2G-	Second Generation
3G-	Third Generation
AC	Admission Control
AI	Application Interface (prefix to interface class method)
ANM	Answer Message (ISUP)
APN	Access Point Name
APN-NI	APN Network Identifier
ARIB	Association of Radio Industries and Business
ATD	Absolute Time Difference
BCCH	Broadcast Control Channel
BER	Bit Error Rate
BSS	Base Station Subsystem
BTS	Base Transceiver Station
CAMEL	Customised Application For Mobile Network Enhanced Logic
CAP	CAMEL Application Part
CM	Connection Management
CN	Core Network
CSE	Camel Service Environment
DL	Downlink
DRNC	Drift RNC
E-OTD	Enhanced Observed Time Difference
FER	Frame Error Rate
GERAN	GSM EDGE Radio Access Network
GGSN	Gateway GPRS Support Node
GMLC	Gateway MLC
GPRS	General Packet Radio Service
GPS	Global Positioning System
HE	Home Environment
H-GMLC	Home-GMLC
HSS	Home Subscriber Server
HLR	Home Location Register
HPLMN	Home Public Land Mobile Network
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPDL	Idle Period Downlink
LA	Location Application
LAF	Location Application Function
LBS	Location Based Services
LCAF	Location Client Authorization Function
LCCF	Location Client Control Function
LCCTF	Location Client Co-ordinate Transformation Function
LCF	Location Client Function
LCZTF	Location Client Zone Transformation Function
LCS	LoCation Services
LDR	Location Deferred Request
LIR	Location Immediate Request,
LMU	Location Measurement Unit
LSAF	Location Subscriber Authorization Function
LSBcF	Location System Broadcast Function
LSBF	Location System Billing Function
LSCF	Location System Control Function
LSCTF	Location System Co-ordinate Transformation Function
LSOF	Location System Operation Function

LSPF	Location Subscriber Privacy Function
LSTF	Location Subscriber Translation Function
MAP	Mobile Application Part
ME	Mobile Equipment
MExE	Mobile Execution Environment
MLC	Mobile Location Center
MLP	Mobile Location Protocol
MM	Mobility Management
MO-LR	Mobile Originated Location Request
MS	Mobile Station
MSC	Mobile services Switching Centre
MSISDN	Mobile Station Integrated Services Data Network
MT-LR	Mobile Terminated Location Request
NA-ESRD	North American Emergency Service Routing Digits
NA-ESRK	North American Emergency Service Routing Key
NI-LR	Network Induced Location Request
OSA	Open Service Architecture
OTDOA	Observed Time Difference Of Arrival
PC	Power Control
PCF	Power Calculation Function
PLMN	Public Land Mobile Network
PMD	Pseudonym mediation device functionality
POI	Privacy Override Indicator
PPR	Privacy Profile Register
PRCF	Positioning Radio Co-ordination Function
PRRM	Positioning Radio Resource Management
PSE	Personal Service Environment
PSMF	Positioning Signal Measurement Function
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RA	Routing Area
RACH	Random Access Channel
RAN	Radio Access Network
RANAP	Radio Access Network Application Part
R-GMLC	Requesting-GMLC
RIS	Radio Interface Synchronization
RNC	Radio Network Controller
RRM	Radio Resource Management
RTD	Real Time Difference
SAI	Service Area Identifier
SAT	SIM Application Tool-Kit
SCCP	Signalling Connection Control Part
SCS	Service Capability Server
SGSN	Serving GPRS Support Node
SI	Service Interface (prefix to interface class method)
SIM	Subscriber Identity Module
SIR	Signal Interference Ratio
SLPP	Subscriber LCS Privacy Profile
SMLC	Serving Mobile Location Center
SMS	Short Message Service
SP	Service Point
SRNC	Serving RNC
SS7	Signaling System No 7
TA	Timing Advance
TMSI	Temporary Mobile Subscriber Identity
TOA	Time Of Arrival
UDT	SCCP Unitdata message
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunication System
USIM	Universal Subscriber Identity Module
U-TDOA	Uplink Time Difference of Arrival

UTRAN	Universal Terrestrial Radio Access Network
VASP	Value Added Service Provider
V-GMLC	Visited -GMLC
VHE	Virtual Home Environment
WCDMA	Wideband Code Division Multiple Access

Further GSM related abbreviations are given in GSM 01.04. Further UMTS related abbreviations are given in 3G TS 21.905 [3].

***** Next modified clause *****

9.1.5 Network Induced Location Request (NI-LR)

Figure 9.4 illustrates positioning for an emergency service call.

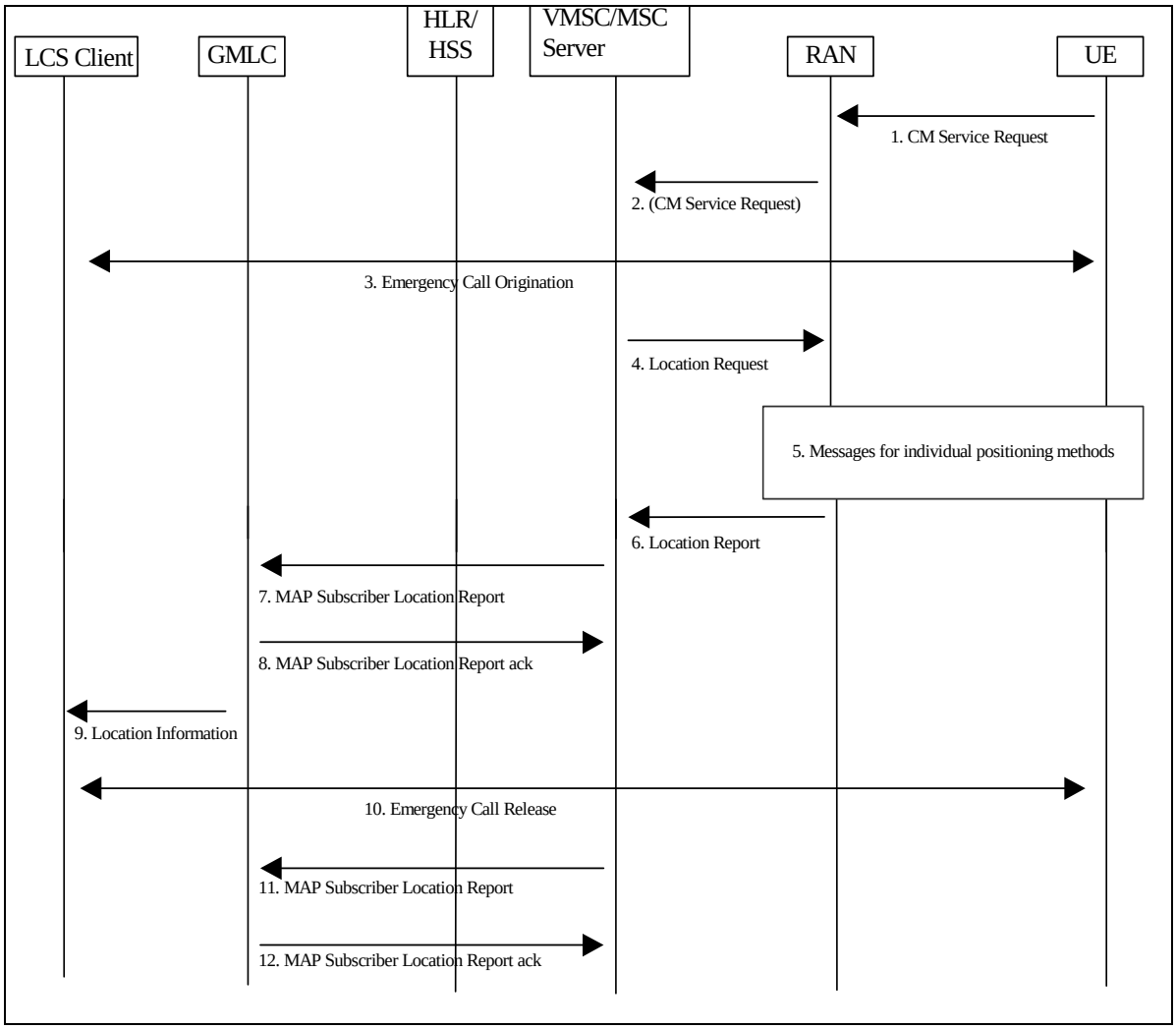

Figure 9.4: Positioning for a NI-LR Emergency Service Call

9.1.5.1 Location Preparation Procedure

1) An initially idle UE requests radio connection setup indicating a request for an Emergency Service call to the VMSC/MSC server via RAN.

2) RAN shall convey the CM service request to the core network. (Before having a CM connection there must be a radio connection.) The UE may identify itself using a TMSI, IMSI or IMEI.

3) The emergency call procedure is applied. The VMSC/MSC server determines based on the serving cell the appropriate emergency services client. The VMSC/MSC server, RAN and UE continue the normal procedure for emergency call origination towards that emergency services client. Depending on local regulatory requirements, the sending of call setup information into the PSTN may be delayed until either the UE's location has been obtained or the location attempt has failed or a PLMN defined timer has expired before location was obtained. If the serving cell serves an area that contains the service domain of multiple emergency services clients, the VMSC/MSC server may delay call setup and invoke location based routing procedures described in section 9.1.5A. Call setup information sent into the PSTN may include the UE location (if already obtained) plus

information that will enable the emergency service provider to request UE location at a later time (e.g. NA-ESRD or NA-ESRK in North America).

4) At any time after step 2, the VMSC/MSC server may initiate procedures to obtain the UE's location. These procedures may run in parallel with the emergency call origination. The VMSC/MSC server sends a Location Request message to RAN associated with the UE's current location area (see step 6 for a MT-LR). This message includes the QoS required for an emergency call.

9.1.5.2 Positioning Measurement Establishment Procedure

5) RAN determines the positioning method and instigates the particular message sequence for this method, as specified in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

9.1.5.3 Location Calculation and Release Procedure

6) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the VMSC/MSC server in a Location Report. The information of the positioning method used may be returned with the location estimate. If a location estimate could not be obtained, the RAN returns a location response containing a failure cause and no location estimate.

7) Depending on local regulatory requirements, the VMSC/MSC server may send a MAP Subscriber Location report to a GMLC associated with the emergency services provider to which the emergency call has been or will be sent. This message shall carry any location estimate returned in step 6, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling UE, ~~and~~ the information about the positioning method used and the serving cell identity or SAI of the UE. In North America, any NA-ESRD and any NA-ESRK that may have been assigned by the VMSC/MSC server shall be included. The message shall also indicate the event that triggered the location report. If location failed (i.e. an error result was returned by RAN in step 6), an indication of failure rather than a location estimate may be sent to the GMLC: the indication of failure is conveyed by not including a location estimate in the MAP Subscriber Location Report.

8) The GMLC acknowledges receipt of the location information. For a North American Emergency Services call, the GMLC shall store the location information for later retrieval by the emergency services LCS client.

9) The GMLC may optionally forward the information received in step 8 to the emergency services LCS client. For a North American emergency services call the client is expected to obtain the location information by requesting it from the GMLC. The information about the positioning method used may be sent with the location information from the GMLC to the LCS client.

10) At some later time, the emergency services call is released.

11) For a North American Emergency Services call, the MSC/MSC server sends another MAP Subscriber Location Report to the GMLC. This message may include the same parameters as before except that there is no position estimate and an indication of emergency call termination is included.

12) The GMLC acknowledges the MSC/MSC server notification and may then release all information previously stored for the emergency call.

***** Next modified clause *****

9.1.5A NI-LR using Location Based Routing – applicable to North American Emergency Calls only

Figure 9.4A illustrates positioning for an emergency service call using location based routing.

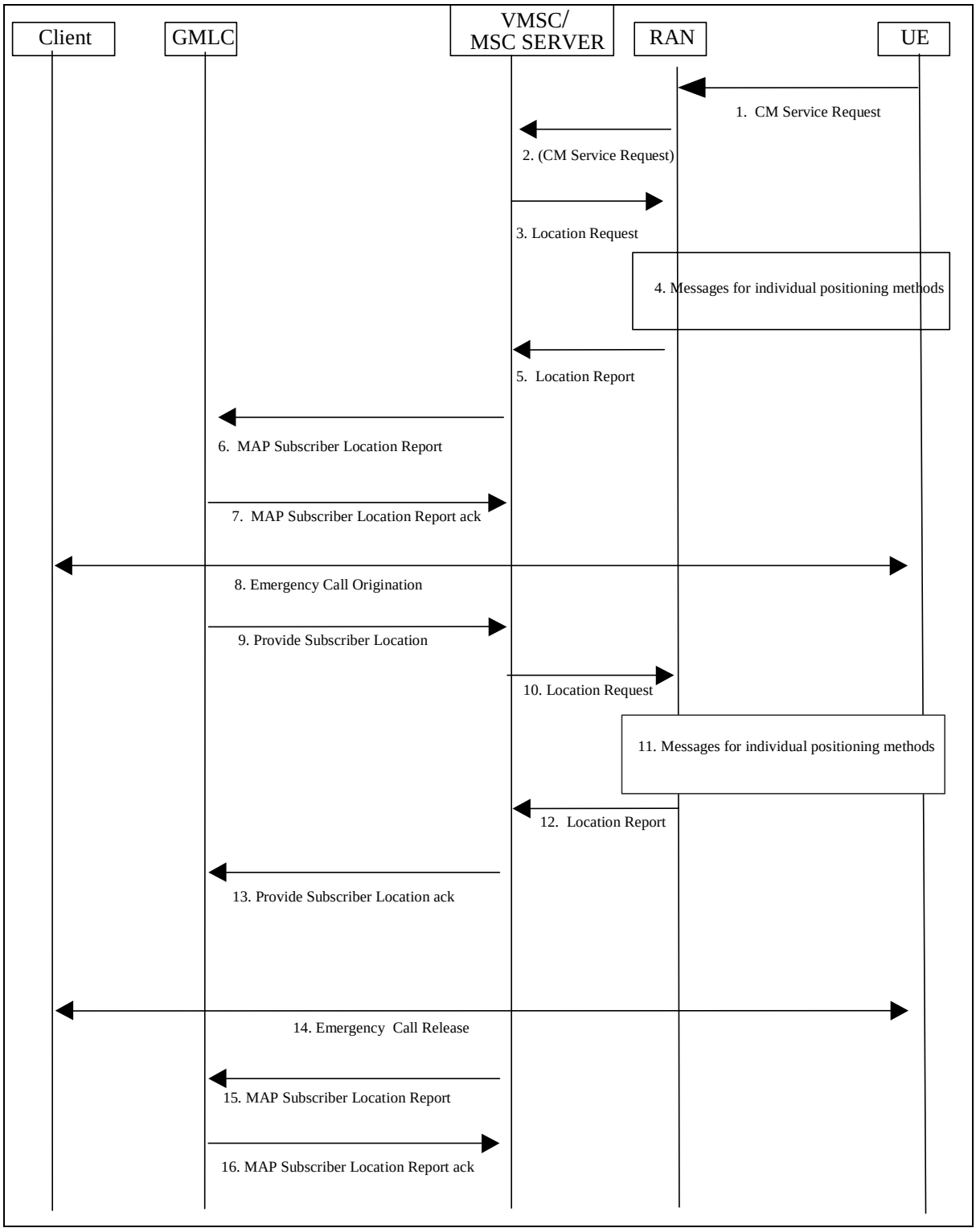

Figure 9.4A: Positioning for a NI-LR Emergency Service Call using Location Based Routing

9.1.5A.1 Location Preparation Procedure

1) An initially idle UE requests radio connection setup indicating a request for an Emergency Service call to the VMSC/MSC server via RAN.

2) RAN shall convey the CM service request to the core network. (Before having a CM connection there must be a radio connection.) The UE may identify itself using a TMSI, IMSI or IMEI.

3) The VMSC/MSC server determines that the serving cell serves an area that contains portions of multiple emergency services zones. Therefore, the VMSC/MSC server delays call setup and initiates procedures to obtain the UE's location for routing the emergency call to the emergency services LCS client. The VMSC/MSC server sends a Location Request message to RAN associated with the UE's current location area. This message includes the type of location information requested, the UE's location capabilities and a QoS with low delay and low horizontal accuracy.

9.1.5A.2 Positioning Measurement Establishment Procedure

4) RAN determines the positioning method and instigates the particular message sequence for this method, as specified in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

9.1.5A.3 Location Calculation and Release Procedure

5) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the VMSC/MSC server. If a location estimate could not be obtained, the RAN returns a location response containing a failure cause and no location estimate. If a failure is received, the VMSC/MSC server initiates emergency call setup using the normal NI-LR procedures.

6) The VMSC/MSC server sends a MAP Subscriber Location Report to a GMLC associated with the emergency services provider to which the emergency call will be sent. This message shall carry any location estimate returned in step 5, the age of this estimate and may carry the MSISDN, IMSI, ~~and~~ IMEI of the calling UE and the serving cell identity or SAI of the UE. The message shall also indicate the event that triggered the location report. Any NA-ESRD and NA-ESRK that was assigned by the VMSC/MSC server shall be included. The message shall also include an indication that the VMSC/MSC server supports the capability to replace NA-ESRK value with the one assigned by the GMLC.

7) The GMLC translates the location estimate into a zone identity and assigns a NA-ESRK, which was requested by the VMSC/MSC server. The GMLC shall include the NA-ESRK value in the MAP Subscriber Location Report ack and send it to the VMSC/MSC server. The GMLC stores the assigned NA- ESRK and any NA-ESRD that was sent by the VMSC/MSC server in step 6.

9.1.5A.4 Location Preparation Procedure

8) The emergency call procedure is applied. The VMSC/MSC server, RAN and UE continue the normal procedure for emergency call origination towards the appropriate emergency services client. Call setup information sent into the PSTN may include the UE location plus information that will enable the emergency service provider to request UE location at a later time (NA-ESRD or NA-ESRK in North America). The NA-ESRK used shall be the one received from the GMLC. If a NA-ESRK is not received from the GMLC then the VMSC/MSC server shall use the default NA-ESRK for the call as in 9.1.5.1 step 3.

9) At any time after step 6, the GMLC may send a MAP Provide Subscriber Location message to the VMSC/MSC server. This message includes a QoS with higher delay and higher horizontal accuracy required for an emergency call.

   If the GMLC is capable of determining whether the initial location satisfies the higher accuracy requirements for an emergency call, then the GMLC may not need to request for a higher accuracy location.

10) The VMSC/MSC server sends a Location Request message to RAN. This message includes the type of location information requested, the UE's location capabilities and requested higher accuracy QoS.

9.1.5A.5 Positioning Measurement Establishment Procedure

11) same as step 4.

9.1.5A.6 Location Calculation and Release Procedure

12) same as step 5.

13) The VMSC/MSC server returns the location information and its age, and the serving cell identity or SAI of the UE to the GMLC. The GMLC shall store the location information for later retrieval by the emergency services LCS client.

14) same as step 10 for normal NI-LR.

15) same as step 11 for normal NI-LR.

16) same as step 12 for normal NI-LR.

***** Next modified clause *****

9.1.7 Packet Switched Network Induced Location Request (PS-NI-LR)

Figure 9.6 illustrates a network induced location request from the SGSN. This procedure may be used e.g. for positioning of an emergency call.

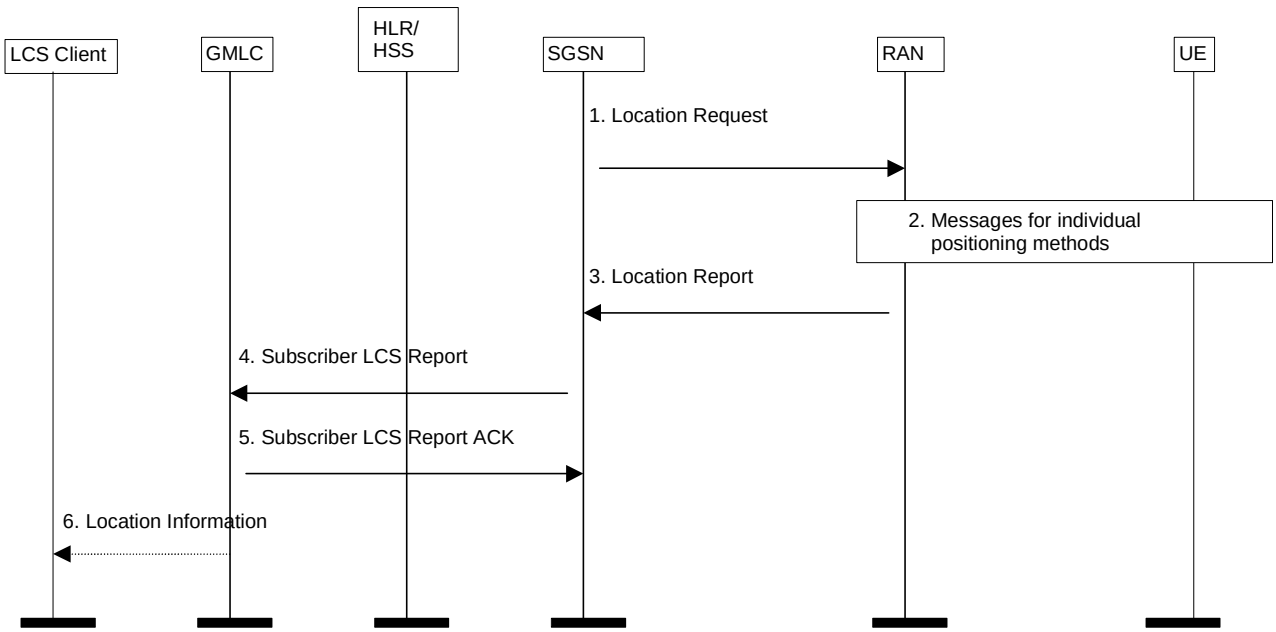

Figure 9.6: Network Induced Location Request

1) The SGSN sends a Location Request message to the RAN. This message indicates the type of location information requested and requested QoS.

9.1.7.1 Positioning Measurement Establishment Procedure

2) If the requested location information and the location accuracy within the QoS can be satisfied based on parameters received from the SGSN and the parameters obtained by the RAN e.g. cell coverage and timing information (i.e. RTT or TA), the RAN may send a Location Report immediately. Otherwise, the RAN determines the positioning method and instigates the particular message sequence for this method. If the position method returns position measurements, the RAN uses them to compute a location estimate. If there has been a failure to obtain position measurements, the RAN may use the current cell information and, if available, RTT or TA value to derive an approximate location estimate. If an already computed location estimate is returned for an UE based position method, the RAN may verify consistency with the current cell and, if available, RTT or TA value. If the location estimate so obtained does not satisfy the requested accuracy and sufficient response time still remains, the RAN may instigate a further location attempt using the same or a different position method. If a vertical location co-ordinate is requested but the RAN can only obtain horizontal co-ordinates, these may be returned.

9.1.7.2 Location Calculation and Release Procedure

3) When a location estimate best satisfying the requested QoS has been obtained, the RAN returns a Location Report to the SGSN. This message carries the location estimate that was obtained. If a location estimate was not successfully obtained, a failure cause is included in the Location Report.

4) The SGSN shall send a MAP Subscriber Location Report to the GMLC obtained in step 1 carrying the MSISDN or PDP address of the UE, the identity of the LCS client, the event causing the location estimate (NI-LR-PS) and the location estimate and its age. The serving cell identity or SAI of the UE may be sent with the location information.

5) The GMLC shall acknowledge receipt of the location estimate provided that it serves the identified LCS client and the client is accessible.

6) The GMLC may transfer the location information to the LCS client either immediately or upon request from the client.

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **236** ⌘**rev** ⌘ Current version: **6.5.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Combined S2-033470(CR214r1), S2-034390(CR213r4) and S2-034388(CR230r3) on LCS2
Source:	⌘	Of the combined document: Editor (Nokia) S2-033470: Clarifications on start time and stop time from Huawei and China Mobile S2-034390: Additional privacy check in defered location request cancellation procedure from Huawei and China Mobile S2-034388: Correction of UE available event cancellation procedure from Huawei, China Mobile and Nokia
Work item code:	⌘	LCS2 ***Date:*** ⌘ 5.12.2003
Category:	⌘	**F** ***Release:*** ⌘ REL-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change: ⌘[H14]	S2-033470:In the current TS 23.271 v6.5.0, the start time and stop time in the LCS Service Request are defined as parameters applicable to periodical requests only. However, in the change of area event procedure, the start time and stop time can be used for specifying the validity time of the request, whether the request is periodical or not. These inconsistent descriptions should be corrected.
Reason for change:	S2-034390: In the current change of area event cancellation procedure, the cancellation can be initiated by the LCS Client when the LCS Client wants to terminate the previous request, or by the R-GMLC when the timer in the R-GMLC has expired, or by the H-GMLC when the H-GMLC is aware that the UE's privacy profile changed and these changes affect any outstanding deferred location requests. Note: if the UE's privacy profile is stored in the PPR, the H-GMLC shall get a notification from the PPR when the UE's privacy profile changed. However, if cancellation procedure should be initiated by the H-GMLC, the corresponding descriptions in the current specification are too vague to implement. Therefore, when the H-GMLC knows that UE's privacy profile has been changed, it is difficult to determine which outstanding deferred location requests are affected by these changes and whether it should be cancelled.
Reason for change:	S2-034388: In the UE available event cancellation procedure the H-GMLC address should be sent to the MSC/SGSN, so that after the MSC/SGSN performs the cancellation, the response can be returned via the correct H-GMLC and R-GMLC to the LCS client. This CR is a correction to support the UE available event cancellation procedure in the Rel-6 LCS network architecture.
Summary of change: ⌘	S2-033470: The inconsistent descriptions are corrected as follows. 1. In the LCS Service Request sent from LCS Client to the LCS Server:

		- The start time and stop time are specified by the LCS Client to indicate the validity time of the request. - The interval is applicable to the periodical request only. 2. In the cancellation of the deferred LCS request (i.e. UE available and change of area event) procedure, the R-GMLC may initiate a cancellation when the validity timer specified by the start time and stop time expired; or an implementation dependent timer specified by the Operator as a default value in the R-GMLC when the stop time is undefined or exceeds the maximum allowed value expired.
Summary of change		S2-034390: 1. When the H-GMLC knows that the UE's privacy profile has been changed, the H-GMLC should perform privacy checks on any outstanding LDRs for the target UE with the updated privacy profile, and based on the results, the H-GMLC shall determine which of the outstanding LDRs should be cancelled. 2. In the figure 9.8, step 7, the name of the message in the figure is changed to "Location information"
Summary of change		S2-034388: H-GMLC address is sent to MSC/SGSN in the Cancellation of a Deferred Location Request – UE available event.
Consequences if not approved:	⌘	S2-033470: The descriptions of the start time and stop time remains inconsisitent and may cause confusion.
Consequences if not approved:	⌘	S2-034390: When the H-GMLC knows that the UE's privacy profile has changed, the method that the H-GMLC uses to determine which outstanding LDRs for that UE are affected and whether it should be cancelled is not clear in the specification.
Consequences if not approved:	⌘	S2-034388: The V-GMLC would not know to which H-GMLC it should send the LCS service cancel response.

Clauses affected:	⌘	S2-033470: 5.5.1 5.6.1 9.1.8.4 9.1.9.1
		S2-034390: 9.1.8.4 9.1.9.1 (The change in 9.2.2 (figure 9.8) was excluded from this combined document, the new figure in S2-034055 is not visible.)
		S2-034388: 9.1.8.4
Other specs Affected:	⌘	Y / N _ / X Other core specifications _ / X Test specifications _ / X O&M Specifications
Other comments:	⌘	

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< First changed clause >>

5.5 Information Flows between Client and Server

Other types of national specific information flows may be supported in addition to the information flow specified here.

Any of the information flows here indicated may not be externally realized if the information does not flow over an open interface. On the other hand, if a flow goes over an open interface, it shall abide to a well-defined protocol, e.g. LIF TS 101 [31], Location Inter-Operability Forum 2001.

5.5.1 Location Service Request

Via the Location Service Request, the LCS client communicates with the LCS server to request for the location information of one or more than one UE within a specified quality of service. There exist two types of location service requests:

- Location Immediate Request (LIR); and
- Location Deferred Request (LDR).

The attributes for the information exchange between the LCS Client and the LCS Server have been standardized by OMA based on requirements set by TS 22.071 and TS 23.271.

The following attributes are identified for Location Service Request information flow:

- Target UE identity (either verinym or pseudonym);
- LCS Client identity;
- Service identity, if needed;
- Response method (SYNC or ASYNC), if needed;
- Codeword, if needed;
- Requestor identity, if needed (and type of Requestor identity if available);
- Number dialled by the target mobile user or APN-NI, if the request is call or session related ;
- Type of Event definition, i.e. UE available or change of area, applicable to deferred location requests only;
- Definitions for change of area type deferred location requests. Following parameters may be defined, if needed;
    a) Indication for event trigger, i.e. UE enters, leaves or is within requested target area;
    b) Indication of either a single event report or multiple event reports;
    c) ~~Start time, stop time and m~~Minimum interval time between area event reports, if multiple event reports is requested;
    d) Indication of the requested location estimate; i.e. whether the location estimate of the target UE should be contained in the change of area event report;
- Start time, stop time (i.e. specifying the validity time of LCS request), if needed; ~~and interval, applicable to periodical requests only;~~
- Interval, applicable to periodical requests only;
- Requested Quality of Service information, if needed;
- Requested type of location, i.e. current location or last known location applicable to LIR only (current location is only available for LDR);
- Priority, if needed;
- Service coverage (i.e. country codes), if needed;

- Requested maximum age of location, if needed;
- Local coordinate reference system, if needed;
- Target area, i.e. geographical area expressed as one of the following format, if needed.

  a) a shape defined in TS 23.032

  b) local coordinate system

  c) country code

  d) PLMN identity

  e) geopolitical name of the area (e.g. London)

Some of the information may be stored in GMLC and the LCS client does not need to include such information in the location service request.

<< Next changed clause >>

5.6 Information Flows between LCS Servers

Other types of national specific information flows may be supported in addition to the information flow specified here.

Any of the information flows here indicated may not be externally realized if the information does not flow over an open interface. On the other hand, if a flow goes over an open interface, it shall abide to a well-defined protocol, which will be further specified in other relevant specifications.

When the LCS server's associated GMLC uses the Lr interface then this interface shall conform to the protocol as specified in (reference to be added) and the procedures defined in clause 9 of the current specification.

5.6.1 Location Service Request

Via the Location Service Request, the source LCS server communicates with the destination LCS server to request for the location information of one UE within a specified quality of service. There exist two types of location service requests:

- Location Immediate Request (LIR); and
- Location Deferred Request (LDR).

The following attributes are identified for Location Service Request information flow:

- Target UE identity, (either one or both of MSISDN and IMSI, or pseudonym);
- LCS Client identity, i.e. LCS client external identity or internal identity;
- LCS Client type, (i.e. Value added, Emergency, PLMN operator or Lawful interception);
- LCS Client name, if needed (and type of LCS client name if available);
- Service type, if needed;
- Response method (SYNC or ASYNC), if needed;
- Codeword, if needed;
- Requestor identity, if needed (and type of Requestor identity if available);
- Number dialled by the target mobile user or APN-NI, if the request is call or session related ;
- Type of Event definition, i.e. UE available or change of area, applicable to deferred location requests only;
- Definitions for change of area type deferred location requests. Following parameters may be defined, if needed;

  a) Indication for event trigger, i.e. UE enters, leaves or is within requested target area;

b) Indication of either a single event report or multiple event reports;

c) Minimum interval time between area event reports;

d) Start time, stop time, i.e. specifying the validity time of LCS area event request

- Requested Quality of Service information, if needed;
- Requested type of location, i.e. “current location”, “current or last known location” or “initial location” applicable to LIR only (current location is only available for LDR);
- Priority, if needed;
- Requested maximum age of location, if needed;
- Privacy override indicator, if needed;
- Service coverage (i.e. country codes), if needed;
- Indicator of privacy check related actions, if needed;
- Supported GAD shapes, if needed;
- Identity of the source LCS server of the Location Service Request, i.e. R-GMLC address;
- HPLMN LCS server address, i.e. H-GMLC address, if needed;
- VPLMN LCS server address, i.e. V-GMLC address, if needed;
- Network address of Privacy Profile Register, if needed;
- Network numbers of serving nodes;
- LCS capability sets of serving nodes, if needed.
- Target area, i.e. geographical area expressed as one of the following format, if needed.

  a) a shape defined in TS 23.032

  b) country code

  c) PLMN identity

- LDR reference number, if needed.

<< Next changed clause >>

9.1.8.4 Cancellation of a Deferred Location Request – UE available event

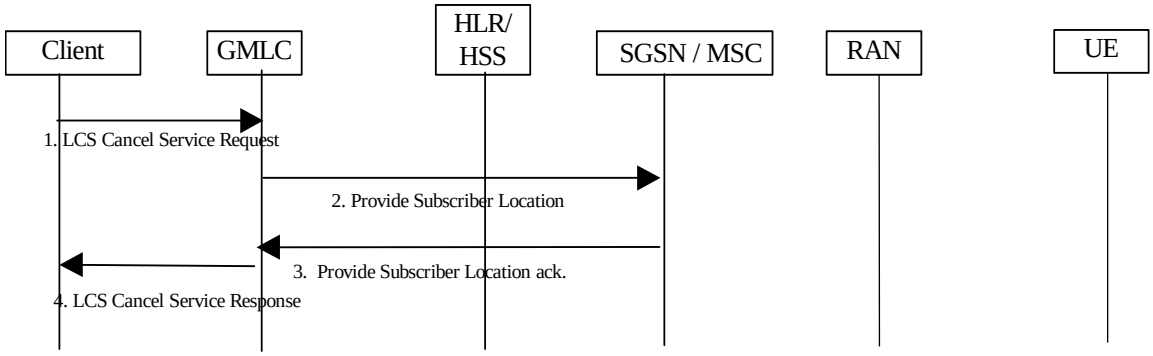


Figure 9.6c: Cancellation of a Deferred MT-LR – UE available event procedure

1) ~~1)~~ The LCS Client requests the cancellation of a previously requested Deferred Location Request.

2) The R-GMLC sends the cancellation request to H-GMLC, including the LDR reference number. The cancellation could be initiated by the R-GMLC itself for some reasons (e.g. the expiry of the validity timer

specified by the start time and stop time; or the expiry of an implementation dependent timer specified by the Operator as a default value in the R-GMLC when the stop time is undefined or exceeds the maximum allowed value~~expired~~).

3) The H-GMLC forwards the LCS Cancel Service Request to V-GMLC with the LDR reference number which is received from the R-GMLC, and the H-GMLC address. The H-GMLC may itself initiate the cancellation procedure, e.g. if an implementation dependent timer in the H-GMLC expired, or when ~~If~~ the UE's privacy profile stored in the H-GMLC or in the PPR was changed.~~,~~ For every ~~any~~ outstanding Deferred Location Request against that UE, the H-GMLC shall perform or ask the PPR to perform a new privacy check based on the updated privacy profile. If the privacy check passes, i.e. the LCS Client is still allowed to position the target UE, the handling of the outstanding Deferred Location Request should be continued. Otherwise, if the privacy check does not pass, i.e. the Location estimate of the target UE is not allowed to be provided to the LCS Client, the H-GMLC shall initiate a cancellation procedure~~, which would not have been authorized with the new profile, shall be cancelled or the requested action for the VPLMN shall be changed. The H-GMLC initiates the cancellation and may send a new Deferred Location Request to the VPLMN. The event type to cancel must be indicated in the Cancellation procedure~~.

~~If the previously requested Deferred Location Request was forwarded to other GMLC (H-GMLC or V-GMLC), the cancellation request from the LCS client shall be forwarded to the other GMLC.~~

Note: The H-GMLC shall know that the UE subscriber's privacy profile has been changed in the PPR when the LCS Privacy Profile Update has been sent~~d~~ from PPR to H-GMLC as described in 9.1.1.2.

4~~2~~) The V-GMLC will indicate this cancellation request in the Provide Subscriber Location toward the SGSN/MSC. The Provide Subscriber Location shall include the H-GMLC address, and the reference number that was included in the previously sent Provide Subscriber Location.

5~~3~~) When the SGSN/MSC completes the cancellation procedure, it notifies it to the V-GMLC in the Provide Subscriber Location Ack (with no location estimate included).

~~If the cancellation request was forwarded to other GMLC (H-GMLC or V-GMLC), the GMLC (H-GMLC or V-GMLC) informs the GMLC (R-GMLC or H-GMLC) that the cancellation procedure has been successfully completed.~~

6) The V-GMLC sends the LCS Cancel Service Response to H-GMLC.

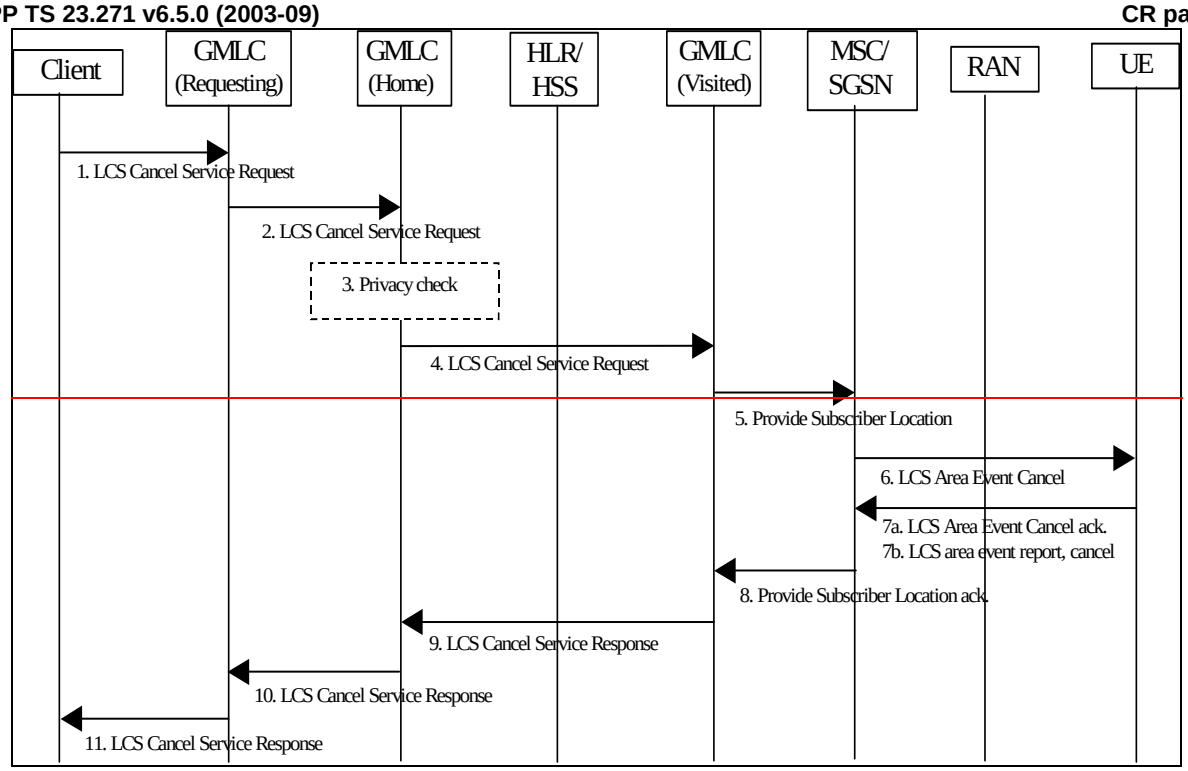
7) H-GMLC sends the LCS Cancel Service Response to R-GMLC. H-GMLC may send the LCS Cancel Service Response to R-GMLC, even if the R-GMLC/LCS client has not requested the cancellation, see step 3.

8~~4~~) The R-GMLC sends the LCS Cancel Service Response to the LCS Client.~~informs the LCS Client that the cancellation procedure has been successfully completed~~.

<< Next changed clause >>

9.1.9.1 Cancellation of a Deferred Location Request – Change of Area event

Figure 9-7b illustrates the procedure for cancelling the Deferred Location Request for the change of area event.



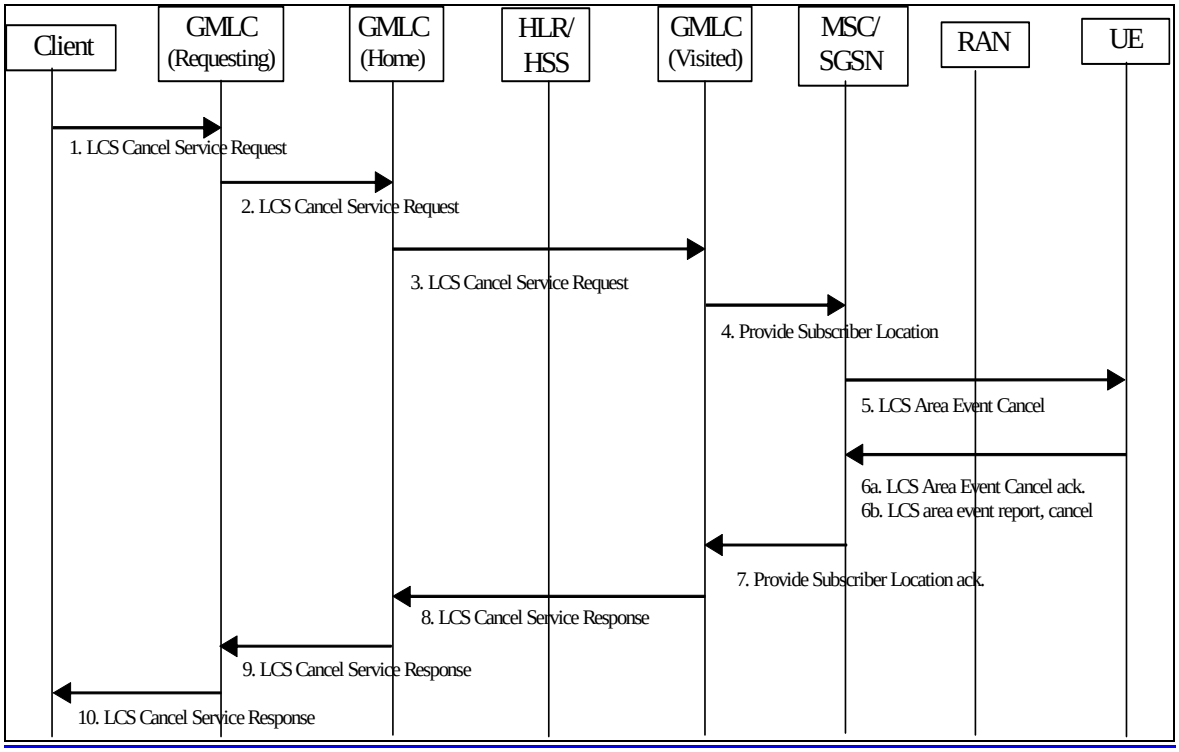


Figure 9.7b: Cancellation of a Deferred MT-LR with change of area event procedure

1) The LCS Client requests the cancellation of a previously requested Deferred Location Request.

2) The R-GMLC sends the cancellation request to H-GMLC, including the LDR reference number. R-GMLC may itself initiate~~s~~ the cancellation for some other reason, e.g. ~~because a timer in the R-GMLC has expired.~~ the expiry of the validity timer specified by the start time and stop time; or the expiry of an implementation dependent timer specified by the Operator as a default value in the R-GMLC when the stop time is undefined or exceeds the maximum allowed value.

3) The H-GMLC forwards the LCS Cancel Service Request to V-GMLC with the LDR reference number which is received from the R-GMLC, and the H-GMLC address. The H-GMLC may itself initiate the cancellation procedure, when~~If~~ the UE's privacy profile stored in the H-GMLC or in the PPR was changed. For every outstanding Deferred Location Request against that UE, the H-GMLC shall perform or ask the PPR to perform a

new privacy check based on the updated privacy profile. If the privacy check passes, i.e. the LCS Client is still allowed to position the target UE, the handling of the outstanding Deferred Location Request should be continued. Otherwise, if the privacy check does not pass, i.e. the Location estimate of the target UE is not allowed to be provided to the LCS Client, the H-GMLC shall initiate a cancellation procedure.~~in such a way that it may impact on a specific deferred location request, H-GMLC shall cancel this deferred location request as described in step 4 and onwards. H-GMLC is made aware that the UE subscribers privacy profile has been changed in the PPR, as described in 9.1.1.2.~~

Note: The H-GMLC shall know that the UE subscriber's privacy profile has been changed in the PPR when the LCS Privacy Profile Update has been sent from PPR to H-GMLC as described in 9.1.1.2.

~~4) The H-GMLC forwards the LCS Cancel Service Request to V-GMLC with the LDR reference number which is received from the R-GMLC, and the H-GMLC address.~~

4)~~5)~~ The V-GMLC sends the Provide Subscriber Location request to SGSN/MSC, indicating a cancellation of a deferred location request and including the LDR reference number and the H-GMLC address received from the H-GMLC.

5~~6~~) The SGSN/MSC sends the LCS Area Event Cancellation, including the LDR reference number and the H-GMLC address, request to UE.

6~~7~~a) The UE cancels the Area event deferred location request and sends the LCS Area Event cancellation ack., with no area event information included to VMSC/SGSN.

6~~7~~b) While the UE is monitoring for the area event to occur, the UE may cancel or terminate the deferred location request for the change of area on its own behalf by sending the LCS Area Event report with the LDR reference number, an indication of the cancellation and an appropriate error cause.

7~~8~~) The SGSN/MSC sends the cancellation acknowledgement to the V-GMLC in the Provide Subscriber Location Ack, with the LDR reference number and the H-GMLC address.

8~~9~~) The V-GMLC sends the LCS Cancel Service Response to H-GMLC with the LDR reference number and the H-GMLC address.

9~~10~~) H-GMLC sends the LCS Cancel Service Response to R-GMLC with the LDR reference number. H-GMLC may send the LCS Cancel Service Response to R-GMLC, even if the R-GMLC/LCS client has not requested the cancellation, see step 3.

10~~11~~) R-GMLC sends the LCS Cancel Service Response to the LCS Client.

<< End of changed clause >>

CR-Form-v7

CHANGE REQUEST

⌘ 23.271 CR 237 ⌘rev - ⌘ Current version: 6.5.0 ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Combined S2-034056(CR234r1), S2-034353(CR229r2) and S2-033469(CR220r1) on LCS2
Source:	⌘	Of combined document: Editor (Nokia) S2-034056: Charging alignment for LCS from Nokia S2-034353: Enhanced LDR reference number in Rel 6 from Huawei and China Mobile S2-033469: Correction of UE available event from Nokia
Work item code:	⌘	LCS2 ***Date:*** ⌘ 5.12.2003
Category:	⌘	**F** ***Release:*** ⌘ REL-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change: ⌘[H14]	S2-034056: SA5 is currently developing specifications on LCS charging and there is a need to clarify in TS 23.271 at what signaling step the charging information shall be recorded in the LCS procedures. 23.271 already defines charging information in some procedures, but not in all.
Reason for change:	S2-034353: In the current specification, the LDR reference number is only contained inside the LCS Server. However, in stage 3 specification, the LDR reference number is deliverd to the LCS Client to identify the correspondence of the request and the response. Furthermore, in stage 3 specification, when the LCS Client initiates a cancellation procedure to cancel a previous outstanding deferred request, the LDR reference number is concluded in the cancel request as an unique identity to indicate which outstanding LDR shall be cancelled. These misalignment between stage 2 and stage 3 should be corrected.
Reason for change:	S2-033469: In the UE available event procedure the H-GMLC address must be sent to the MSC/SGSN, so that when the event occurs the LCS service response can be sent via the correct H-GMLC to the LCS client. This CR is a correction to support the UE available event in the Rel-6 LCS network architecture. The address of the R-GMLC shall not be sent to V-GMLC and SGSN/MSC.
Summary of change: ⌘	S2-034056: Text is added that that R-GMLC, H-GMLC and V-GMLC and SGSN/MSC may record charging information when location information has been delivered. Charging information may also be recorded for an accepted deferred location request.
Summary of change	S2-034353: A definition of LDR reference number is added, and LDR reference number is also added as an optional parameter in the LCS Service Response message sent from LCS Server to LCS Client. In addition, the affected procedures are updated. The category is 'F', because the correction to the chang of area event is only applicab le in Release 6.
Summary of change	S2-033469: H-GMLC address is sent to MSC/SGSN in the deferred mobile terminated – location request (MT-LR) with the UE available event. The address

		of R-GMLC is removed from the Area event signaling procedure.
Consequences if not approved:	⌘	S2-034056: Charging of LCS procedures may be handled differently in different implementations. SA5 would have to define when charging information is recorded.
Consequences if not approved:	⌘	S2-034353: The stage 2 specification can't align with stage 3 specification, a important function will be left uncompleted in stage2 TS.
Consequences if not approved:	⌘	S2-033469: The V-GMLC would not know to which H-GMLC it should send the LCS service response. The handling of the R-GMLC address would not be aligned between different procedures.

Clauses affected:	⌘	S2-034056: 9.1.1 9.1.1A 9.1.2 9.1.5 9.1.5A 9.1.6 9.1.7 9.1.8 9.1.9 9.2.1 9.2.2
Clauses affected:		S2-034353: 3.1 5.5.2 9.1.8.1 9.1.8.2 9.1.8.3 9.1.8.4 9.1.9 9.1.9.1 Annex F
Clauses affected:		S2-033469: 5.6.1 9.1.8 9.1.9

		Y	N			
Other specs	⌘	X		Other core specifications	⌘	S2-034056: 32.271, 32.250, 32.251 S2-033469: 29.002
Affected:			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	S2-033469: This CR affects the OMA – Roaming Location Protocol specification for the Lr interface between GMLCs. S2-034353 Enhanced LDR reference number in Rel 6: No impacts to current stage 3 specifics

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< First changed clause >>

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

CAMEL: CAMEL is a network functionality, which provides the mechanisms of Intelligent Network to a mobile user

Call Related: any LCS related operation which is associated with an established call in CS domain and a session via an active PDP context in PS domain.

Codeword: access code, which is used by a Requestor or LCS Client in order to gain acceptance of a location request for a Target UE. The codeword is part of the privacy information that may be registered by a Target UE user.

Current Location: after a location attempt has successfully delivered a location estimate and its associated time stamp, the location estimate and time stamp is referred to as the "current location" at that point in time

Deferred location request: location request where the location response (responses) is (are) required after a specific event has occurred. The event may or may not occur immediately

Global Positioning System: Global Positioning System (GPS) consists of three functional elements: Space Segment (satellites), User Segment (receivers), and Control Segment (maintenance etc.). The GPS receiver calculates its own position based on the received time differences for several satellites

Immediate location request: location request where a single location response only is required immediately

Initial Location: in the context of an originating emergency call the location estimate and the associated time stamp at the commencement of the call set-up is referred to as "initial location"

Last Known Location: current location estimate and its associated time stamp for Target UE stored in the LCS Server is referred to as the "last known location" and until replaced by a later location estimate and a new time stamp is referred to as the "last known location"

LCS (LoCation Services): LCS is a service concept in system (e.g. GSM or UMTS) standardization. LCS specifies all the necessary network elements and entities, their functionalities, interfaces, as well as communication messages, due to implement the positioning functionality in a cellular network. Note that LCS does not specify any location based (value added) services except locating of emergency calls

LCS Client: software and/or hardware entity that interacts with a LCS Server for the purpose of obtaining location information for one or more Mobile Stations. LCS Clients subscribe to LCS in order to obtain location information. LCS Clients may or may not interact with human users. The LCS Client is responsible for formatting and presenting data and managing the user interface (dialogue). The LCS Client may reside in the Mobile Station (UE)

LCS Client Access barring list: optional list of MSISDNs per LCS Client where the LCS Client is not allowed to locate any MSISDN therein

LCS Client Subscription Profile: collection of subscription attributes of LCS related parameters that have been agreed for a contractual period of time between the LCS client and the service provider

LCS Feature: capability of a PLMN to support LCS Client/server interactions for locating Target UEs

LCS Server: software and/or hardware entity offering LCS capabilities. The LCS Server accepts requests, services requests, and sends back responses to the received requests. The LCS server consists of LCS components, which are distributed to one or more PLMN and/or service provider

LDR reference number: Unique identity of a Location Deferred Request, which is assigned and maintained by the R-GMLC and circulated between the LCS Client, R-GMLC, H-GMLC, V-GMLC, MSC/SGSN and UE. Notes: UE is involved only when the event type of the deferred request is “change of area”. In addition, in a Periodical Immediate/deferred LCS Service Request, the LDR reference number is exclusive.

Local Information: information related to a given location, or general information, which is made available in a given location

Local Service: service, which can be exclusively provided in the current serving network by a Value added Service Provider

Location (Based) Application: location application is an application software processing location information or utilizing it in some way. The location information can be input by a user or detected by network or UE. Navigation is one location application example

Location Based Service (LBS): service provided either by teleoperator or a 3rd party service provider that utilizes the available location information of the terminal. Location Application offers the User Interface for the service. LBS is either a pull or a push type of service (see Location Dependent Services and Location Independent Services). In ETSI/GSM documentation of SoLSA, LBS is called "Location Related Service". ETSI and/or 3GPP -wide terminology harmonization is expected here

Location Dependent Service: service provided either by teleoperator or a 3rd party service provider that is available (pull type) or is activated (push type) when the user arrives to a certain area. It doesn't require any subscription in advance, but the push type activation shall be confirmed by the user. The offered service itself can be any kind of service (e.g. a public Xerox machine or the discount list in a store)

Location Estimate: geographic location of an UE and/or a valid Mobile Equipment (ME), expressed in latitude and longitude data. The Location Estimate shall be represented in a well-defined universal format. Translation from this universal format to another geographic location system may be supported, although the details are considered outside the scope of the primitive services

Location Independent Service: service provided either by teleoperator or a 3rd party service provider that is available and therefore can be activated anywhere in the network coverage. It is activated by the user's request or by other user's activated service, and therefore it requires a subscription in advance (pull type). The offered service itself can be any kind of service (e.g. MMS, SWDL, or LBS!)

Mobile Assisted positioning: any mobile centric positioning method (e.g. IPDL-OTDOA, E-OTD, GPS) in which the UE provides position measurements to the network for computation of a location estimate by the network. The network may provide assistance data to the UE to enable position measurements and/or improve measurement performance

Mobile Based positioning: any mobile centric positioning method (e.g. IPDL-OTDOA, E-OTD, GPS) in which the UE performs both position measurements and computation of a location estimate and where assistance data useful or essential to one or both of these functions is provided to the UE by the network. Position methods where an UE performs measurements and location computation without network assistance data are not considered within this category

Mobile Station: mobile station (MS) consists of Mobile or User Equipment (ME or UE) with a valid SIM or USIM attached. The abbreviation "UE" in this specification refers both to MS and User Equipment, see below.

Non-dialable call back number: In case of a SIM-less emergency call, a non-dialable callback number shall be used to identify the target UE. The format and structure of the non-dialable callback number is according to national or regional regulations.

PLMN Access barring list: optional list of MSISDN per PLMN where any LCS Client is not allowed to locate any MSISDN therein except for certain exceptional cases

Positioning (/location detecting): positioning is a functionality, which detects a geographical location (of e.g. a mobile terminal)

Positioning method (/locating method): method or technical solution, which is used to get an estimate of the target mobile's geographical location. For example positioning methods based on radio cell coverage, GPS or Assisted GPS methods, which are based on the Time-Of-Arrival (TOA) algorithm, and OTDOA or E-OTD methods, which are based on the Time-Difference-Of-Arrival (TDOA) algorithm. The positioning methods are further described in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

Predefined area: geographical area, which is not related to cell or radio coverage. The mobile may take special action when it recognises it has entered or left a predefined area

Privacy Class: list of LCS Clients defined within a privacy exception class to which permission may be granted to locate the target UE. The permission shall be granted either on activation by the target UE or permanently for a contractual period of time agreed between the target UE and the service provider

Privacy Exception List: list consisting of various types of privacy classes (i.e. operator related, personal etc.). Certain types of classes may require agreement between the service provider and the target UE

Privacy Profile Register, PPR: The PPR stores privacy information of the target mobile. The PPR also executes privacy checks and sends the privacy check results to other network elements using the Lpp interface. PPR may be a standalone network entity or the PPR functionality may be integrated in H-GMLC.

Prohibited area: area where the mobile must not activate its transmitter. The Prohibited area may be a Predefined area described above or related to radio cell(s)

Pseudo-external identity: The pseudo-external identity is not the identity of real external LCS client but the identity, which is used for notifying the result of the enhanced privacy check. The pseudo-external identity shall keep the compatibility with pre Rel-6 privacy mechanisms, which does not understand privacy check result made by H-GMLC/PPR. Each operator defines its own the pseudo-external identities.

Pseudonym: A fictitious identity, which may be used to conceal the true identity (i.e. MSISDN and IMSI) of a target UE from the requestor and the LCS client.

Pseudonym mediation device: functionality that verifies pseudonyms to verinyms

Request id: identity which is used to identify the correspondence of a location request to multiple responses when the Response method is ASYNC. Each receiving GMLC (R-GMLC or V-GMLC or H-GMLC) allocates and maintains the Request id to identify each ASYNC location request, and includes it in the responses to the source entity of the location request (i.e. LCS client or GMLC).

Requestor: the originating entity which has requested the location of the target UE from the LCS client.

Requestor Identity: This identifier is identifying the Requestor and can be e.g. MSISDN or logical name.

Response method: method how a GMLC, which receives a location request message from another entity (i.e. LCS client or GMLC), responds to the location request. There are two methods, synchronous (SYNC) and asynchronous (ASYNC). When the requesting entity wishes multiple responses (either about one or several target UE's location) to a single location request the procedure is ASYNC and when the requesting entity wishes a single response the procedure is SYNC. The source entity of the location request (i.e. LCS client or GMLC) can choose a preferred method and informs the method to the receiving GMLC. However, the selection of the method used is made by the receiving GMLC and when the ASYNC method is selected the Request id is notified to the source entity. The receiving GMLC can turn a SYNC request into an ASYNC procedure, e.g. in an overload situation, and the source entity (i.e. LCS client or GMLC) should be able to receive multiple responses even though the request was SYNC.

Service coverage: a list of country codes where an LCS client offers its location services.

Service Type: attribute of specific location based service provided by the LCS client, as defined in TS 22.071.

Subscription Profile: profile detailing the subscription to various types of privacy classes

Target area: geographical area which is used for change of area type deferred location request. The target area is defined by LCS client and is expressed as geographical area using a shape defined in TS 23.032, as a geographical area using local coordinate system, as a country code, as a PLMN identity or as a geopolitical name of the area (e.g. London).

Target UE: UE being positioned

User Equipment: term 'User Equipment', or 'UE', should for GSM be interpreted as 'MS', as defined in GSM TS 04.02 [19]. UE in this specification may also refer to a Mobile Equipment or User Equipment used for emergency calls, that do not have valid SIM or USIM

Verinym: True identity, i.e. MSISDN or IMSI, of the target UE

Further UMTS related definitions are given in 3G TS 22.101.

<< Next changed clause >>

5.5.2 Location Service Response

The LCS server (GMLC) sends the Location Service Response to the LCS client either as an:

- Immediate Response; or a
- Deferred Response, these deferred responses can be either single or periodic.

The following attributes are identified for the Location Service Response information flow:

- Location indication of UE in geographical coordinates expressed as a shape as defined in TS 23.032 or local coordinate system;
- The information about the positioning method used to obtain the location estimate of the UE, if it is available at the LCS server and if needed;
- Time stamp of location estimate;
- Indication when UE enters, is within or leaves the Geographical area, if needed;
- Acknowledgement for a deferred location request, if needed.
- Request id, if needed.
- LDR reference number, if needed.

In addition the information attributes of the location service request may be used also in the location service response.

<< Next changed clause >>

5.6.1 Location Service Request

Via the Location Service Request, the source LCS server communicates with the destination LCS server to request for the location information of one UE within a specified quality of service. There exist two types of location service requests:

- Location Immediate Request (LIR); and
- Location Deferred Request (LDR).

The following attributes are identified for Location Service Request information flow:

- Target UE identity, (either one or both of MSISDN and IMSI, or pseudonym);
- LCS Client identity, i.e. LCS client external identity or internal identity;
- LCS Client type, (i.e. Value added, Emergency, PLMN operator or Lawful interception);
- LCS Client name, if needed (and type of LCS client name if available);
- Service type, if needed;
- Response method (SYNC or ASYNC), if needed;
- Codeword, if needed;
- Requestor identity, if needed (and type of Requestor identity if available);
- Number dialled by the target mobile user or APN-NI, if the request is call or session related ;
- Type of Event definition, i.e. UE available or change of area, applicable to deferred location requests only;
- Definitions for change of area type deferred location requests. Following parameters may be defined, if needed;
  a) Indication for event trigger, i.e. UE enters, leaves or is within requested target area;
  b) Indication of either a single event report or multiple event reports;
  c) Minimum interval time between area event reports;
- Requested Quality of Service information, if needed;
- Requested type of location, i.e. “current location”, “current or last known location” or “initial location” applicable to LIR only (current location is only available for LDR);
- Priority, if needed;
- Requested maximum age of location, if needed;
- Privacy override indicator, if needed;
- Service coverage (i.e. country codes), if needed;
- Indicator of privacy check related actions, if needed;
- Supported GAD shapes, if needed;
- ~~Identity of the source LCS server of the Location Service Request, i.e. R-GMLC address;~~
- HPLMN LCS server address, i.e. H-GMLC address, if needed;
- VPLMN LCS server address, i.e. V-GMLC address, if needed;
- Network address of Privacy Profile Register, if needed;

- Network numbers of serving nodes;
- LCS capability sets of serving nodes, if needed.
- Target area, i.e. geographical area expressed as one of the following format, if needed.

  a) a shape defined in TS 23.032

  b) country code

  c) PLMN identity
- LDR reference number, if needed.

<< Next changed clause >>

9.1.1 Common MT-LR procedure in PS and CS domain

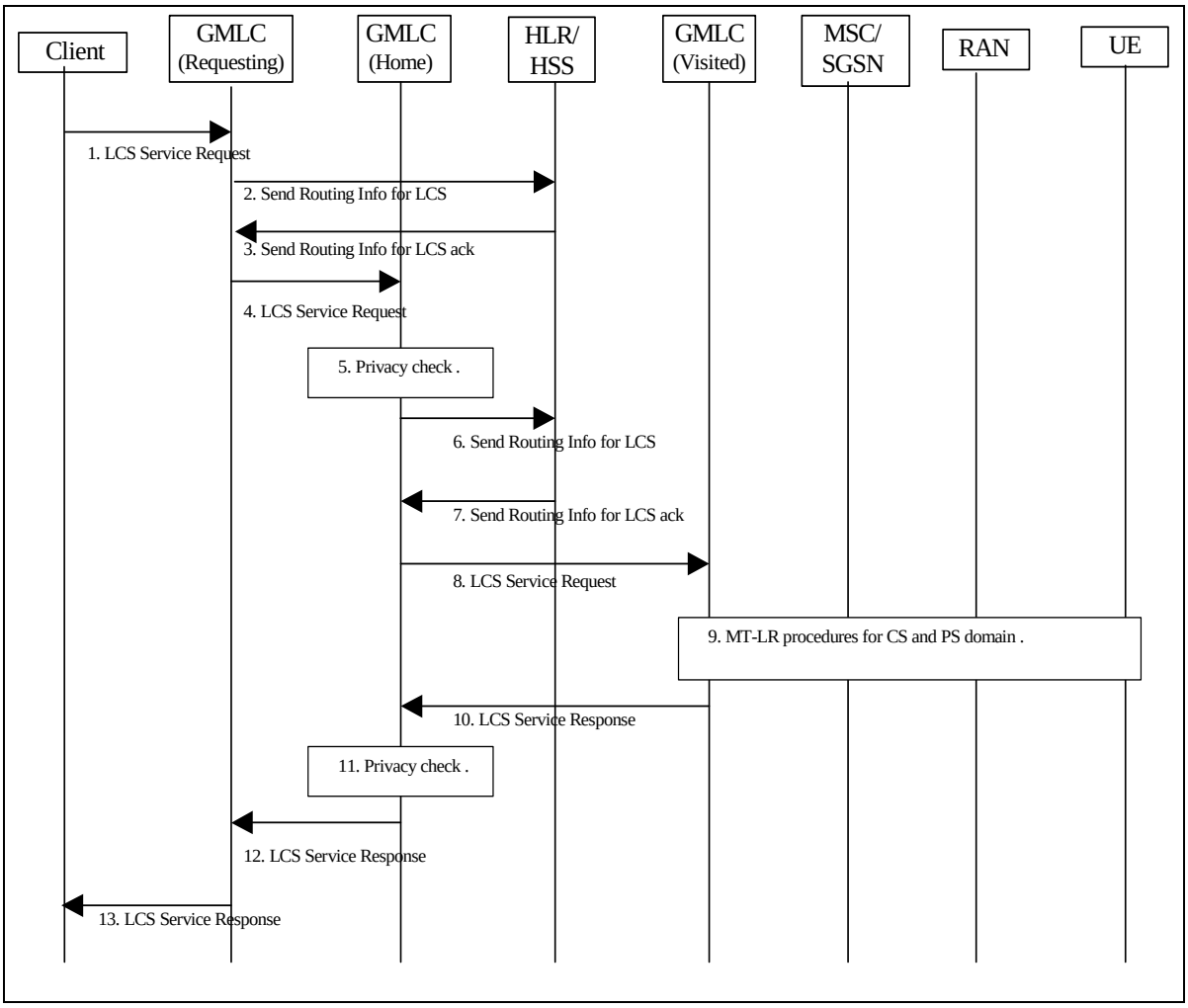


Figure 9.1: General Network Positioning for a MT-LR

1) An external LCS client requests the current location of a target UE from a GMLC. The LCS Client may also request a deferred location request, i.e. based on event. The R-GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI or pseudonym of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. For a call related location request, the LCS client includes the LCS client's called party number, as dialled by the target mobile user, in the LCS service request. For a session related location request, the LCS client includes the APN-NI of the LCS client, as used by the target UE, in the LCS service request. For a call/session related request the R-GMLC may verify that the called party number or APN-NI is correct for the LCS client in question. The LCS client's dialled number or APN-NI are checked in step 9 for the call/session related class.
The LCS request may carry also the Service Identity and the Codeword and the service coverage information. The R-GMLC may verify that the Service Identity received in the LCS request matches one of the service identities allowed for the LCS client. If the service identity does not match one of the service identities for the LCS client, the R-GMLC shall reject the LCS request. Otherwise, the R-GMLC can map the received service identity in a corresponding service type.
If the location request is originated by a Requestor, the Requestor Identity may be added to the LCS service request. The LCS client should authenticate the Requestor Identity but this is outside the scope of this specification. The LCS service request may also contain the type of the Requestor identity if the requestor identity was included.
If the H-GMLC address is not contained in the pseudonym or cannot deduced from the pseudonym, the R-GMLC shall determine the verinym for the pseudonym. In this case the R-GMLC may access to its associated PMD as described in 9.1.1.3.

The R-GMLC verifies whether it stores the privacy profile of the target UE. If the R-GMLC stores the UE's privacy profile, (this means the R-GMLC is the H-GMLC of the target UE), then step 2, 3, 4 and 12 are skipped. If location is required for more than one UE, or if periodic location is requested, the steps following below may be repeated. In case the location is requested for more than one UE, the R-GMLC should verify whether the number of Target UEs in the LCS request is equal or less than the Maximum Target UE Number of the LCS client. If the Maximum Target UE Number is exceeded, the R-GMLC should respond to the client with proper error cause.

2) If the R-GMLC already knows, (e.g. from a previous location request or an internal lookup table), or is able to determine, (e.g. it is possible to use a DNS lookup mechanism similar to IETF RFC 2916), the network address of H-GMLC of the target UE, or in case the location service request contains the target UE's pseudonym, which includes the target UE's Home-GMLC address, or a pseudonym from which the target UE's Home-GMLC address can be deduced, then this step and step 3 may be skipped.
Otherwise, the R-GMLC sends a SEND_ROUTING_INFO_FOR_LCS message to the home HLR/HSS of the target UE to be located with the IMSI or MSISDN of the UE.
The details of the alternative methods of retrieving H-GMLC address other than the sending SEND_ROUTING_INFO_FOR_LCS message to the HLR/HSS, (e.g. internal lookup table, DNS lookup mechanism), are not in the scope of this specification.

Editor´s note: The support for number portability with these alternative solutions of retrieving H-GMLC address still needs further study and should be in line with the general solution to support number portability in Rel-6.

3) The HLR/HSS verifies whether the R-GMLC is authorized to request UE location information. If not, an error response is returned.
Otherwise the HLR/HSS returns one or several of the network addresses of the current SGSN and/or VMSC/MSC server, the LCS capabilities of the serving nodes if available and whichever of the IMSI and MSISDN that was not provided in step 2. The HLR/HSS returns the address of the H-GMLC. The HLR/HSS also returns the address of the PPR and V-GMLC, if available.

Note: HLR/HSS may prioritize between the MSC/VLR or SGSN address sent to the GMLC. The prioritisation might be based on information received from SGSN and/or MSC/VLR concerning the UE's capabilities for LCS. Other priority criteria are for further study.

4) If R-GMLC finds out that it is the H-GMLC, the signalling steps 4 and 12 are skipped.
If the R-GMLC did not receive the H-GMLC address in step 3 and can not retrieve the H-GMLC address in some other way (e.g. DNS lookup), then steps 4, 5, 6, 7, 8, 10, 11 and 12 are skipped and the R-GMLC directly sends the PSL message to the serving node.
Otherwise, the R-GMLC sends the location request to the H-GMLC. If one or several of the network addresses of the current SGSN and/or VMSC/MSC server, the LCS core network signalling capabilities of the serving nodes, IMSI and MSISDN for the target UE and the address of the V-GMLC and the PPR have been retrieved in Step 3, the R-GMLC shall pass the information with the location request to the H-GMLC. The R-GMLC shall also send the service coverage information to the H-GMLC, if the information is available.

5) The H-GMLC verifies whether the R-GMLC is authorized to request UE location information. If the R-GMLC is not authorized, an error response is returned.
If the LCS service request contains the pseudonym of the target UE and the H-GMLC cannot resolve the PMD address from the pseudonym, the H-GMLC itself determines the verinym (MSISDN or IMSI) of the target UE. If the H-GMLC can resolve the address of PMD from the pseudonym, the H-GMLC requests the verinym from its associated PMD, see clause 9.1.1.3. In case H-GMLC knows that the PMD functionality is integrated in PPR, it can include the information from the LCS Identity Request in the LCS authorisation request to the PPR, see clause 9.1.1.1. In this case, if H-GMLC is not able to obtain the verinym of the target UE, the H-GMLC shall cancel the location request.
The H-GMLC performs privacy check on the basis of the UE user's privacy profile stored in the H-GMLC and the capabilities of the serving nodes (MSC/VLR and/or SGSN), if available. If the privacy profile of the target UE is stored in a PPR and the H-GMLC received the network address of the PPR from R-GMLC or is able to determine the PPR address (e.g. from a previous location request or an internal lookup table), the H-GMLC shall ask the PPR to perform the privacy check as described in the 9.1.1.1. If the privacy profile is stored in a PPR but the network address of the PPR is not available, the H-GMLC shall send SRI for LCS message to HLR/HSS in step 6 in order to get the PPR address and the privacy check in this step shall be performed after step 7. Also if the key of the UE user's privacy profile (i.e. MSISDN or IMSI) is not available, the privacy check in this step shall be performed after step 7. The H-GMLC/PPR verifies LCS barring restrictions in the UE user's privacy

profile in the H-GMLC/PPR. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If the location service request is to be barred, GMLC shall terminate the request towards the R-GMLC or the LCS client with the appropriate error code. As a result of the privacy check, the H-GMLC/PPR selects one or two indicators of the privacy check related action and/or a pseudo-external identity. (The details of the indicator of the privacy check related action and the pseudo-external identity are described in chapter 9.5.4 and Annex C). If the requested type of location is "current or last known location" and the requested maximum age of location information is available, the H-GMLC verifies whether it stores the previously obtained location estimate of the target UE. If the H-GMLC stores the location estimate and the location estimate satisfies the requested accuracy and the requested maximum age of location, the H-GMLC checks the result of the privacy check. In case the result of the privacy check for call/session unrelated class is "Location allowed without notification" then steps 6, 7, 8, 9 and 10 may be skipped.

6) If the H-GMLC does not know IMSI for the particular MSISDN (e.g. from a previous location request), and the VMSC/MSC server address or SGSN address, the H-GMLC shall send a SEND_ROUTING_INFO_FOR_LCS message to the home HLR/HSS of the target UE to be located with the IMSI or MSISDN of this UE. Also if the privacy profile is stored in a PPR but the network address of the PPR was not available in the step 5, the H-GMLC shall send the SRI for LCS message to HLR/HSS. Otherwise, this step and step 7 may be skipped.

7) The HLR/HSS then returns one or several of the network addresses of the current SGSN and/or VMSC/MSC server, the LCS core network signalling capabilities of the serving nodes and whichever of the IMSI and MSISDN that was not provided in step (6) for the particular UE. The HLR/HSS may also return the address of the PPR and the V-GMLC, if available.

Note: HLR/HSS may prioritize between the MSC/VLR or SGSN address sent to the GMLC. The prioritisation might be based on information received from SGSN and/or MSC/VLR concerning the UE's capabilities for LCS. Other priority criteria are for further study.

8) If step 6 and step 7 were performed, the H-GMLC/PPR may do a new privacy check, or if the privacy profile is stored in a PPR but the network address of the PPR was not available in step 5 and the PPR address is obtained in step 7, the H-GMLC shall ask the PPR to perform the privacy check as described in the 9.1.1.1.
Also if the location request is an immediate location request and the service coverage information (i.e. list of country codes) was sent from R-GMLC, the H-GMLC checks the country codes of the serving node addresses. If the H-GMLC finds out the current SGSN and/or VMSC/MSC server locates out of the service coverage, the H-GMLC returns an appropriate error message to the R-GMLC or the LCS client.
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 not to use the Lr interface, the H-GMLC does not send the location request to the V-GMLC and step 10 is skipped. In this case, the H-GMLC sends the location service request message to the serving node.
If the H-GMLC received the address of the V-GMLC from the HLR/HSS and the V-GMLC address is different from the H-GMLC address, the H-GMLC may send the location request to the V-GMLC. The location request shall contain one or several of the network addresses of the current SGSN and/or MSC/VLR, and the IMSI and MSISDN of the target UE. The location request may also carry the requested action of the VPLMN as the result of the privacy check in the H-GMLC (i.e. by using the indicator of the privacy check related action as described in chapter 9.5.4 or by using the pseudo-external identity as described in Annex C). The V-GMLC first authenticates that the location request is allowed from this GMLC, PLMN or from this country. If not, an error response is returned.

9) In case the GMLC (H-GMLC, R-GMLC or V-GMLC) receives only the MSC/VLR address, the MT LR proceeds as the CS-MT-LR procedure described in 9.1.2. In case GMLC receives only the SGSN address, the MT LR proceeds as the PS-MT-LR procedure described in 9.1.6. In case the GMLC receives several of the following addresses, SGSN, VMSC and/or MSC Server, it has to decide where to send the location request. If the requested MT-LR is known to be associated with a CS call, the CS-MT-LR procedure shall be invoked. If the requested MT-LR is associated with a PS session, the PS-MT-LR procedure shall be invoked. Otherwise, both CS-MT-LR and PS-MT-LR are applicable. If LCS Client indicated deferred location request, GMLC shall indicate this together with applicable event type (e.g. UE available) in the requested PS/CS-MT-LR, see 9.1.8.

NOTE: The order in which these procedures are invoked and whether one or both procedures are used may depend on information in the LCS service request, subscription information for the LCS client, possible priority information returned by the HSS or information already stored in the GMLC (e.g. obtained from previous location requests).

10) The V-GMLC sends the location service response to the H-GMLC. The location service response may contain the information about the positioning method used. The V-GMLC may record charging information.

11) If the privacy check in step 5 indicates that further privacy checks are needed, or on the basis of the privacy profile, the H-GMLC shall perform an additional privacy check or the H-GMLC may ask the PPR to perform the privacy check as described in the 9.1.1.1 in order to decide whether the H-GMLC can forward the location information to the LCS client. If the location request from the R-GMLC or the LCS client contained the pseudonym, the H-GMLC shall use the pseudonym of the target UE in the location response to the R-GMLC or the LCS client. One example when this additional privacy check is needed is when the target UE user has defined different privacy settings for different geographical locations.

12) The H-GMLC sends the location service response to the R-GMLC. The H-GMLC may store the location information and its age. The location service response may contain the information about the positioning method used. The H-GMLC may record charging information.

13) R-GMLC sends the location service response to the LCS client. If the location request from the LCS client contained the pseudonym and the R-GMLC resolved the verinym from the pseudonym in the step 1, the R-GMLC shall use the pseudonym of the target UE in the location response to the LCS client. If the LCS client requires it, the R-GMLC may first transform the universal location co-ordinates provided by the SGSN or MSC/MSC server into some local geographic system. The R-GMLC may record ~~billing~~charging information both for ~~both~~ the LCS client and inter-network revenue charges from the SGSN or MSC/MSC server's network. The location service response from the R-GMLC to the LCS client may contain the information about the positioning method used.

The detailed CS-MT-LR and PS-MT-LR procedures in step 9 of figure 9.1 are described in 9.1.2 and 9.1.6.The detailed procedure for deferred PS/CS-MT-LR is described in 9.1.8.

<< Next changed clause >>

9.1.1A Common MT-LR procedure in PS and CS domain for Emergency MT-LR

The network induced location request as described in chapter 9.1.5 may be used in some cases to determine the location of the UE used for an emergency call. This chapter describes the case when the emergency centre initiates an emergency MT-LR.

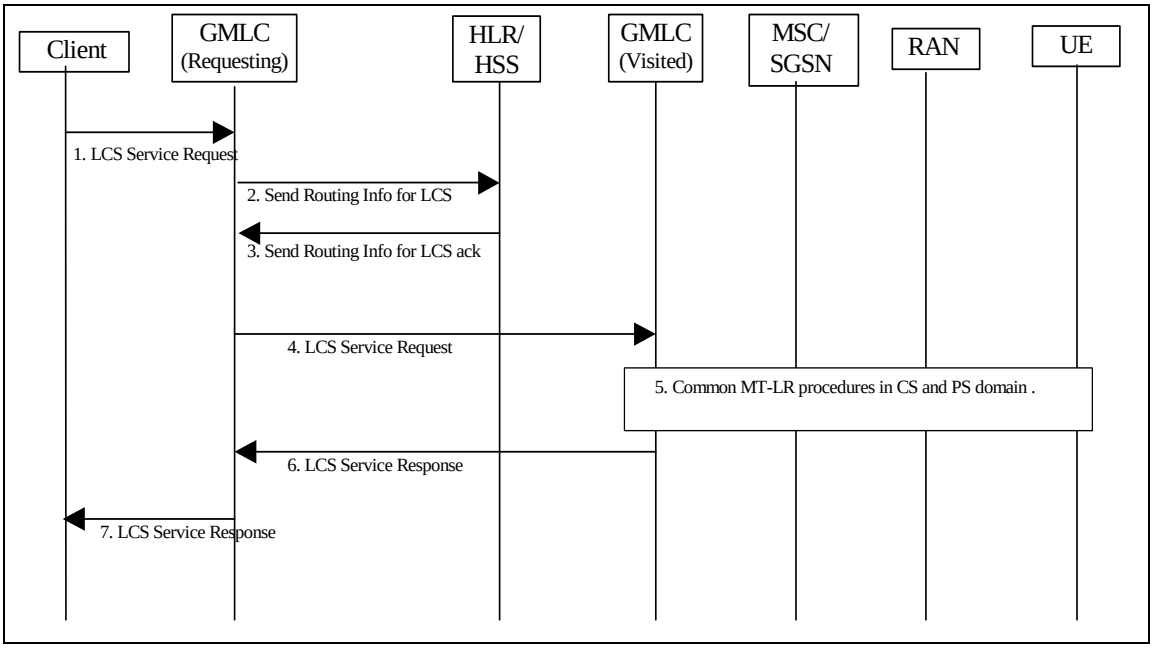


Figure 9.1A: Network Positioning for an Emergency MT-LR

1) An external LCS client which has the privacy override capability, (e.g. Emergency service provider), requests the location of a target UE from a GMLC. The R-GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client.

2) If the R-GMLC already knows IMSI for the particular MSISDN, (e.g. from a previous location request) and the VMSC/MSC server address or SGSN address, this step and step 3 may be skipped. Otherwise, the R-GMLC sends a SEND_ROUTING_INFO_FOR_LCS message to the home HLR/HSS of the target UE to be located with the IMSI or MSISDN of this UE.

3) The HLR/HSS verifies whether the R-GMLC is authorized to request UE location information. If not, an error response is returned.
Otherwise the HLR/HSS returns one or several of the network addresses of the current SGSN and/or VMSC/MSC server and whichever of the IMSI and MSISDN that was not provided in step 2. The HLR/HSS also returns the address of the V-GMLC, if available.

Note: HLR/HSS may prioritize between the MSC/VLR or SGSN address sent to the GMLC. The prioritisation might be based on information received from SGSN and/or MSC/VLR concerning the UE's capabilities for LCS. Other priority criteria are for further study.

4) In the cases when the R-GMLC did not receive the address of the V-GMLC, or when the V-GMLC address is the same as the R-GMLC address, or when both PLMN operators agree not to use the Lr interface, the R-GMLC does not send the location request to the V-GMLC and the step 6 is skipped. In this case, the R-GMLC sends the location service request message directly to the serving node.
If the R-GMLC received the address of the V-GMLC from the HLR/HSS and the V-GMLC address is different from the R-GMLC address, the R-GMLC sends the location request to the V-GMLC. The location request shall contain one or several of the network addresses of the current SGSN and/or MSC/VLR, the IMSI and MSISDN

of the target UE and the privacy override indicator. The V-GMLC first authenticates that the location request is allowed from this GMLC, PLMN or from this country. If not, an error response is returned.

5) In case the GMLC receives only the MSC/VLR address, the MT LR proceeds as the CS-MT-LR procedure described in 9.1.2. In case GMLC receives only the SGSN address, the MT LR proceeds as the PS-MT-LR procedure described in 9.1.6. In case the GMLC receives several of the following addresses, SGSN, VMSC and/or MSC Server, it has to decide where to send the location request.

NOTE: The order in which these procedures are invoked and whether one or both procedures are used may depend on information in the LCS service request, subscription information for the LCS client, possible priority information returned by the HLR/HSS or information already stored in the GMLC (e.g. obtained from previous location requests).

6) The V-GMLC sends the location service response to the R-GMLC. The location service response may contain the information about the positioning method used. The V-GMLC may record charging information.

7) R-GMLC sends the location service response to the LCS client. If the LCS client requires it, the R-GMLC may first transform the universal location co-ordinates provided by the SGSN or MSC/MSC server into some local geographic system. The location service response from the GMLC to the LCS client may contain the information about the positioning method used. After receiving (stage 3) acknowledgement from the LCS client, the R-GMLC may record charging information both for the LCS client and inter-network revenue charges from the SGSN or MSC/MSC server's network.

The detailed CS-MT-LR and PS-MT-LR procedures in step 5 of figure 9.1A are described in 9.1.2 and 9.1.6.

<< Next changed clause >>

9.1.2 Circuit Switched Mobile Terminating Location Request (CS-MT-LR)

Figure 9.2 illustrates general network positioning for LCS clients external to the PLMN. In this scenario, it is assumed that the target UE is identified using either an MSISDN or IMSI.

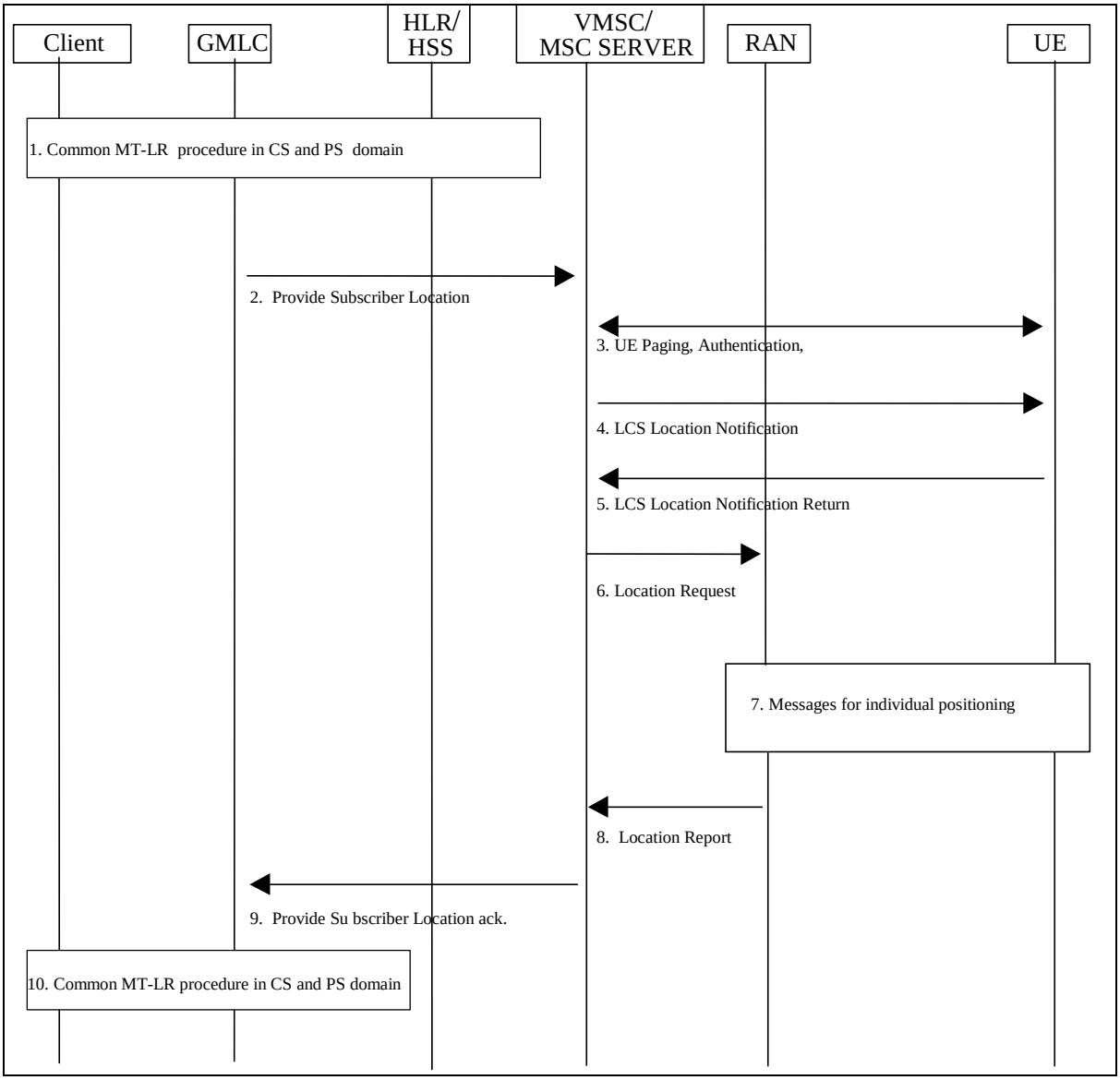


Figure 9.2: Network Positioning for a CS-MT-LR

9.1.2.1 Location Preparation Procedure

1) Common PS and CS MT-LR procedure as described in 9.1.1.

2) The GMLC sends a PROVIDE_ SUBSCRIBER _LOCATION message to the MSC/MSC server indicated by the HLR/HSS. This message carries the type of location information requested (e.g. current location), the UE subscriber's IMSI, LCS QoS information (e.g. accuracy, response time) and an indication of whether the LCS client has the override capability. For a call related location request, the message also carries the LCS client's called party number. For a value added LCS client, the message shall carry the client name, the external identity of the LCS client (or the pseudo external identity) and the Requestor Identity (if that is both supported and available). Also the message may carry the type of the LCS client name and also the type of the Requestor identity if the requestor identity was included. For a PLMN operator LCS client, the message shall carry the internal identity of the LCS client. Moreover the message may also carry the Service Type**.** If the result of the privacy check at H-GMLC/PPR indicated that the codeword shall be sent to the UE user, the message may carry also the codeword received from the LCS client. For a PLMN operator LCS client, the message shall carry the internal identity of the LCS client. If the Requestor Identity is provided, the GMLC shall send it as separate information. In addition, in order to display the requestor identity in case of pre rel-5 network elements (i.e. MSC and/or UE), the requestor identity may be also added to the LCS client name by the GMLC. When the Requestor identity is added to the LCS client name the practise described in the Annex D should be followed. The message also shall carry the indicators of privacy related action which is described in chapter 9.5.4 , if it is provided by H-GMLC.

3) If the GMLC is located in another PLMN or another country, the VMSC/MSC server first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. If the PSL message from the GMLC contains the indicators of privacy related action, the VMSC/MSC server determines a required privacy related action as described in Annex A.3. If the PSL message from the GMLC does not include the indicators of privacy related action, the VMSC/MSC server then verifies LCS barring restrictions in the UE user's subscription profile in the MSC server. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC.
Otherwise, if the UE is in idle mode, the Core Network performs paging, authentication and ciphering. The MSC will page a GPRS attached UE either through A/Iu or Gs interface, depending on the presence of the Gs interface (see Note 2). The UE will inform the network about its LCS capabilities, as described in chapter 6.3.4. If the UE is instead in dedicated mode, the VMSC/MSC server will already have UE classmark information. In GSM this is supported by controlled early classmark sending.

Note 1: In GSM, if the target UE has an established circuit call other than speech, the location request may be denied and an error response is then returned to the GMLC. If the location request is allowed for a non-speech circuit call, it shall be up to RAN to decide, on the basis of the applicable position methods and requested QoS, whether positioning is possible.

Note 2: In some network mode of operation, a GPRS capable UE may not receive the CS paging. In addition, upon receipt of a CS paging, a GPRS capable UE may immediately answer to the Paging Request or delay the answer, as defined in 3GPP TS 22.060 and 23.060. A GPRS UE in class B mode may also suspend its GPRS traffic, sending a GPRS Suspension Request to the network.

4) If the location request comes from a value added LCS client and the indication of requested privacy related action or the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS (according to the UE Capability information), an LCS Location Notification Invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client, the Requestor Identity (if that is both supported and available) and whether privacy verification is required. Also the message may indicate the type of the LCS client name and also the type of the Requestor identity if the requestor identity was included. Moreover, the message may carry also the service type and the codeword.

   Optionally, the VMSC/MSC server may, after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 6 without waiting for a LCS Location Notification Return Result message in step 5.

NOTE 3: It is for further study, if all available client identities are to be included in the Privacy Notification message to be shown to the end-user.

5) The target UE notifies the UE user of the location request. If privacy verification was requested, the target UE indicates to the UE user whether the location request will be allowed or not allowed in the absence of a response and waits for the user to grant or withhold permission. The UE then returns an LCS Location Notification Return Result to the VMSC/MSC server indicating, if privacy verification was requested, whether permission is granted or denied. Optionally, the LCS Location Notification Return Result message can be returned some time after step 4, but before step 9. If the UE user does not respond after a predetermined time period, the VMSC/MSC server shall infer a "no response" condition. The VMSC/MSC server shall return an error response to the GMLC if privacy verification was requested and either the UE user denies permission or there is no response with the UE subscription profile indicating barring of the location request in the absence of a response.

6) The MSC/MSC server sends a Location Request message to RAN. This message includes the type of location information requested and requested QoS and, in GSM, the UE's location capabilities.

9.1.2.2 Positioning Measurement Establishment Procedure

7) RAN determines the positioning method and instigates the particular message sequence for this method, as specified in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

9.1.2.3 Location Calculation and Release Procedure

8) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the MSC/MSC server in a Location Report message. The information about the positioning method used may be returned with the location estimate. If a location estimate could not be obtained, RAN returns a Location Report message containing a failure cause and no location estimate.

9) The MSC/MSC server returns the location information and its age to the GMLC, if the VMSC/MSC server has not initiated the Privacy Verification process in step 4. If step 4 has been performed for privacy verification, the VMSC/MSC server returns the location information only, if it has received a LCS Location Notification Return Result indicating that permission is granted. In these cases, the information about the positioning method used may be sent with the location information. If a LCS Location Notification Return Result message indicating that permission is not granted is received, or there is no response, with the requested privacy action or the UE subscription profile indicating barring of location in the absence of a response, the VMSC/MSC server shall return an error response to the GMLC. If RAN did not return a successful location estimate, but the privacy checks in steps 4 - 5 were successfully executed, the VMSC/MSC server may return the last known location of the target UE if this is known and the LCS client is requesting the current or last known location. The MSC/MSC server may then release the Mobility Management connection to the UE, if the UE was previously idle, and the MSC/MSC server may record ~~billing~~charging information.

10) Common MT-LR procedure in PS and CS domain as described in 9.1.1.

<< Next changed clause >>

9.1.5 Network Induced Location Request (NI-LR)

Figure 9.4 illustrates positioning for an emergency service call.

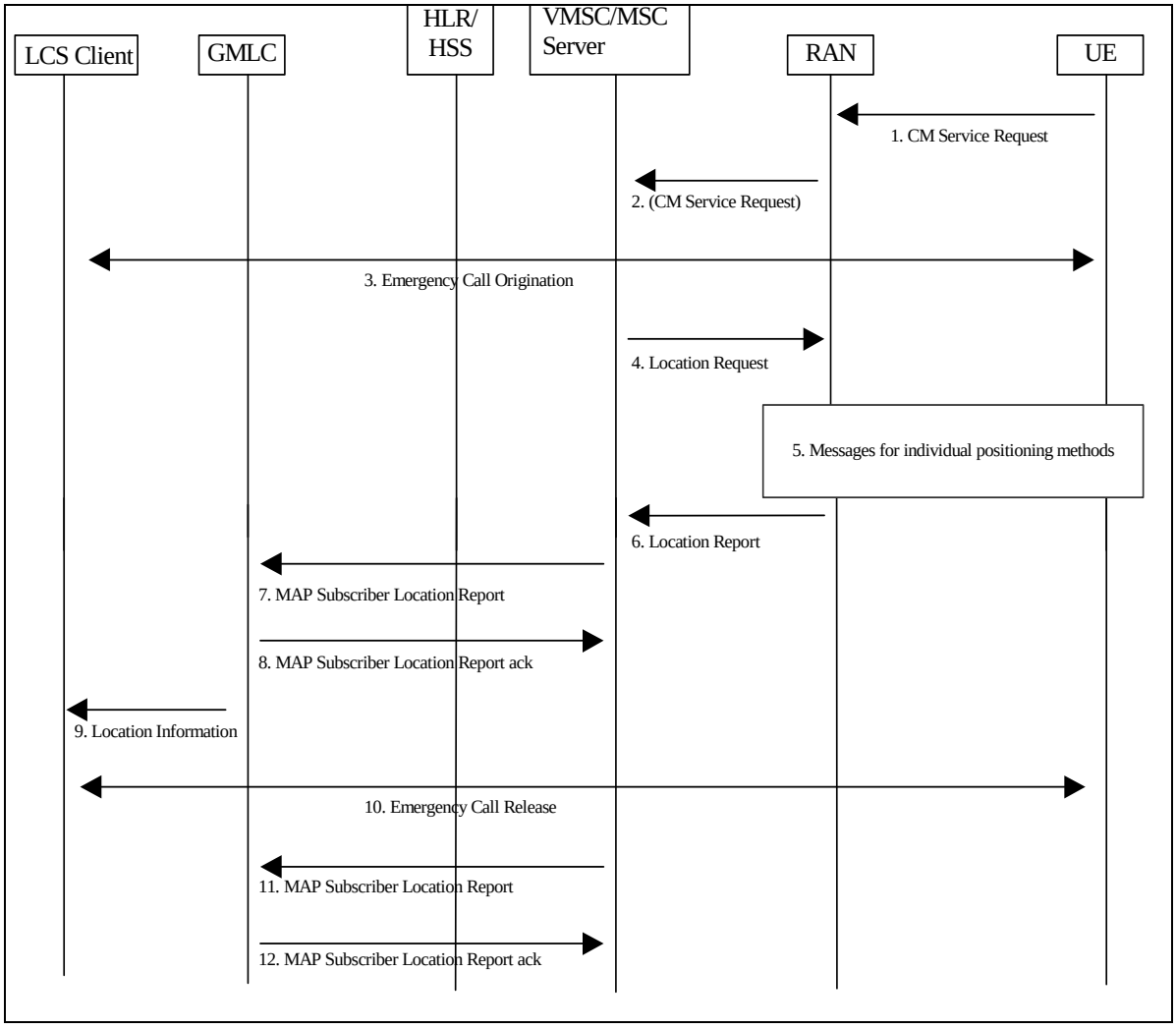


Figure 9.4: Positioning for a NI-LR Emergency Service Call

9.1.5.1 Location Preparation Procedure

1) An initially idle UE requests radio connection setup indicating a request for an Emergency Service call to the VMSC/MSC server via RAN.

2) RAN shall convey the CM service request to the core network. (Before having a CM connection there must be a radio connection.) The UE may identify itself using a TMSI, IMSI or IMEI.

3) The emergency call procedure is applied. The VMSC/MSC server determines based on the serving cell the appropriate emergency services client. The VMSC/MSC server, RAN and UE continue the normal procedure for emergency call origination towards that emergency services client. Depending on local regulatory requirements, the sending of call setup information into the PSTN may be delayed until either the UE's location has been obtained or the location attempt has failed or a PLMN defined timer has expired before location was obtained. If the serving cell serves an area that contains the service domain of multiple emergency services clients, the VMSC/MSC server may delay call setup and invoke location based routing procedures described in section 9.1.5A. Call setup information sent into the PSTN may include the UE location (if already obtained) plus

information that will enable the emergency service provider to request UE location at a later time (e.g. NA-ESRD or NA-ESRK in North America).

4) At any time after step 2, the VMSC/MSC server may initiate procedures to obtain the UE's location. These procedures may run in parallel with the emergency call origination. The VMSC/MSC server sends a Location Request message to RAN associated with the UE's current location area (see step 6 for a MT-LR). This message includes the QoS required for an emergency call.

9.1.5.2 Positioning Measurement Establishment Procedure

5) RAN determines the positioning method and instigates the particular message sequence for this method, as specified in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

9.1.5.3 Location Calculation and Release Procedure

6) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the VMSC/MSC server in a Location Report. The information of the positioning method used may be returned with the location estimate. If a location estimate could not be obtained, the RAN returns a location response containing a failure cause and no location estimate.

7) Depending on local regulatory requirements, the VMSC/MSC server may send a MAP Subscriber Location report to a GMLC associated with the emergency services provider to which the emergency call has been or will be sent. This message shall carry any location estimate returned in step 6, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling UE, and the information about the positioning method used. In case a SIM-less UE is used to make the emergency call, the MSISDN may be populated with a non-dialable callback number as specified in clause 6.4.3. In North America, any NA-ESRD and any NA-ESRK that may have been assigned by the VMSC/MSC server shall be included. The message shall also indicate the event that triggered the location report. If location failed (i.e. an error result was returned by RAN in step 6), an indication of failure rather than a location estimate may be sent to the GMLC: the indication of failure is conveyed by not including a location estimate in the MAP Subscriber Location Report. The MSC/MSC server may record charging information.

8) The GMLC acknowledges receipt of the location information. For a North American Emergency Services call, the GMLC shall store the location information for later retrieval by the emergency services LCS client.

9) The GMLC may optionally forward the information received in step 8 to the emergency services LCS client. The GMLC may also record charging information. For a North American emergency services call the client is expected to obtain the location information by requesting it from the GMLC. The information about the positioning method used may be sent with the location information from the GMLC to the LCS client.

10) At some later time, the emergency services call is released.

11) For a North American Emergency Services call, the MSC/MSC server sends another MAP Subscriber Location Report to the GMLC. This message may include the same parameters as before except that there is no position estimate and an indication of emergency call termination is included.

12) The GMLC acknowledges the MSC/MSC server notification and may then release all information previously stored for the emergency call.

<< Next changed clause >>

9.1.5A NI-LR using Location Based Routing – applicable to North American Emergency Calls only

Figure 9.4A illustrates positioning for an emergency service call using location based routing.

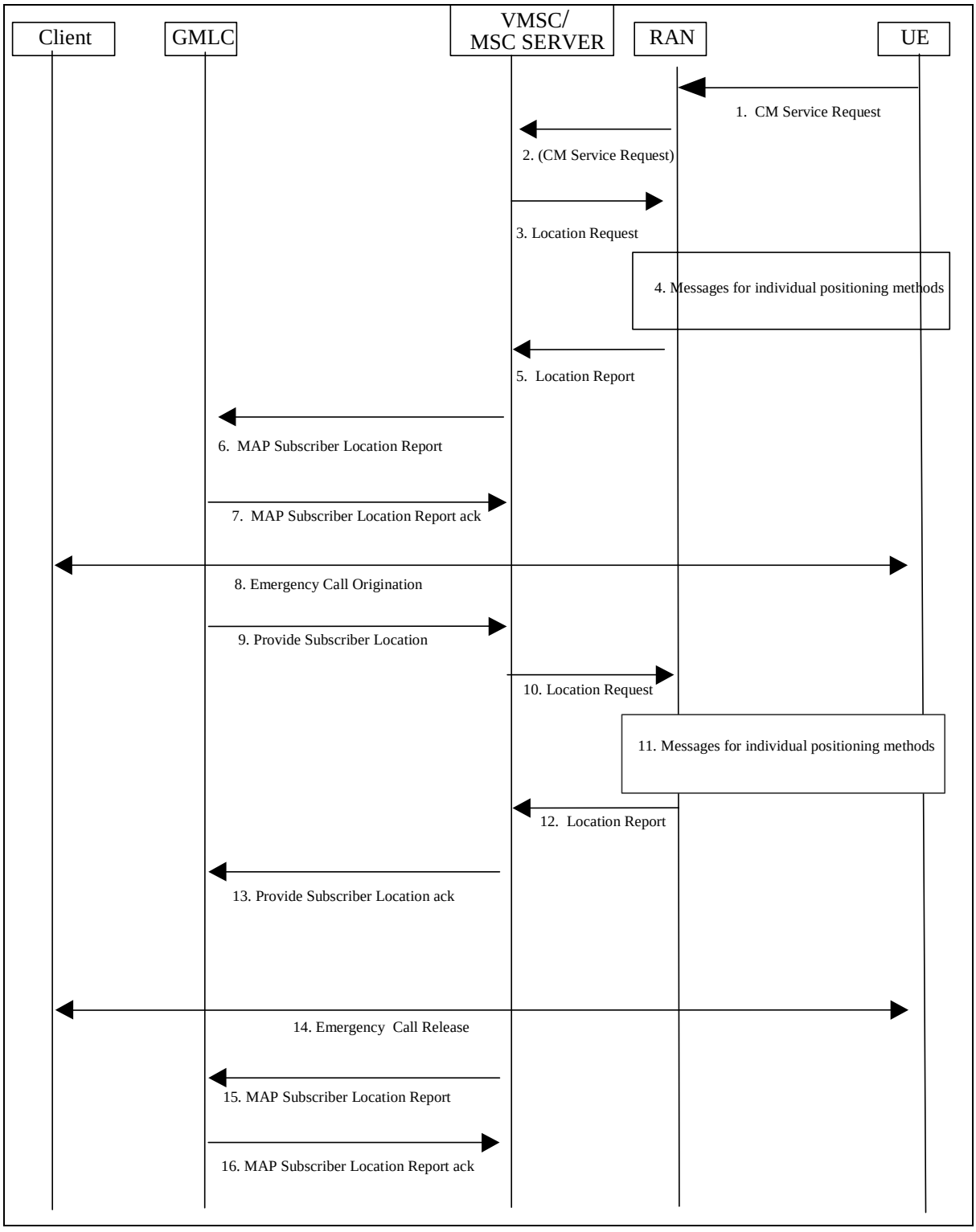


Figure 9.4A: Positioning for a NI-LR Emergency Service Call using Location Based Routing

9.1.5A.1 Location Preparation Procedure

1) An initially idle UE requests radio connection setup indicating a request for an Emergency Service call to the VMSC/MSC server via RAN.

2) RAN shall convey the CM service request to the core network. (Before having a CM connection there must be a radio connection.) The UE may identify itself using a TMSI, IMSI or IMEI.

3) The VMSC/MSC server determines that the serving cell serves an area that contains portions of multiple emergency services zones. Therefore, the VMSC/MSC server delays call setup and initiates procedures to obtain the UE's location for routing the emergency call to the emergency services LCS client. The VMSC/MSC server sends a Location Request message to RAN associated with the UE's current location area. This message includes the type of location information requested, the UE's location capabilities and a QoS with low delay and low horizontal accuracy.

9.1.5A.2 Positioning Measurement Establishment Procedure

4) RAN determines the positioning method and instigates the particular message sequence for this method, as specified in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16].

9.1.5A.3 Location Calculation and Release Procedure

5) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the VMSC/MSC server. If a location estimate could not be obtained, the RAN returns a location response containing a failure cause and no location estimate. If a failure is received, the VMSC/MSC server initiates emergency call setup using the normal NI-LR procedures.

6) The VMSC/MSC server sends a MAP Subscriber Location Report to a GMLC associated with the emergency services client to which the emergency call will be sent. This message shall carry any location estimate returned in step 5, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling UE. The message shall also indicate the event that triggered the location report. Any NA-ESRD and NA-ESRK that was assigned by the VMSC/MSC server shall be included. The message shall also include a request for an NA-ESRK value based on the UE position. The VMSC/MSC server and GMLC may record charging information.

7) The GMLC translates the location estimate into a zone identity and assigns a NA-ESRK, which was requested by the VMSC/MSC server. The GMLC shall include the NA-ESRK value in the MAP Subscriber Location Report ack and send it to the VMSC/MSC server. The GMLC stores the assigned NA- ESRK and any NA-ESRD that was sent by the VMSC/MSC server in step 6.

9.1.5A.4 Location Preparation Procedure

8) The emergency call procedure is applied. The VMSC/MSC server, RAN and UE continue the normal procedure for emergency call origination towards the appropriate emergency services client. Call setup information sent into the PSTN may include the UE location plus information that will enable the emergency service provider to request UE location at a later time (NA-ESRD or NA-ESRK in North America). The NA-ESRK used shall be the one received from the GMLC. If a NA-ESRK is not received from the GMLC then the VMSC/MSC server shall use the default NA-ESRK for the call as in 9.1.5.1 step 3.

9) At any time after step 6, the GMLC may send a MAP Provide Subscriber Location message to the VMSC/MSC server. This message includes a QoS with higher delay and higher horizontal accuracy required for an emergency call.

   If the GMLC is capable of determining whether the initial location satisfies the higher accuracy requirements for an emergency call, then the GMLC may not need to request for a higher accuracy location.

10) The VMSC/MSC server sends a Location Request message to RAN. This message includes the type of location information requested, the UE's location capabilities and requested higher accuracy QoS.

9.1.5A.5 Positioning Measurement Establishment Procedure

11) same as step 4.

9.1.5A.6 Location Calculation and Release Procedure

12) same as step 5.

13) The VMSC/MSC server returns the location information and its age to the GMLC. The GMLC shall replace the previously stored low accuracy location information with the higher accuracy information for later retrieval by the emergency services LCS client. The VMSC/MSC server and GMLC may record charging information.

14) same as step 10 for normal NI-LR.

15) same as step 11 for normal NI-LR.

16) same as step 12 for normal NI-LR.

<< Next changed clause >>

9.1.6 Packet Switched Mobile Terminating Location Request (PS-MT-LR)

Figure 9.5 illustrates the general network positioning for LCS clients external to the PLMN for packet switched services. In this scenario, it is assumed that the target UE is identified using an MSISDN or IMSI.

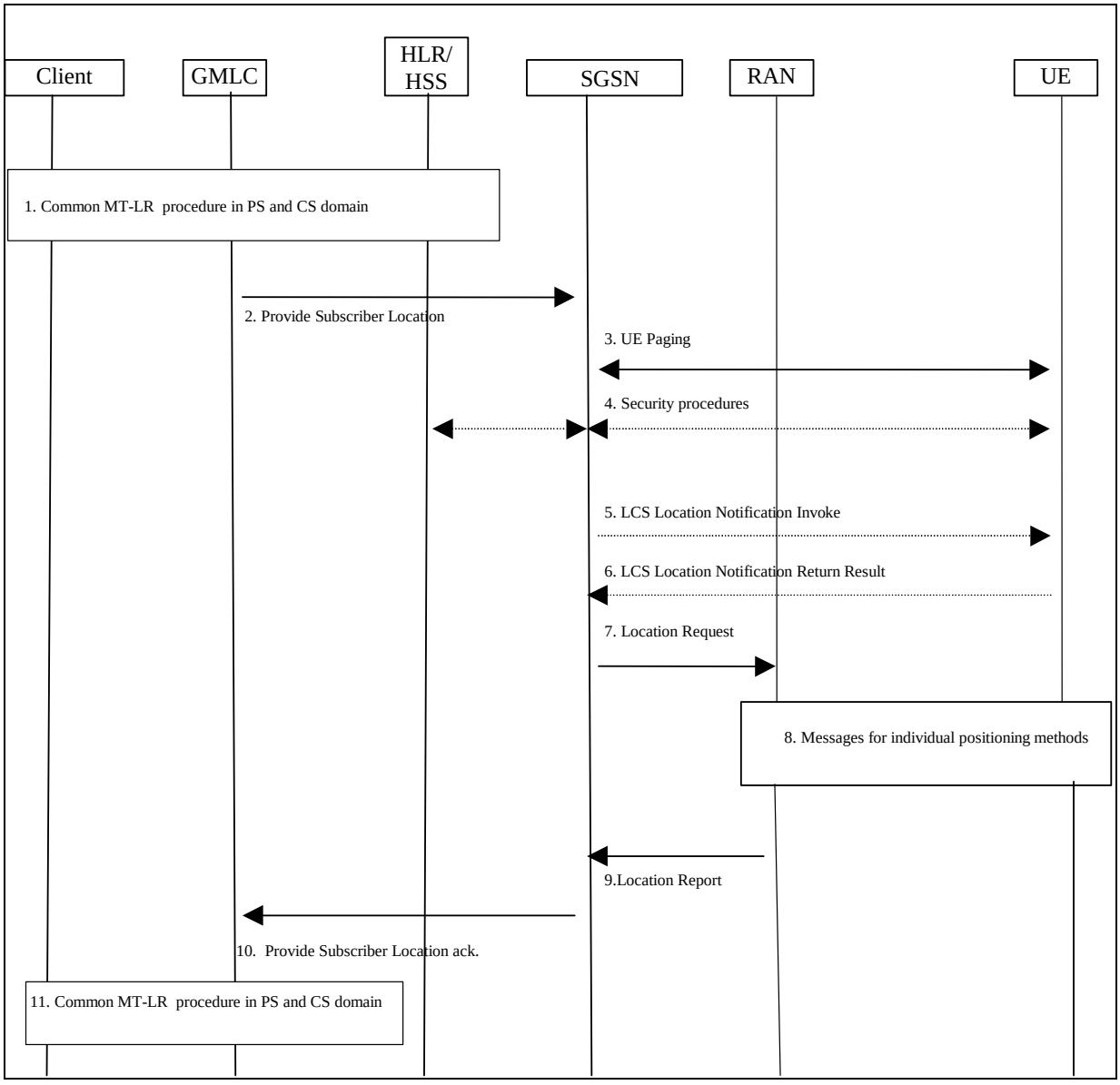


Figure 9.5: General Network Positioning for Packet Switched MT-LR

9.1.6.1 Location Preparation Procedure

1) Common PS and CS MT-LR procedure as described in 9.1.1.

2) GMLC sends a Provide Subscriber Location message to the SGSN indicated by the HLR/HSS. This message carries the type of location information requested (e.g. current location), the UE subscriber's IMSI, LCS QoS information (e.g. accuracy, response time) and an indication of whether the LCS client has the override capability. For a session related location request, the message also carries the APN-NI to which the user has established the session. For a value added LCS client, the message shall carry the client name, the external identity of the LCS client (or the pseudo external identity) and the Requestor Identity (if that is both supported

and available), optionally the message may also carry the Service Type. Also the message may carry the type of the LCS client name and also the type of the Requestor identity if the requestor identity was included. If the result of the privacy check at H-GMLC/PPR indicated that the codeword shall be sent to the UE user, the message may carry also the codeword received from the LCS client. For a PLMN operator LCS client, the message shall carry the internal identity of the LCS client. If the Requestor Identity is provided, the GMLC shall send it as separate information. In addition, in order to display the requestor identity in case of pre rel-5 network elements (i.e. SGSN and/or UE), the requestor identity may be also added to the LCS client name by the GMLC. When the Requestor identity is added to the LCS client name the practise described in the Annex D should be followed. The message also shall carry the indicators of privacy related action which is described in chapter 9.5.4 , if it is provided by H-GMLC.

3) If the GMLC is located in another PLMN or another country, the SGSN first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. If the PSL message from the GMLC includes the indicators of privacy related action, the SGSN determines a required privacy related action as described in Annex A.3. If the PSL message from the GMLC does not include the indicators of privacy related action, the SGSN then verifies LCS barring restrictions in the UE user's subscription profile in the SGSN. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC.
Otherwise, if the UE is in idle mode, the SGSN performs paging. The paging procedure is defined in TS 23.060[15].

4) Security functions may be executed. These procedures are defined in TS 23.060 [15].

5) If the location request comes from a value added LCS client and the indicators of privacy related action or the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS, a notification invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client and the Requestor Identity (if that is both supported and available), whether privacy verification is required. Also the message may indicate the type of the LCS client name and also the type of the Requestor identity if the requestor identity was included. Moreover, the message may carry also the service type and the codeword. Optionally, the SGSN may after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 7 without waiting for a LCS Location Notification Return Result message in step 6.

6) The target UE notifies the UE user of the location request and, if privacy verification was requested, waits for the user to grant or withhold permission. The UE then returns a notification result to the SGSN indicating, if privacy verification was requested, whether permission is granted or denied. Optionally, this message can be returned some time after step 5, but before step 10. If the UE user does not respond after a predetermined time period, the SGSN shall infer a "no response" condition. The SGSN shall return an error response to the GMLC if privacy verification was requested and either the UE user denies permission or there is no response with the UE subscription profile indicating barring of the location request.

7) The SGSN sends a Location Request message to the RAN. This message includes the type of location information requested, the requested QoS and any other location information received in paging response.

9.1.6.2 Positioning Measurement Establishment Procedure

8) If the requested location information and the location accuracy within the QoS can be satisfied based on parameters received from the SGSN and the parameters obtained by the RAN e.g. cell coverage and timing information (i.e. RTT or TA), the RAN may send a Location Report immediately. Otherwise, the RAN determines the positioning method and instigates the particular message sequence for this method in UTRAN Stage 2 TS 25.305 and in GERAN Stage 2 TS 43.059. If the position method returns position measurements, the RAN uses them to compute a location estimate. If there has been a failure to obtain position measurements, the RAN may use the current cell information and, if available, RTT or TA value to derive an approximate location estimate. If an already computed location estimate is returned for an UE based position method, the RAN may verify consistency with the current cell and, if available, RTT or TA. If the location estimate so obtained does not satisfy the requested accuracy and sufficient response time still remains, the RAN may instigate a further location attempt using the same or a different position method. If a vertical location co-ordinate is requested but the RAN can only obtain horizontal co-ordinates, these may be returned.

9.1.6.3 Location Calculation and Release Procedure

9) When location information best satisfying the requested location type and QoS has been obtained, the RAN returns it to the SGSN in a Location Report message. The information of the positioning method used may be returned with the location information. If a location estimate could not be obtained, the RAN returns a Location Report message containing a failure cause and no location estimate.

10) The SGSN returns the location information and its age to the GMLC, if the SGSN has not initiated the Privacy Verification process in step 5. If step 5 has been performed for privacy verification, the SGSN returns the location information only, if it has received a LCS Location Notification Return Result indicating that permission is granted. In these cases, the information about the positioning method used may be sent with the location information. If a LCS Location Notification Return Result message indicating that permission is not granted is received, or there is no response, with the requested privacy action or the UE subscription profile indicating barring of location, the SGSN shall return an error response to the GMLC. If the SGSN did not return a successful location estimate, but the privacy checks were successfully executed, the SGSN may return the last known location of the target UE if this is known and the LCS client is requesting the current or last known location. The SGSN may record ~~billing~~charging information.

11) Common MT-LR procedure in PS and CS domain as described in 9.1.1.

<< Next changed clause >>

9.1.7 Packet Switched Network Induced Location Request (PS-NI-LR)

Figure 9.6 illustrates a network induced location request from the SGSN. This procedure may be used e.g. for positioning of an emergency call.

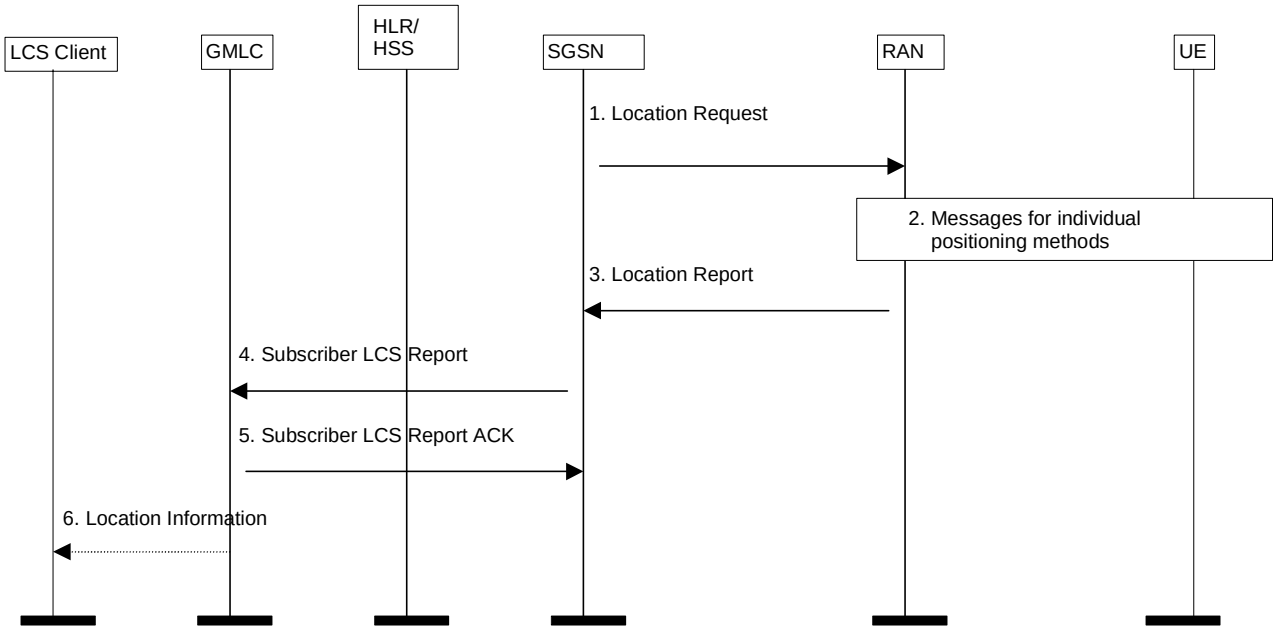


Figure 9.6: Network Induced Location Request

1) The SGSN sends a Location Request message to the RAN. This message indicates the type of location information requested and requested QoS.

9.1.7.1 Positioning Measurement Establishment Procedure

2) If the requested location information and the location accuracy within the QoS can be satisfied based on parameters received from the SGSN and the parameters obtained by the RAN e.g. cell coverage and timing information (i.e. RTT or TA), the RAN may send a Location Report immediately. Otherwise, the RAN determines the positioning method and instigates the particular message sequence for this method. If the position method returns position measurements, the RAN uses them to compute a location estimate. If there has been a failure to obtain position measurements, the RAN may use the current cell information and, if available, RTT or TA value to derive an approximate location estimate. If an already computed location estimate is returned for an UE based position method, the RAN may verify consistency with the current cell and, if available, RTT or TA value. If the location estimate so obtained does not satisfy the requested accuracy and sufficient response time still remains, the RAN may instigate a further location attempt using the same or a different position method. If a vertical location co-ordinate is requested but the RAN can only obtain horizontal co-ordinates, these may be returned.

9.1.7.2 Location Calculation and Release Procedure

3) When a location estimate best satisfying the requested QoS has been obtained, the RAN returns a Location Report to the SGSN. This message carries the location estimate that was obtained. If a location estimate was not successfully obtained, a failure cause is included in the Location Report.

4) The SGSN shall send a MAP Subscriber Location Report to the GMLC obtained in step 1 carrying the MSISDN of the UE, the identity of the LCS client, the event causing the location estimate (NI-LR-PS) and the location estimate and its age. The SGSN may record charging information.

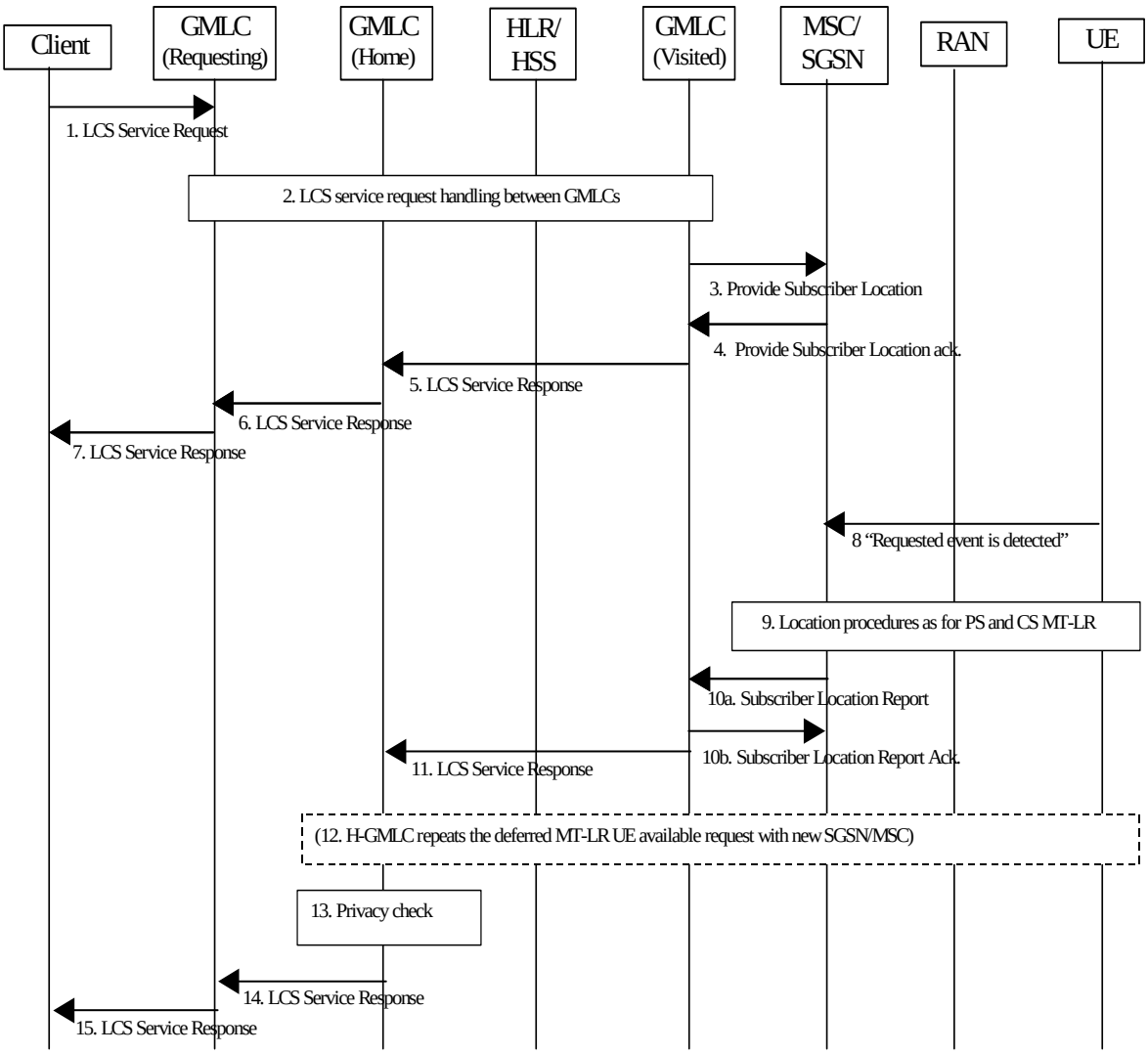
5) The GMLC shall acknowledge receipt of the location estimate provided that it serves the identified LCS client and the client is accessible.

6) The GMLC may transfer the location information to the LCS client either immediately or upon request from the client. The GMLC may record charging information.

<< Next changed clause >>

9.1.8 Mobile Terminating Deferred Location Request – UE available event

Figure 9.6a illustrates the procedures for a Deferred Location Request, where the Location Report is returned based on a UE available event.



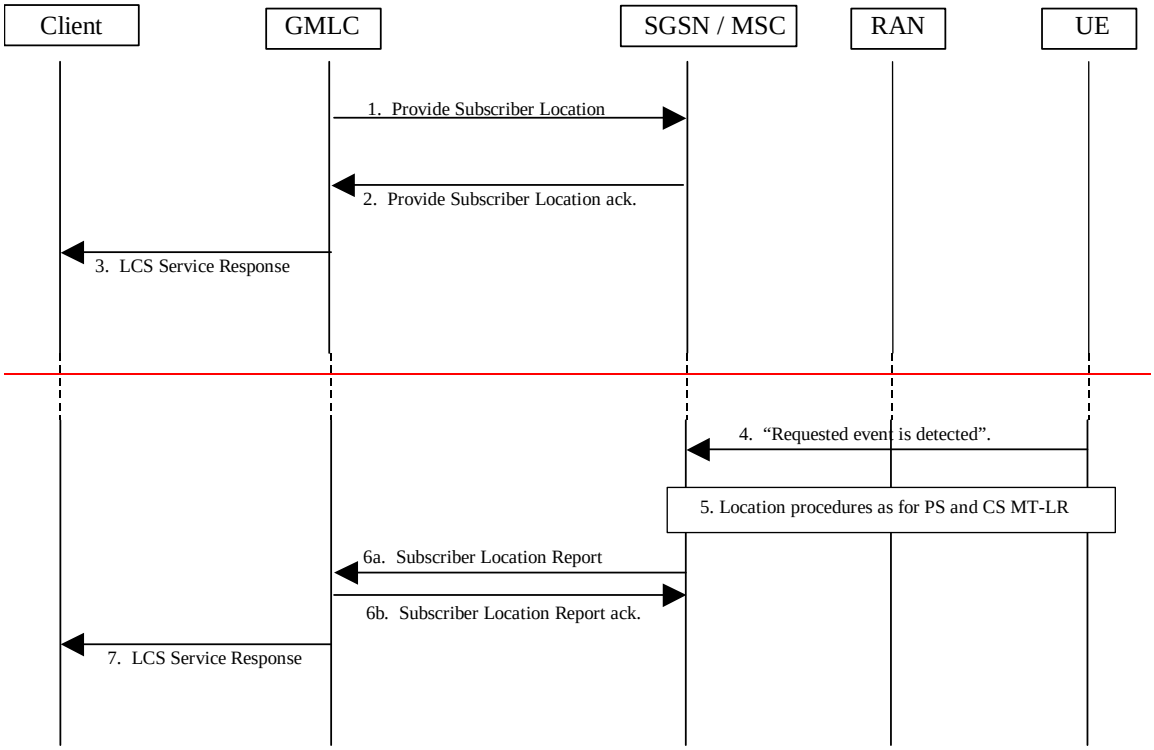


Figure 9.6a: General Network Positioning for a Deferred MT-LR with UE available event

9.1.8.1 Deferred Location Request Procedure

~~1) GMLC assigns a reference number to Provide Subscriber Location. Provide Subscriber Location is received in SGSN/MSC as described in 9.1.2/9.1.6. In addition, the Deferred Location Request includes the reference number and the event that shall trigger the sending of Location Report.~~

~~Note: The GMLC shall send the Provide Subscriber Location for the UE regardless of the ongoing previous MT-LR for the same UE.~~

~~2) If the SGSN/MSC cannot support the deferred location request for the specified event (for temporary or permanent reasons), a Provide Subscriber Location return error shall be returned with a suitable cause. If the SGSN/MSC can support the deferred location request for the specified event, a Provide Subscriber Location ack. shall be returned to the GMLC without a location estimate.~~

~~3) The GMLC then returns the LCS Service Response to the LCS Client via H-GMLC and R-GMLC to notify whether the request was successfully accepted or not.~~

~~9.1.8.2 Location Report Procedure~~

~~4) Immediately following step 3, the SGSN/MSC shall verify if the requested event is already satisfied (e.g. UE available inferred from a current transaction) or can be invoked immediately (e.g. by paging the UE and receiving a page response). If requested event is not existing the SGSN/MSC waits until it has occurred or until some maximum time has expired.~~

~~In case the SGSN/MSC receives an indication that the UE has moved to another SGSN/MSC while it is waiting for the requested event to happen, a Subscriber Location Report is directly sent to the GMLC with the reference number that was included in the Provide Subscriber Location and the information that MT-LR must be re-initiated against the new SGSN/MSC. The address of the new SGSN/MSC is included in Subscriber Location Report if available. (If new SGSN/MSC address was included, the GMLC continues at step 1 above, otherwise it continues with an interrogation against HLR as described in 9.1.1.)~~
~~If V-GMLC is noticed that the UE has moved to another PLMN while it is waiting for the requested event to happen, a location report message shall be sent to the H-GMLC from V-GMLC with the information that MT-~~

~~LR must be re-initiated against the new VPLMN. The H-GMLC continues with an interrogation against HLR/HSS as described in 9.1.1.~~

~~5) When the requested event is detected, the SGSN/MSC will proceed with the location request as described in 9.1.2/9.1.6.~~

~~If either security or privacy check related actions fail, a Subscriber Location Report with the reference number that was included in the Provide Subscriber Location is returned with appropriate error cause indicating termination of the deferred location request.~~

~~6) When location information has been obtained from the RAN, the SGSN/MSC returns the Subscriber Location Report. The report shall indluced the reference number that was included in the Provide Subscriber Location and an indication that this is a response to a previously sent deferred location request.~~

~~If the location information could not be obtained, or the SGSN/MSC for some other reason decides to not wait any longer for the requested event to occur (ex. timer expires), the Subscriber Location Report with the reference number that was included in the Provide Subscriber Location will be returned with an appropriate error cause indicating termination of the deferred location request.~~

~~7) GMLC then returns the LCS Service Response to the LCS Client via H-GMLC and R-GMLC as in 9.1.1.~~

1) The LCS Service Request shall contain an indication of the requested event i.e. UE available. The R-GMLC assigns a LDR reference number to this LCS Service request.

2) LCS service request handling between GMLCs as described in clause 9.1.1. The information received by the R-GMLC is transferred to the V-GMLC via the H-GMLC, including the LDR reference number and the H-GMLC address.

3) The V-GMLC sends the UE available event to MSC/SGSN in the Provide Subscriber Location request (deferred) and includes the LDR reference number and the H-GMLC address in the request.

Note: It shall be possible to issue the deferred location requests for the UE available event, even in case there is an ongoing previous MT-LR for the same UE.

4) If the SGSN/MSC cannot support the deferred location request for the specified event (for temporary or permanent reasons), a Provide Subscriber Location return error shall be returned with a suitable cause. If the SGSN/MSC can support the deferred location request for the specified event, a Provide Subscriber Location ack. shall be returned to the V-GMLC without a location estimate. The SGSN/MSC may record charging information for an accepted deferred location request.

5) V-GMLC returns the LCS Service Response to H-GMLC to notify whether the request was successfully accepted or not. The V-GMLC may record charging information for an accepted deferred location request.

6) H-GMLC returns the LCS Service Response to R-GMLC to notify whether the request was successfully accepted or not. The H-GMLC may record charging information for an accepted deferred location request.

7) The R-GMLC then returns the LCS Service Response to the LCS Client to notify whether the request was successfully accepted or not. When the R-GMLC returns the LCS Service Response to the LCS Client, the LDR reference number assigned by the R-GMLC shall be included. The R-GMLC may record charging information for an accepted deferred location request.

<< Next changed clause >>

9.1.8.2 Location Report Procedure

8) Immediately following step 3, the SGSN/MSC shall verify if the requested event is already satisfied (e.g. UE available inferred from a current transaction) or can be invoked immediately (e.g. by paging the UE and receiving a page response). If the requested event is not already satisfied, the SGSN/MSC waits until it has occurred or until some maximum time has expired.

   In case the SGSN/MSC receives an indication that the UE has moved to another SGSN/MSC, while it is waiting for the requested event to happen, SGSN/MSC shall immediately send a Subscriber Location Report to the V-GMLC, which forwards it to the H-GMLC. The report shall include the privacy related action, reference number and H-GMLC address that were included in the Provide Subscriber Location request and SGSN/MSC shall also include the address of the new SGSN/MSC, if available. (H-GMLC shall in this case reinitiate the MT-LR with the new SGSN/MSC, see step 12.)

9) When the requested event is detected, the SGSN/MSC shall proceed with the location request as described in 9.1.2/9.1.6.

   If either security or privacy check related actions fail, e.g. because the location information is not session or call related, the SGSN/MSC shall send a Subscriber Location Report with the reference number and H-GMLC address that was included in the Provide Subscriber Location with appropriate error cause indicating termination of the deferred location request.

10) When location information has been obtained from the RAN, the SGSN/MSC returns the Subscriber Location Report. The report shall include the reference number that was included in the Provide Subscriber Location, the H-GMLC address and an indication that this is a response to a previously sent deferred location request. The SGSN/MSC may record charging information.

    If the location information could not be obtained, or the SGSN/MSC for some other reason decides to not wait any longer for the requested event to occur (ex. timer expires), the Subscriber Location Report with the reference number and H-GMLC address that was included in the Provide Subscriber Location will be returned with an appropriate error cause indicating termination of the deferred location request.

11) V-GMLC sends the LCS Service Response to the H-GMLC with an indication of the event occurrence and the LDR reference number.

12) In case the LCS Service Response indicates to H-GMLC that the mobile has moved to another SGSN/MSC, the H-GMLC shall send the deferred MT-LR with UE available event to the V-GMLC (previous or new), which forwards the request to the new SGSN/MSC, as described in step 2 onwards.

13) The H-GMLC performs the privacy check as described in clause 9.1.1.

14) The H-GMLC sends the LCS Service Response to R-GMLC.

15) The R-GMLC sends the LCS Service Response to the LCS Client. When the R-GMLC returns the LCS Service Response to the LCS Client, the LDR reference number that was sent to the LCS Client in step 3 shall be included.

<< Next changed clause >>

9.1.8.3 Combined Periodical/Deferred Mobile Terminating Location Request with UE available event

Figure 9.6b illustrates the procedures for a Combined Periodical/Deferred Mobile Terminating Location Request with UE available event, where the response to the LCS client is returned periodically and based on the event.

Note: In the description below, it is assumed that the LCS client issues the Periodical/Deferred MT-LR with only the location estimate type of "current location".

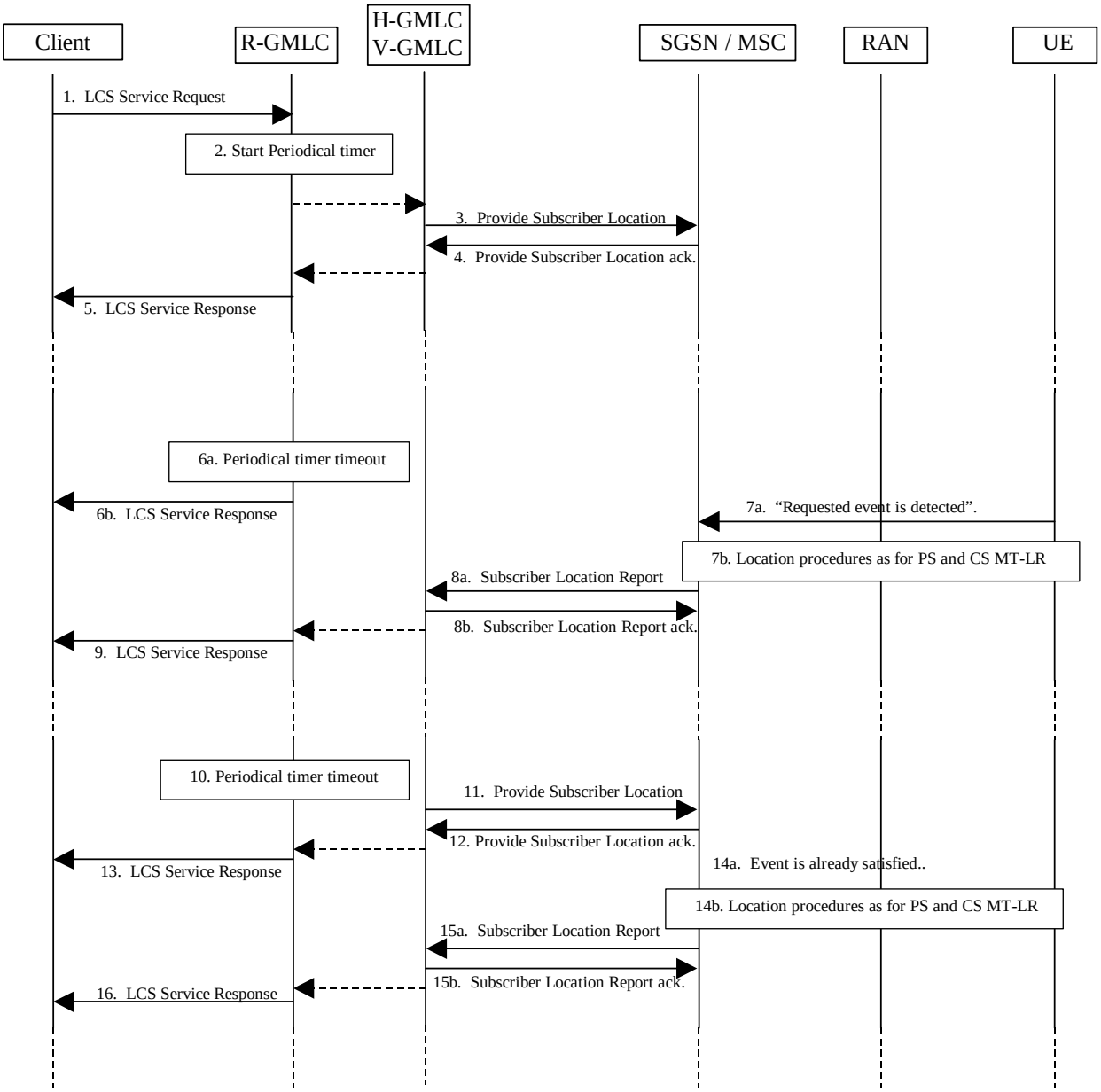


Figure 9.6b: General Network Positioning for a Combined Periodical/Deferred MT-LR

1) When a R-GMLC receives a LCS Service Request from a LCS client, the R-GMLC verifies the identity of the LCS client as described in 9.1.1.

2) The R-GMLC starts the periodical timer, and initiates the common LCS procedures as described in 9.1.1.

3) The V-GMLC sends a Deferred Location Request to the SGSN/MSC by means of Provide Subscriber Location as described in 9.1.2/9.1.6. In addition, the Deferred Location Request includes the reference number assigned by the R-GMLC and the event that shall trigger the sending of Subscriber Location Report.

4) If the SGSN/MSC cannot support the deferred location request for the specified event or the LCS client is not allowed to position the requested UE according to subscription information, a Provide Subscriber Location error is returned to the V-GMLC. If the SGSN/MSC can support the deferred location request for the specified event and the privacy checks are satisfied, a Provide Subscriber Location ack shall be returned to the V-GMLC without a location estimate. The SGSN/MSC may record charging information for an accepted deferred location request.

5) The V-GMLC then returns the LCS Service Response to the LCS Client via H-GMLC and R-GMLC to notify whether the request was successfully accepted or not. The V-GMLC, H-GMLC and R-GMLC may record charging information for an accepted deferred location request. When the R-GMLC returns the LCS Service Response to the LCS Client, the LDR reference number assigned by the R-GMLC shall be included.

6) When the periodical timer expires, if the R-GMLC is still waiting for the event, the R-GMLC shall send a LCS Service Response to the LCS client, indicating that the location is not available at that moment. The LDR reference number that was sent to the LCS Client in step 5 shall be included in the response.

7) When the requested event is detected, the SGSN/MSC will proceed with the location request as described in 9.1.2/9.1.6.

8) When location information has been obtained from the RAN, the SGSN/MSC returns the Subscriber Location Report. The report shall include the reference number included in the previously sent Provide Subscriber Location and an indication that this is a response to a previously sent deferred location request. The SGSN/MSC may record charging information.

If the location information could not be obtained, or the SGSN/MSC for some other reason decides to not wait any longer for the requested event to occur (ex. timer expires), the Subscriber Location Report with the reference number included in the previously sent Provide Subscriber Location will be returned with an appropriate error cause indicating termination of the deferred location request.

9) The V-GMLC then returns the LCS Service Response to the LCS Client via H-GMLC and R-GMLC as in 9.1.2/9.1.6. When the R-GMLC returns the LCS Service Response to the LCS Client, the LDR reference number that was sent to the LCS Client in step 5 shall be included.

10) When the timer expires, if the R-GMLC is not waiting for the event, the R-GMLC initiates the common LCS procedures as described in 9.1.1. The R-GMLC should use the same LDR reference number assigned in the step 3, should NOT assign a new LDR reference number.

11) Same as step 3.

12) Same as step 4.

13) Same as step 5.

14) If the requested event is already satisfied, the SGSN/MSC will proceed with the location request as described in 9.1.2/9.1.6.

15) Same as step 8.

16) Same as step 9.

<< Next changed clause >>

9.1.8.4 Cancellation of a Deferred Location Request – UE available event

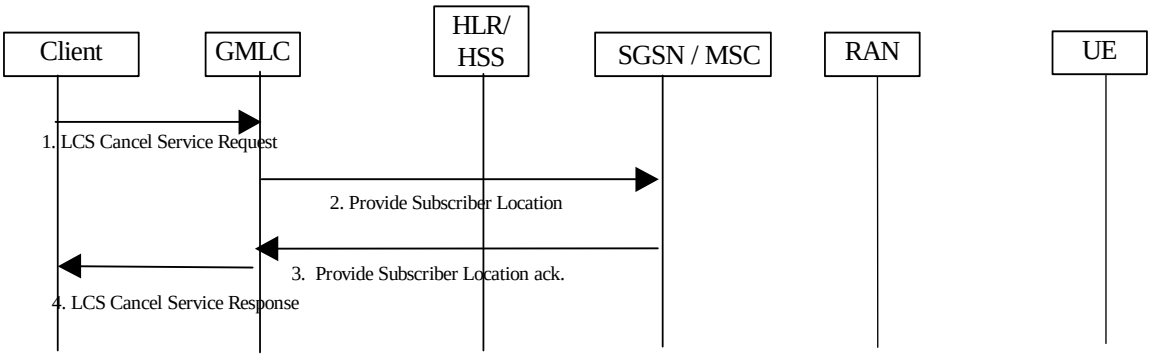


Figure 9.6c: Cancellation of a Deferred MT-LR – UE available event procedure

1) The LCS Client requests the cancellation of a previously requested Deferred Location Request. The LDR reference number that was included in the previous LCS Service Response sent by the GMLC shall be included in the request to indicate which outstanding LDR should be cancelled. The cancellation could be initiated by the GMLC itself for some reasons (e.g. implementation dependent timer in the GMLC expired). If the UE's privacy profile stored in the H-GMLC or in the PPR was changed, any outstanding Deferred Location Request, which would not have been authorized with the new profile, shall be cancelled or the requested action for the VPLMN shall be changed. The H-GMLC initiates the cancellation and may send a new Deferred Location Request to the VPLMN. The event type to cancel must be indicated in the Cancellation procedure.

   If the previously requested Deferred Location Request was forwarded to other GMLC (H-GMLC or V-GMLC), the cancellation request from the LCS client shall be forwarded to the other GMLC.

Note: The GMLC shall know that the UE subscribers privacy profile has been changed in the PPR when the LCS Privacy Profile Update has been send from PPR to GMLC as described in 9.1.1.2.

2) The GMLC will indicate this cancellation request in the Provide Subscriber Location toward the SGSN/MSC. The Provide Subscriber Location shall include the reference number specified by LCS Client in the LCS Cancel Service Request. ~~that was included in the previously sent Provide Subscriber Location~~.

3) When the SGSN/MSC completes the cancellation procedure, it notifies it to the GMLC in the Provide Subscriber Location Ack (with no location estimate included).

   If the cancellation request was forwarded to other GMLC (H-GMLC or V-GMLC), the GMLC (H-GMLC or V-GMLC) informs the GMLC (R-GMLC or H-GMLC) that the cancellation procedure has been successfully completed.

4) The GMLC informs the LCS Client that the cancellation procedure has been successfully completed.

<< Next changed clause >>

9.1.9 Deferred Location Request Procedure for the change of area event

Figure 9-6d illustrates the procedures for a Deferred Location Request where the Location Report is returned to the network by the UE following a change of area event. An ~~change of~~ area event occurs when the UE leaves, enters or is within a target area as defined by geographical area, PLMN identity, country code or geopolitical name of the area. Details of the target area are contained in the LCS Service Request message, see clause 5.5.1.

The PLMN operator may choose to use another mechanism (such as SIM Application Toolkit) for the transfer and detection mechanism of the Area Definition and change of area event information to the UE. In this case, the GMLCs handle steps 2 to 7 and 11 to 14 differently from that shown below. An alternative mechanism is detailed in Annex F

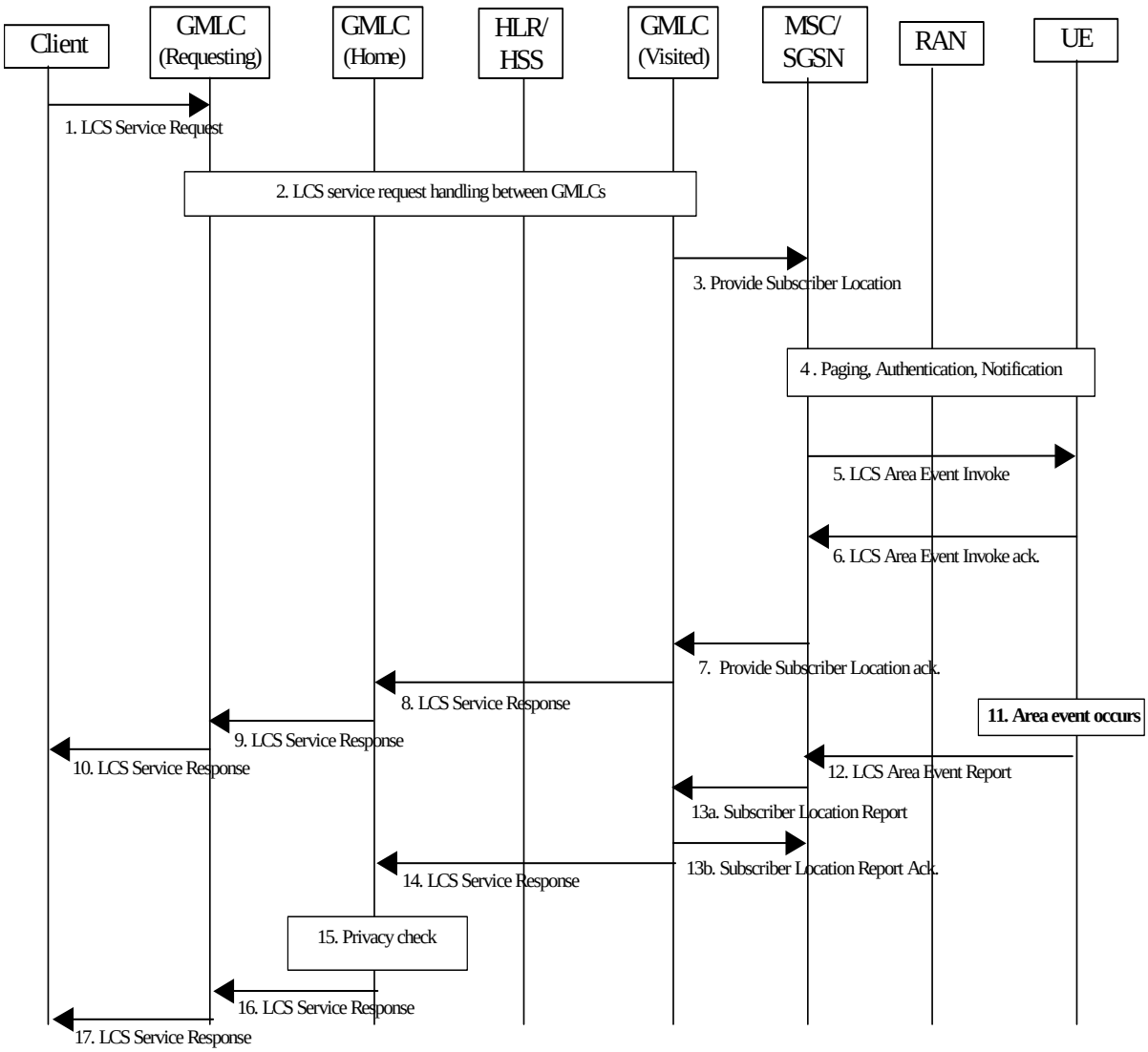


Figure 9.6d: Deferred MT-LR procedure for the Area event

1) The LCS Service Request contains the change of area type deferred location request information, i.e. details of the target area and the nature of the event, whether the event to be reported is the UE being inside, entering into or leaving the target area. The LCS service request may specify the validity time, i.e. start time and stop time, for the deferred location request and R-GMLC may cancel the deferred location request as described in clause 9.1.9.1. In addition, when validity time of a pending area event request in the target UE expires, the UE shall delete the pending deferred location request. The LCS Service Request shall contain an indication of the minimum interval time between area event reports, if applicable. The LCS service request shall contain the information whether the deferred area event may be reported one time only, or several times. If the change of area event is reported one time only, the Location Service request shall be completed after the first area event has

occurred. The R-GMLC assigns a LDR reference number to this LCS Service request. If the target area is expressed by local coordinate system or geopolitical name, the R-GMLC shall convert the target area to geographical area expressed by a shape defined in TS23.032. In addition to the target area definition, the LCS Client may include the country code of the target area in the area event request.

2) LCS service request handling between GMLCs as described in clause 9.1.1. If indication of the requested location estimate is included in the area event request, the R-GMLC should record this indication and any relevant parameters such as QoS. The information received by the R-GMLC is transferred to the V-GMLC via the H-GMLC, including the LDR reference number~~, the R-GMLC address~~ and the H-GMLC address.

   If the H-GMLC notices that the current visited PLMN does not serve the target area, it may generate a modified deferred LCS service request in order to get notified when the target UE enters a PLMN that serves the target area. The modified target area event is that the target UE enters one of the PLMNs that serve the original target area. Note that the new area event may include multiple PLMNs (identified by PLMN IDs) if there are more than one PLMN that serves the original target area, based on the stored PLMN list and the corresponding estimated coverage. The H-GMLC then generates a new location request with the new defined area event and the same rest of the information in the original request.

   The new location request is sent to the target UE via the current V-GMLC. The H-GMLC keeps the original area event location service request pending for as long as determined by the validity time of the request. When the UE enters one of the pre-defined PLMNs, it sends an area event location report to H-GMLC. The H-GMLC then sends the original area event location service request to the UE via the new V-GMLC. If the H-GMLC cannot derive a list of PLMNs that may cover the target area, and the current visited network does not cover the target area, the H-GMLC may reject the request.

Editor's Note: There is an issue related to the scenario that, after the original area event was download to the target the UE, the UE may switch to a different network that also serves the target area. Solution to resolve this issue is for further study.

3) If the received target area is expressed by a shape defined in TS23.032, V-GMLC converts the target area into an Area Definition consisting of the corresponding list of cell identities, location areas or routing area. If the V-GMLC is not able to translate the target area into network identities, it shall reject the request and send an LCS service response to H-GMLC with the appropriate error cause.
   If the received target area is expressed by country code or PLMN identity, the V-GMLC shall use the country code or PLMN identity as the Area Definition.
   The V-GMLC sends the Area Definition to MSC/SGSN in the Provide Subscriber Location request (deferred) and includes the LDR reference number~~, the R-GMLC address~~ and the H-GMLC address in the request.
   The message shall define whether the event to be reported is the UE being inside, entering into or leaving the area. The message shall also include the validity period of the location request, the minimum interval time between area event reports, the information whether the deferred area event may be reported one time only or several times, if applicable.

4) The MSC/SGSN verifies the UE capabilities with regard to the change of area event. If either the MSC/ SGSN or the UE does not support the deferred location request for the change of area event (for temporary or permanent reasons), a Provide Subscriber Location return error shall be returned with a suitable cause in step 7. If the UE is in idle mode, the core network performs paging, authentication and ciphering. If privacy notification/verification is requested, the MSC/SGSN sends an LCS Location Notification Invoke message to the target UE indicating the change of area type deferred location request and whether privacy verification is required. LCS Location Notification is further specified in clauses 9.1.2 and 9.1.6. If privacy verification was requested, the UE returns an LCS Location Notification Return Result to the MSC/SGSN indicating whether permission is granted or denied.

5) The MSC/SGSN sends the LCS Area Event Invoke to the UE carrying the Area Definition, other area event information, the LDR reference number~~, the R-GMLC address~~ and the H-GMLC address. The message shall also define whether the event to be reported is the UE being inside, entering into, leaving the area. The message shall also include the validity period of the location request, the minimum interval time between area event reports and the information whether the deferred area event may be reported one time only, or several times, if applicable.

6) If the LCS Area Event Invoke is successfully received by the UE and the UE supports the change of area type deferred location request, the UE sends acknowledgement to MSC/SGSN and begins monitoring for the change of area event. The UE shall determine whether it is inside, entering into or leaving the target area by comparing the current serving cell identity, location area, routing area, PLMN identity or country code to the Area

Definition received from the MSC/SGSN. In case of soft handover, it is sufficient if one of the cells belongs to the target area. In case the Area Definition consists of a location or routing area, PLMN or country identity the UE shall check for the area event during the normal location or routing area update procedure. The change of area event detection mechanism must not influence on the normal UE cell selection and reselection procedures. If the UE does not support the deferred location request (for temporary or permanent reasons), it shall send the LCS Area Event Invoke ack. with the appropriate error cause.

7) If either the MSC/ SGSN or the UE does not support the deferred location request for the change of area event (for temporary or permanent reasons), a Provide Subscriber Location return error shall be returned to the V-GMLC with a suitable cause. If both of the SGSN/MSC and UE supports the deferred location request for the change of area event, a Provide Subscriber Location ack. shall be returned to the V-GMLC without a location estimate. MSC/SGSN shall include the result of the notification/verification in the response to the V-GMLC, if the notification/verification is needed. The response message shall include the LDR reference number~~, the R-GMLC address~~ and the H-GMLC address. The change of area event invoke result shall be also included, if necessary. After sending the Provide Subscriber Location ack to the V-GMLC, the deferred location request shall be completed in the MSC/SGSN. The SGSN/MSC may record charging information for an accepted area event request.

8) to 10) V-GMLC returns the LCS Service Response via H-GMLC and R-GMLC to the LCS Client to notify whether the request was successfully accepted or not. When the R-GMLC returns the LCS Service Response to the LCS Client, the LDR reference number assigned by the R-GMLC shall be included. After sending the LCS Service Response to the H-GMLC, the deferred location request shall be completed in the V-GMLC. The V-GMLC or R-GMLC may record charging information for an accepted area event request.

11) UE detects that the requested area event has occurred.

12) Before sending the LCS Area Event Report the UE shall establish either a CS radio connection or PS signalling connection as specified in clauses 9.2.1 and 9.2.2. The UE sends the LCS Area Event Report to the VMSC/SGSN including the original LDR reference number~~, the R-GMLC address~~ and the H-GMLC address. The report shall also include the result of the notification/verification procedure, if the notification/verification is needed.
If the UE was requested to report the change of area event one time only, the deferred location request shall be completed. In case multiple reports were requested, the UE must not send a repeated LCS Area Event Report more often than the requested minimum interval indicated in the LCS Area Event Invoke.

Editor's Note: It could be useful to have MSC/SGSN repeat the notification procedure with the target UE after the UE has reported the change of area event, but this is for further study.

13) If the MSC/SGSN does not supports the deferred location request for the change of area event (for temporary or permanent reasons), the MSC/SGSN sends the subscriber location report to its associated V-GMLC with a suitable error cause. Otherwise, the MSC/SGSN sends the subscriber location report to its associated V-GMLC with an indication of the event occurrence, the LDR reference number~~, the R-GMLC address~~ and the H-GMLC address. V-GMLC sends an acknowledgement to MSC/SGSN in step 13b and the MSC/SGSN may record charging ~~billing~~ information.

14) If the V-GMLC does not supports the deferred location request for the change of area event (for temporary or permanent reasons), the V-GMLC sends an LCS Service Response to the H-GMLC with a suitable error cause. Otherwise, the V-GMLC sends the LCS Service Response to the H-GMLC with an indication of the event occurrence, the LDR reference number~~, the R-GMLC address~~ and the H-GMLC address. The LDR reference number~~, the R-GMLC address~~ and the H-GMLC address will be used to identify the source of the original deferred location request in the case that the UE has relocated before the area event occurred. The V-GMLC may record charging information.

15) The H-GMLC performs the privacy check as described in clause 9.1.1.

16) The H-GMLC sends the LCS Service Response to R-GMLC. Unless multiple reports were requested, the deferred location request shall be completed in the H-GMLC after sending the LCS Service Response to the R-GMLC. The H-GMLC may record charging information.

17) If the R-GMLC finds the indication of the requested location estimate is stored, the R-GMLC should generate a new immediate LCS Service Request with the QoS specified in the original request. Then the R-GMLC sends the new request to the H-GMLC and waits the result the location request. The H-GMLC performs the privacy check as described in clause 9.1.1, and the subsequent procedures in clause 9.1.1 are continued.

The R-GMLC sends the LCS Service Response to the LCS client, the LDR reference number that was sent to the LCS Client in step 10 shall be included in the response. If the location estimate of the target UE is requested in the request and the location estimate was successfully obtained, the R-GMLC shall put the obtained location estimate into the LCS Service Response. If the location estimate of the target UE is requested in the request but the location estimate could not be obtained, the R-GMLC sends the LCS Service Response without the location estimate. Unless multiple reports were requested, the deferred location request shall be completed in the R-GMLC after sending the LCS Service Response to the LCS client. The R-GMLC may record charging information.

9.1.9.1 Cancellation of a Deferred Location Request – Change of Area event

Figure 9-7b illustrates the procedure for cancelling the Deferred Location Request for the change of area event.

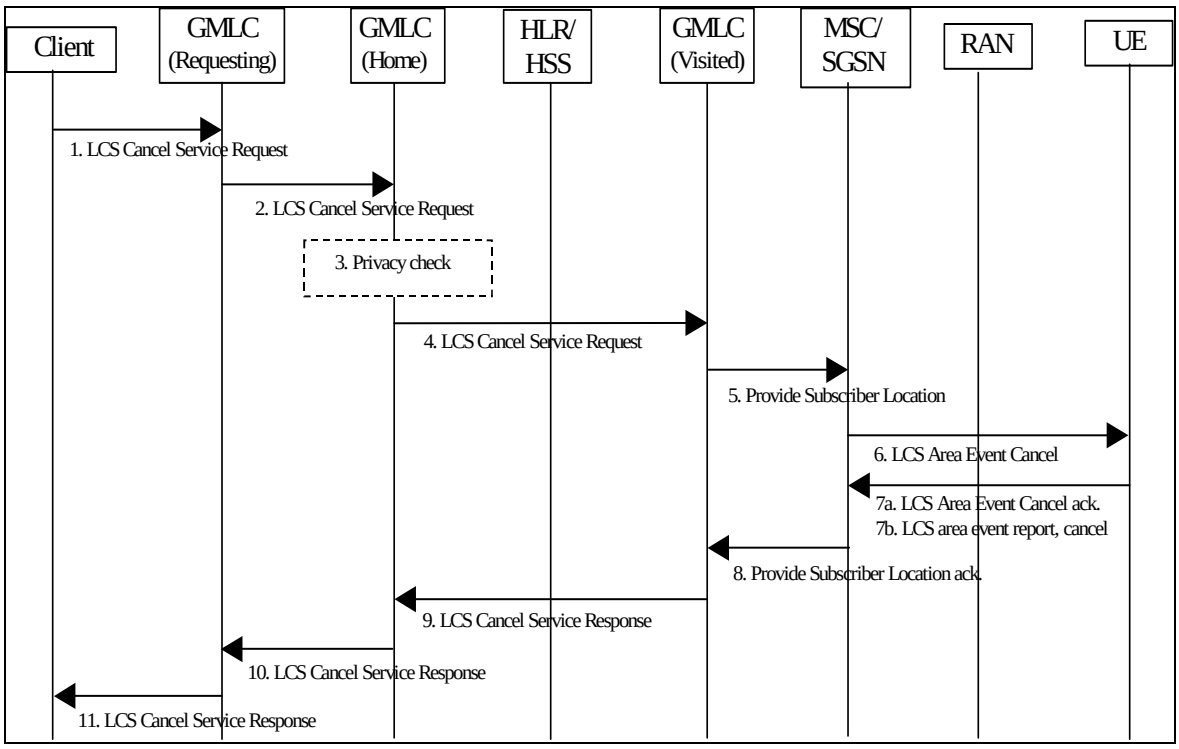


Figure 9.7b: Cancellation of a Deferred MT-LR with change of area event procedure

1) The LCS Client requests the cancellation of a previously requested Deferred Location Request. The LDR reference number that was included in the previous LCS Service Response sent by the GMLC shall be included in the request to indicate which outstanding LDR should be cancelled

2) The R-GMLC sends the cancellation request to H-GMLC, including the LDR reference number. R-GMLC may itself initiates the cancellation for some other reason, e.g. because a timer in the R-GMLC has expired.

3) If the UE's privacy profile stored in the H-GMLC or in the PPR was changed in such a way that it may impact on a specific deferred location request, H-GMLC shall cancel this deferred location request as described in step 4 and onwards. H-GMLC is made aware that the UE subscribers privacy profile has been changed in the PPR, as described in 9.1.1.2.

4) The H-GMLC forwards the LCS Cancel Service Request to V-GMLC with the LDR reference number which is received from the R-GMLC, and the H-GMLC address.

5) The V-GMLC sends the Provide Subscriber Location request to SGSN/MSC, indicating a cancellation of a deferred location request and including the LDR reference number specified by the LCS Client in the LCS Cancel Service Request and the H-GMLC address received from the H-GMLC.

6) The SGSN/MSC sends the LCS Area Event Cancellation, including the LDR reference number and the H-GMLC address, request to UE.

7a) The UE cancels the Area event deferred location request and sends the LCS Area Event cancellation ack., with no area event information included to VMSC/SGSN.

7b) While the UE is monitoring for the area event to occur, the UE may cancel or terminate the deferred location request for the change of area on its own behalf by sending the LCS Area Event report with the LDR reference number, an indication of the cancellation and an appropriate error cause.

8) The SGSN/MSC sends the cancellation acknowledgement to the V-GMLC in the Provide Subscriber Location Ack, with the LDR reference number and the H-GMLC address.

9) The V-GMLC sends the LCS Cancel Service Response to H-GMLC with the LDR reference number and the H-GMLC address.

10) H-GMLC sends the LCS Cancel Service Response to R-GMLC with the LDR reference number. H-GMLC may send the LCS Cancel Service Response to R-GMLC, even if the R-GMLC/LCS client has not requested the cancellation, see step 3.

11) R-GMLC sends the LCS Cancel Service Response to the LCS Client.

<< Next changed clause >>

9.2.1 Mobile Originating Location Request, Circuit Switched (CS-MO-LR)

The following procedure shown in figure 9.7 allows an UE to request either its own location, location assistance data or broadcast assistance data message ciphering keys from the network. Location assistance data may be used subsequently by the UE to compute its own location throughout an extended interval using a mobile based position method. The ciphering key enables the UE to decipher other location assistance data broadcast periodically by the network. The MO-LR after location update request may be used to request ciphering keys or GPS assistance data using the follow-on procedure described in TS 24.008 [24]. The procedure may also be used to enable an UE to request that its own location be sent to an external LCS client.

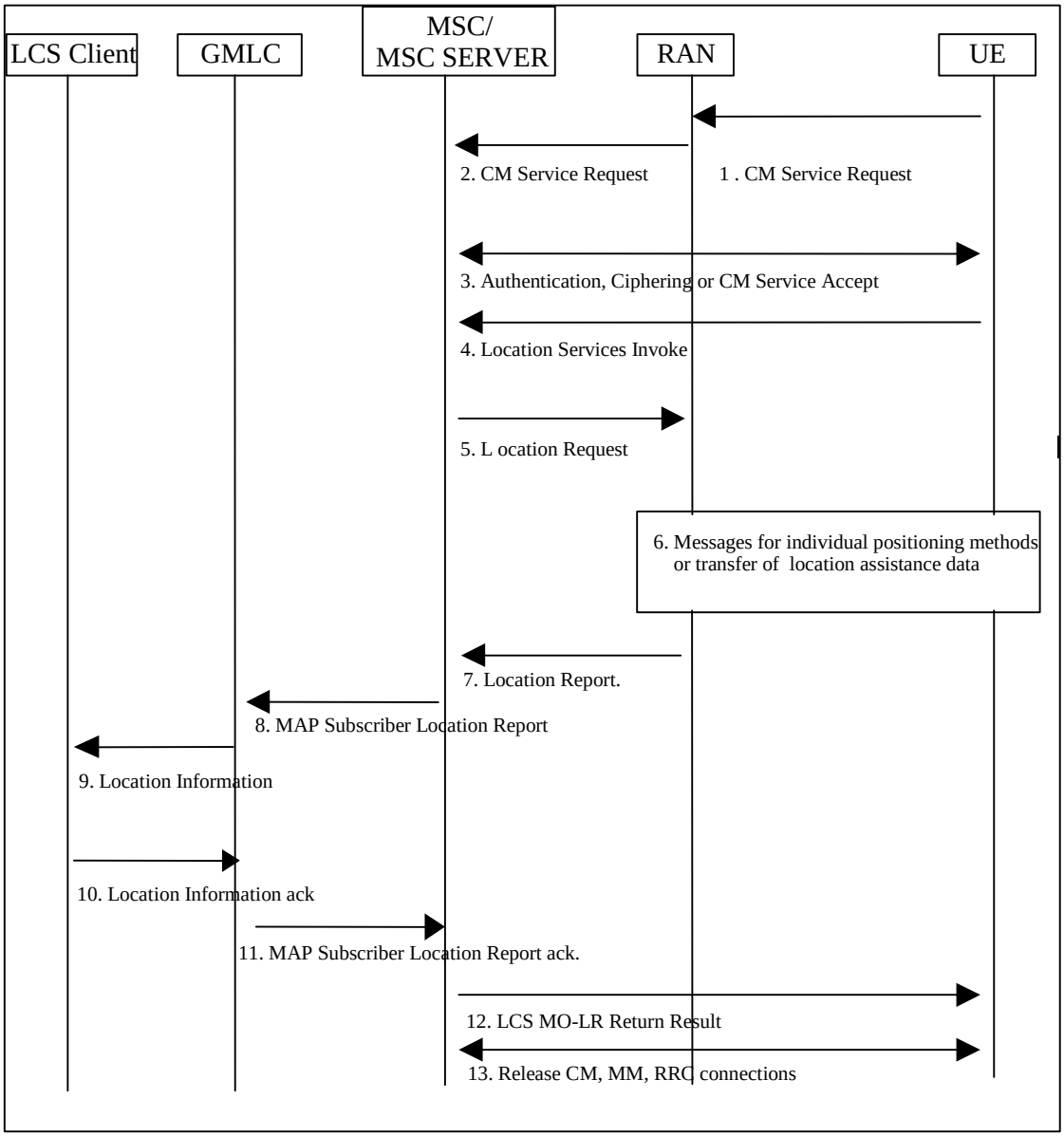


Figure 9.7: General Network Positioning for CS-MO-LR

9.2.1.1 Location Preparation Procedure

1) If the UE is in idle mode, the UE requests a radio connection setup and sends a CM service request indicating a request for a call independent supplementary services to the VMSC/MSC server via RAN.

2) RAN shall convey the CM service request to the core network. If the UE is in dedicated mode, the UE sends a CM Service Request on the already established radio connection.

3) The VMSC/MSC server instigates authentication and ciphering if the UE was in idle mode or returns a Direct Transfer CM Service Accept if the UE was in dedicated mode. The UE will inform the network about its LCS capabilities, as described in chapter 6.3.4.

4) The UE sends a LCS CS-MO-LR Location Services invoke to the VMSC/MSC server. Different types of location services can be requested: location of the UE, location of the UE to be sent to an external LCS client, location assistance data or broadcast assistance data message ciphering keys. If the UE is requesting its own location or that its own location be sent to an external LCS client, this message carries LCS requested QoS information (e.g. accuracy, response time), the requested maximum age of location and the requested type of location (e.g. “current location”, “current or last known location”). If the UE is requesting that its location be sent to an external LCS client, the message shall include the identity of the LCS client and may include the address of the GMLC through which the LCS client should be accessed. If a GMLC address is not included, the VMSC/MSC server may assign a GMLC address stored in the VMSC/MSC server. If a GMLC address is not available for this case, the VMSC/MSC server shall reject the location request. If the UE is instead requesting location assistance data or ciphering keys, the message specifies the type of assistance data or deciphering keys and the positioning method for which the assistance data or ciphering applies. The VMSC/MSC server verifies in the UE's subscription profile that the UE has permission to request its own location, request that its location be sent to an external LCS client or request location assistance data or deciphering keys (whichever applies). If the UE is requesting positioning and has an established call, the VMSC/MSC server may reject the request for certain non-speech call types.

5) In case the requested type of location is “current or last known location” and the requested maximum age of location information is sent from UE, the VMSC/MSC server verifies whether it stores the previously obtained location estimate of the target UE. If the VMSC/MSC server stores the location estimate and the location estimate satisfies the requested maximum age of location, this step and steps 6 and 7 may be skipped. Otherwise the VMSC/MSC server sends a Location Request message to RAN associated with the Target UE. The message indicates whether a location estimate or location assistance data is requested and, in GSM, includes the UE's location capabilities. If the UE's location is requested, the message also includes the requested QoS. If location assistance data is requested, the message carries the requested types of location assistance data.

9.2.1.2 Positioning Measurement Establishment Procedure

6) If the UE is requesting its own location, RAN determines the positioning method and instigates the particular message sequence for this method, as specified in UTRAN Stage 2, TS 25.305 [1] and GERAN Stage 2, TS 43.059 [16]. If the UE is instead requesting location assistance data, RAN transfers this data to the UE as described in subsequent clauses in TS 25.305 [1] and TS 43.059 [16] UE.

9.2.1.3 Location Calculation and Release Procedure

7) When a location estimate best satisfying the requested QoS has been obtained or when the requested location assistance data has been transferred to the UE, RAN returns a Location Report to the VMSC/MSC server. This message carries the location estimate or ciphering keys if this was obtained. If a location estimate or deciphering keys were not successfully obtained or if the requested location assistance data could not be transferred successfully to the UE, a failure cause is included in the Location Report.

8) If the UE requested transfer of its location to an external LCS client and a location estimate was successfully obtained, the VMSC/MSC server shall send a MAP Subscriber Location Report to the GMLC obtained in step 4 carrying the MSISDN of the UE, the identity of the LCS client, the event causing the location estimate (CS-MO-LR) and the location estimate and its age. Otherwise, this step and steps 9-11 are skipped.

9) If the identified LCS Client is not accessible, this step and step 10 are skipped. Otherwise the GMLC transfers the location information to the LCS client.

10) If the LCS Client doesn’t support MO-LR (for temporary or permanent reasons) or can’t handle the location estimate of the UE, e.g. LCS Client doesn't have the corresponding data of the UE, the LCS Client shall return the Location Information ack message to the GMLC with a suitable error cause. Otherwise, the LCS Client sends the GMLC the Location Information ack message signalling that the location estimate of the UE has been handled successfully.

11) If the identified LCS Client is not accessible, the GMLC sends MAP Subscriber Location Report ack to MSC/MSC server with an appropriate error case. Otherwise, the GMLC shall send MAP Subscriber Location Report ack to MSC/MSC SERVER. The message shall specify whether the location estimate of the UE has been handled successfully by the identified LCS Client, and if not, the corresponding error cause obtained in step 10.

12) The VMSC/MSC server returns a CS-MO-LR Return Result to the UE carrying any location estimate requested by the UE, ciphering keys or an indicator whether a location estimate was successfully transferred to the identified LCS client. If the location estimate was successfully transferred to the identified LCS Client, the CS-MO-LR Return Result message shall specify whether the location estimate of the UE has been handled successfully by the identified LCS Client, and if not, the corresponding error cause obtained in step 11.

13) The VMSC/MSC server may release the CM, MM and radio connections to the UE, if the UE was previously idle, and the VMSC/MSC server may record ~~billing~~charging information.

<< Next changed clause >>

9.2.2 Mobile Originating Location Request, Packet Switched (PS-MO-LR)

The following procedure shown in figure 9.8 allows an UE to request either its own location; location assistance data or broadcast assistance data message ciphering keys from the network. Location assistance data may be used subsequently by the UE to compute its own location throughout an extended interval using a mobile based position method. A ciphering key enables the UE to decipher other location assistance data broadcast periodically by the network. The PS-MO-LR may be used to request ciphering keys or GPS assistance data. The procedure may also be used to enable an UE to request that its own location be sent to an external LCS client.

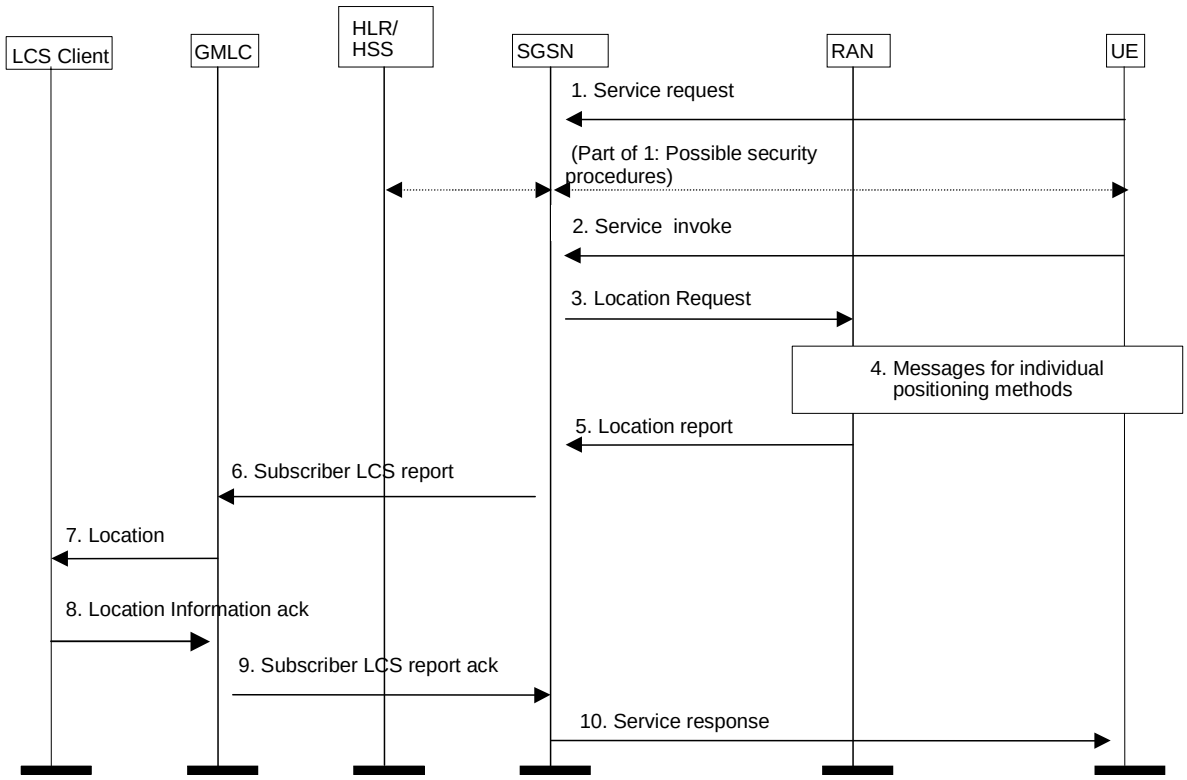


Figure 9.8: General Network Positioning for packet switched MO-LR

9.2.2.1 Location Preparation Procedure

1) In UMTS, if the UE is in idle mode, the UE requests a PS signaling connection and sends a Service request indicating signaling to the SGSN via the RAN. If the UE already has PS signaling connection, the UE does not need to send Service request. Security functions may be executed. These procedures are described in TS 23.060 [15]. In GSM this signaling step is not needed.

2) The UE sends a LCS PS-MO-LR Location Services invoke message to the SGSN. Different types of location services can be requested: location of the UE, location of the UE to be sent to an external LCS client, location assistance data or broadcast assistance data message ciphering keys. If the UE is requesting its own location or that its own location be sent to an external LCS client, this message carries LCS requested QoS information (e.g. accuracy, response time), the requested maximum age of location and the requested type of location (e.g. “current location”, “current or last known location”). If the UE is requesting that its location be sent to an external LCS client, the message shall include the identity of the LCS client and may include the address of the GMLC through which the LCS client should be accessed. If a GMLC address is not included, the SGSN may assign a GMLC address stored in the SGSN. If a GMLC address is not available for this case, the SGSN shall reject the location request. If the UE is instead requesting location assistance data or ciphering keys, the message specifies the type of assistance data or deciphering keys and the positioning method for which the assistance data

or ciphering applies. The SGSN verifies the subscription profile of the UE and decides if the requested service is allowed or not.

3) In case the requested type of location is “current or last known location” and the requested maximum age of location information is sent from UE, the SGSN verifies whether it stores the previously obtained location estimate of the target UE. If the SGSN stores the location estimate and the location estimate satisfies the requested maximum age of location, this step and steps 4 and 5 may be skipped. Otherwise the SGSN sends a Location Request message to the RAN associated with the Target UE's location. The message indicates whether a location estimate or location assistance data is requested. If the UE's location is requested, the message also includes the requested QoS. If location assistance data is requested, the message carries the requested types of location assistance data. The message carries also location parameters received in the Service Invoke message.

9.2.2.2 Positioning Measurement Establishment Procedure

4) If the UE is requesting its own location, the actions described in UTRAN Stage 2, TS 25.305 [1] or GERAN stage 2 TS 43.059 [16] are performed. If the UE is instead requesting location assistance data, the RAN transfers this data to the UE as described in subsequent clauses. The RAN determines the exact location assistance data to transfer according to the type of data specified by the UE, the UE location capabilities and the current cell.

9.2.2.3 Location Calculation and Release Procedure

5) When a location estimate best satisfying the requested QoS has been obtained or when the requested location assistance data has been transferred to the UE, the RAN returns a Location Report to the SGSN. This message carries the location estimate or ciphering keys if this was obtained. If a location estimate or deciphering keys were not successfully obtained or if the requested location assistance data could not be transferred successfully to the UE, a failure cause is included in the Location Report.

6) If the UE requested transfer of its location to an external LCS client and a location estimate was successfully obtained, the SGSN shall send a MAP Subscriber Location Report to the GMLC obtained in step 2 carrying the MSISDN of the UE, the identity of the LCS client, the event causing the location estimate (MO-LR-PS) and the location estimate and its age. Otherwise, this step and steps 7-9 are skipped.

7) If the identified LCS Client is not accessible, this step and step 8 are skipped. Otherwise the GMLC transfers the location information to the LCS client.

8) If the LCS Client doesn’t support MO-LR (for temporary or permanent reasons) or can’t handle the location estimate of the UE, e.g. LCS Client doesn't have the corresponding data of the UE, the LCS Client shall return the Location Information ack message to the GMLC with a suitable error cause. Otherwise, the LCS Client sends the GMLC the Location Information ack message signalling that the location estimate of the UE has been handled successfully.

9) If the identified LCS Client is not accessible, the GMLC sends MAP Subscriber Location Report ack to SGSN with an appropriate error case. Otherwise, the GMLC shall send MAP Subscriber Location Report ack to SGSN. The message shall specify whether the location estimate of the UE has been handled successfully by the identified LCS Client, and if not, the corresponding error cause obtained in step 8.

10) The SGSN returns a Service Response message to the UE carrying any location estimate requested by the UE, ciphering keys or an indicator whether a location estimate was successfully transferred to the identified LCS client. If the location estimate was successfully transferred to the identified LCS Client, the CS-MO-LR Return Result message shall specify whether the location estimate of the UE has been handled successfully by the identified LCS Client, and if not, the corresponding error cause obtained in step 9. The SGSN may record charging information.

<< Next changed clause >>

Annex F (Informative): Mechanism for performing Change of Area Event Detection.

Note: the classification (i.e. normative or informative) of this Annex is FFS.

As described in section 9.1.9 that there may be alternative mechanisms to transfer the deferred MT-LR with Area Event request to the UE. This annex illustrates one mechanism. In this mechanism a Short Message Service (SMS) is used to transfer, to the UE/(U)SIM, the Area event detection request via an (U)SIM Application Toolkit application.

(U)SIM Application Toolkit (USAT) Based Solution

In this (U)SAT based solution, the area event detection mechanism relies on the proactive control of the UE by the (U)SIM using the (U)SAT commands controlled by a specific Change of Area Deferred Location application. Figure F.1 illustrates one possible method for downloading a change of area event application to the UE, but does not detail the operation of the application. The details of the application is outside the scope of this specification. Further information about the possible (U)SAT commands, can be found from TS 31.111.

The following procedure (shown in Figure F.1) replaces Figure 9.6d in clause 9.1.9.

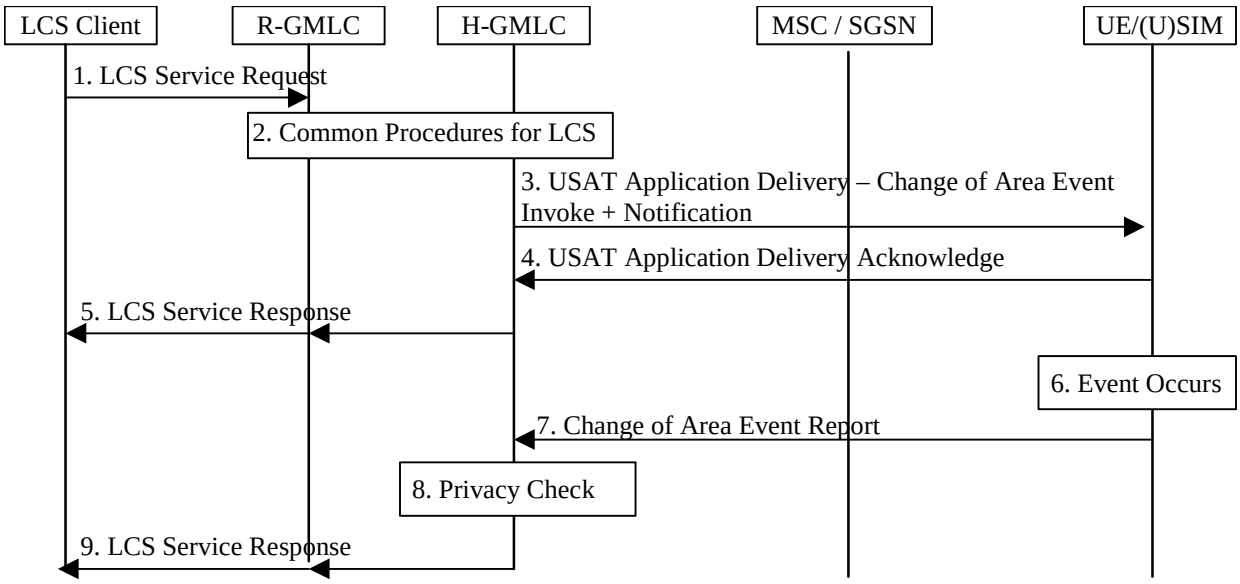


Figure F.1: (U)SAT Application Download and Change of Area Event Detection Procedure

1) This step is the same as step 1 in clause 9.1.9.

2) This step is similar to step 2 in clause 9.1.9, except the LCS Service Request does not reach the V-GMLC. Also the H-GMLC may request a translation of geographic shape to network identities from a GMLC in the network serving the target UE.

3) Information about the event, the (U)SAT application, that shall trigger the sending of the Location Report shall be sent to the UE/(U)SIM. If privacy action (notification and/or verification) was requested as a result of the privacy check, the H-GMLC shall also include the required action to the UE/(U)SIM. If notification/verification is required, the request shall indicate the identity of the LCS client, the Requestor Identity (if available), and the reference number. The mechanism by which the trigger detection is performed via (U)SAT application may be operator dependent. However, the (U)SAT Application shall contain the following information: reference number, H-GMLC address, validity period of request, and the area definition (of the target area).

4) If privacy verification was requested, the UE/(U)SIM indicates to its user whether the location request will be allowed or not allowed in the absence of a response and waits for the user to grant or deny permission. If privacy

verification was requested and the user grants permission, the USAT Application shall be installed and the UE/(U)SIM then returns an acknowledgement to the H-GMLC indicating permission is granted and (U)SAT application is successfully installed. If the UE user does not respond after a predetermined time period (and the request is not allowed in the absence of a response) or denies permission, the UE/(U)SIM shall infer a "no response" condition, the USAT Application is not installed, an appropriate error response is returned to the GMLC/LCS Client and the remaining steps are skipped. Otherwise the UE/(U)SIM notifies the UE user of the location request (if required by the privacy action) and shall install the (U)SAT application and acknowledge successful installation to the H-GMLC, including an indication of “no response” but request is allowed if necessary. If at any point the (U)SAT application fails to install, due to lack of support or otherwise, the UE/(U)SIM shall inform the H-GMLC using an appropriate error cause.

5) The H-GMLC returns a LCS Service Response via R-GMLC to the LCS Client to notify whether the request was successfully accepted/installed or not, without a location estimate. When the R-GMLC returns the LCS Service Response to the LCS Client, the LDR reference number assigned by the R-GMLC shall be included.

6) The UE/(U)SIM detects the desired change of area event.

7) The UE/(U)SIM reports the change of area event.

8) The H-GMLC may perform another privacy check as described in clause 9.1.1.

9) The H-GMLC then returns a LCS Service Response to the LCS Client via the R-GMLC, if applicable, as in 9.1.1. When the R-GMLC returns the LCS Service Response to the LCS Client, the LDR reference number that was sent to the LCS Client in step 5 shall be included. If the GMLC for some other reason decides to not wait any longer for the requested event to occur (e.g. timer expires), an LCS Service Response shall be returned with an appropriate error cause indicating termination of the deferred location request.

H-GMLC may be the origination point of the SMS-DELIVER and the USAT Application messages.