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Title: CR(s) to 23.271

Agenda item: 7.2.3

Document for: APPROVAL

S2 Tdoc	Title	Spec	CR	Rev	Cat	C_Ver	Rel	WI
S2-050448	Velocity Request and Reporting	23.271	296	4	B	6.a.0	Rel-7	LCS-R7
S2-050526	Clarification of LDR reference number	23.271	297	2	F	6.a.0	Rel-6	LCS2
S2-050363	Correction in Location Report Procedure	23.271	298	1	F	6.a.0	Rel-6	LCS2

3GPP TSG-SA WG2 Meeting #44
Budapest, Hungary. 26th Jan. - 2nd Feb. 2005.

Tdoc ⌘S2-050448

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.271** CR **296** ⌘ **rev** **5** ⌘ Current version: **6.10.0** ⌘

*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 [X] Radio Access Network [X] Core Network [X]

Title:	⌘	Velocity Request and Reporting
Source:	⌘	3GPP TSG_SA WG2
Work item code:	⌘	LCS3
Date:	⌘	01/02/2005
Category:	⌘	**B**
Release:	⌘	Rel-7

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:
Ph2 (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)
Rel-7 (Release 7)

Reason for change:	⌘	The stage 1 LCS requirements now notes that it shall be possible to report the velocity of a UE.
Summary of change:	⌘	• An LCS client is able to request that the velocity of a UE be reported along with its position as part of a position request • If available, the velocity of a UE can be reported along with its position estimate
Consequences if not approved:	⌘	The stage 2 LCS description will not be synchronized with the Stage 1 as it will not be possible to report the velocity of a UE.

Clauses affected:	⌘	3.1; 4; 4.2; 5.4.4; 5.5.1; 5.5.2; 5.6.1; 5.6.2; 6; 6.2; 7.1.1; 7.1.2; 7.3; 7.4.1; 9; 9.1.1; 9.1.2.1; 9.1.5.1; 9.1.6.1; 9.2.1; 9.2.1.1; 9.2.1.3; 9.2.2; 9.2.2.1; 9.2.2.3

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	TS 44.031, TS 25.331, TS 25.305, TS 25.413, TS 48.008, TS 48.071, TS 49.031, TS 29.002, TS 24-030, TS 24-080, TS 48.018
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	Related discussion paper: ***S2-050242;*** May impact OMA RLP and MLP

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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 CHANGE**********

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 QoS Class: The QoS class determines the degree of adherence to the quality of service information as required by the source of a location request

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. The location estimate may include the velocity of the UE.

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 and, optionally, velocity (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. Country code in this context means E.164 country code for a geographic area [35a].

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 the LCS client and is expressed as geographical area using a shape defined in TS 23.032 [11], as a geographical area using local coordinate system, as an E.164 country code for a geographic area [35a], 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', as defined in 3GPP TS 21.905 [3]. 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

Velocity: The speed of a UE and the direction in which it is travelling, encoded as defined in TS 23.032 [11]. Velocity may be defined as either 2-D (horizontal) velocity or 3-D (horizontal and vertical) velocity. Both 2-D and 3-D velocity may be reported either with or without uncertainty.

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

Further UMTS related definitions are given in 3GPP TS 22.101 [8].

**********NEXT CHANGE**********

4 Main concepts

A general description of location services and service requirements are given in the specification TS 22.071 [4]. The positioning of the UE is a service provided by the Access Network. In particular, all Access Networks (e.g. UTRAN, GERAN), that facilitate determination of the locations of User Equipments, shall be able to exchange location information with the core network as defined in the present document (when connected to a Core Network). Optionally, location information may also be communicated between GMLCs, located in the same or a different PLMN, via the specified GMLC to GMLC interface.

By making use of the radio signals the capability to determine the (geographic) location of the user equipment (UE) or mobile station (UE) shall be provided. The location information may be requested by and reported to a client (application) associated with the UE, or by a client within or attached to the Core Network. The location information may also be utilised internally in the system; for example, for location assisted handover or to support other features such as home location billing. The location information request may ask for the velocity of the UE as part of the positioning information. The position information shall be reported in standard, i.e. geographical co-ordinates, together with the time-of-day and the estimated errors (uncertainty) of the location of the UE according to specification TS 23.032 [11]. The velocity of the UE may be optionally returned in a format specified in TS 23.032 [11].

It shall be possible for the majority of the UE (active or idle) within a network to use the feature without compromising the radio transmission or signalling capabilities of the GSM/UMTS networks.

The UE and the network may support a number of different positioning methods and the UE may support or not support privacy invocation request and response. The UE informs the core network and radio access network about its LCS capabilities in this respect as defined in TS 24.008 [24] and TS 25.331 [25].

The uncertainty of the location measurement shall be network design (implementation) dependent at the choice of the network operator, this is further described in TS 25.305 [1] and TS 43.059 [16].

There are many different possible uses for the location information. The positioning feature may be used internally by the GSM/UMTS network (or attached networks), by value-added network services, by the UE itself or through the network, and by "third party" services. The positioning feature may also be used by an emergency service (which may be mandated or "value-added"), but the position service is not exclusively for emergencies.

There are regulatory requirements to support anonymity in location services in some countries.

**********NEXT CHANGE**********

4.2 Location Services Categories

Generally there are four categories of usage of the location service. These are the Commercial LCS, the Internal LCS, the Emergency LCS and the Lawful Intercept LCS. The definition of these services and their categories is outside the scope of the present document.

- The Commercial LCS (or Value Added Services) will typically be associated with an application that provides a value-added service to the subscriber of the service, through knowledge of the UE location (and, optionally, velocity) and if available, and at the operator's discretion, the positioning method used to obtain the location estimate. This may be, for example, a directory of restaurants in the local area of the UE, together with directions for reaching them from the current UE location.

- The Internal LCS will typically be developed to make use of the location information of the UE for Access Network internal operations. This may include; for example, location assisted handover and traffic and coverage measurement. This may also include support certain O&M related tasks, supplementary services, IN related services and GSM bearer services and teleservices.

- The Emergency LCS will typically be part of a service provided to assist subscribers who place emergency calls. In this service, the location of the UE caller and, if available, the positioning method used to obtain the location estimate is provided to the emergency service provider to assist them in their response. This service may be mandatory in some jurisdictions. In the United States, for example, this service is mandated for all mobile voice subscribers.

- The Lawful Intercept LCS will use the location information to support various legally required or sanctioned services.

**********NEXT CHANGE**********

5.4.4 Positioning components

The positioning components Positioning Radio Co-ordination Function (PRCF), Positioning Calculation Function (PCF), Positioning Signal Measurement Function (PSMF) and Positioning Radio Resource Management (PRRM) are described in documents specific to each Access Network type.

For location services the Access Network shall send the result of the positioning to the core network in geographical co-ordinates as defined in TS 23.032 [11]. If requested, and if available, the positioning result may also include the velocity of the UE as defined in TS 23.032 [11]. The Access Network shall map the cell(s) the Target UE is associated with into geographical co-ordinates, but this mapping is not standardized.

These entities are defined in TS 25.305 [1] for UTRAN and in TS 43.059 [16] for GERAN.

**********NEXT CHANGE**********

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.

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) 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;
- Interval, applicable to periodical requests only;
- Requested Quality of Service information, if needed, i.e. accuracy, response time and LCS QoS Class;
- 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);
- Velocity of the UE, if needed
- Priority, if needed;
- Service coverage (i.e. E.164 country codes for geographic areas [35a]), 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 [11]
    b) local coordinate system
    c) E.164 country code for a geographic area [35a]
    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.

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 [11] or local coordinate system;
- Velocity of the UE as defined in TS 23.032 [11], if requested and if available.
- 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.
- Indication that the requested QoS was not met, if needed, only applicable if the request was for best effort class

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

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.

When the LCS server's associated GMLC uses the Lr interface then this interface shall conform to 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 SIP-URI, 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, i.e. accuracy, response time and LCS QoS Class;
- 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);
- Velocity of the UE, if needed
- Priority, if needed;
- Requested maximum age of location, if needed;
- Privacy override indicator, if needed;
- Service coverage (i.e. E.164 country codes for geographic areas [35a]), if needed;
- Indicator of privacy check related actions, if needed;
- Supported GAD shapes, if needed;
- 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 [11]
  b) E.164 country code for a geographic area [35a]
  c) PLMN identity
- LDR reference number, if needed.

5.6.2 Location Service Response

The Location Service Response is sent to the source LCS server as the result of the Location Service Request by the destination LCS Server:

- 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 [11];
- Velocity of the UE as defined in TS 23.032 [11], if requested and if available.
- Indication when UE enters, is within or leaves the geographical area, if needed;
- The information about the positioning method used to obtain the location estimate of the UE, if it is available at the LCS server and needed;
- Age of location estimate;
- Acknowledgement for a deferred location request, if needed.
- Request id, if needed
- Indication that the requested QoS was not met, if needed, only applicable if the request was for best effort QoS class

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

**********NEXT CHANGE**********

6 LCS Architecture

Figure 6.1 shows the general arrangement of the Location Service feature in GSM and UMTS. This illustrates, generally, the relation of LCS Clients and servers in the core network with the GERAN and UTRAN Access Networks. The LCS entities within the Access Network communicate with the Core Network (CN) across the A, Gb and Iu interfaces. Communication among the Access Network LCS entities makes use of the messaging and signalling capabilities of the Access Network.

As part of their service or operation, the LCS Clients may request the location information of UE. There may be more than one LCS client. These may be associated with the GSM/UMTS networks or the Access Networks operated as part of a UE application or accessed by the UE through its access to an application (e.g. through the Internet).

The clients make their requests to a LCS Server. There may be more than one LCS Server. The client must be authenticated and the resources of the network must be co-ordinated including the UE and the calculation functions, to estimate the location and, optionally, velocity of the UE and result returned to the client. As part of this process, information from other systems (other Access Networks) can be used. As part of the location information returned to the client, an estimate of the accuracy of the estimate and the time-of-day the measurement was made may be provided.

**********NEXT CHANGE**********

6.2 Allocation of LCS functions to network elements

Table 6.1 shows a summary of the Functional Groups and Functional Blocks for Location services. Table 6.2 and figure 6.2 show the generic configuration for LCS and the distribution of LCS functional blocks to network elements. Different positioning methods, including network-based, mobile-based, mobile-assisted and network-assisted positioning methods may be used. With this configuration both the network and the mobiles are able to measure the timing of signals and compute the mobile's location estimate. Depending on the applied positioning method it is possible to utilise the corresponding configuration containing all needed entities. For instance, if network-based positioning is applied, the entities that are involved in measuring the mobile's signal and calculating its location estimate are allocated to the network elements of the access stratum. On the other hand, in case mobile-based or network-assisted methods are used these entities should be allocated to the UE.

LCS is logically implemented on the network structure through the addition of one network node, the Mobile Location Center (MLC). It is necessary to name a number of new interfaces. The LCS generic architecture can be combined to produce LCS architecture variants.

Table 6.1: Summary of Functional Groups and Functional Blocks for Location services

Funct. Group	Functional component	Full name of Functional Block	Abbrev.
Loc. Client	Location Client Component	(External) Location Client Function	LCF
		Internal Location Client Function	LCF -internal
LCS Server in PLMN	Client handling component	Location Client Control Function	LCCF
		Location Client Authorization Function	LCAF
		Location Client Co-ordinate Transformation Function	LCCTF
		Location Client Zone Transformation Function	LCZTF
	System handling component	Location System Control Function	LSCF
		Location System Billing Function	LSBF
		Location System Operations Function	LSOF
		Location System Co-ordinate Transformation Function	LSCTF
		Location IMS – Interworking Function	LIMS-IWF
	Subscr. Handling component	Location Subscriber Authorization Function	LSAF
		Location Subscriber Privacy function	LSPF
	Positioning component	Positioning Radio Control Function	PRCF
		Positioning Calculation Function	PCF
		Positioning Signal Measurement Function	PSMF
		Positioning Radio Resource Management	PRRM

Table 6.2 and figure 6.2 illustrate the allocation of functional entities in the reference configuration of LCS. It is assumed that the CS and PS have either their own independent mobility management or use the joint mobility management through the optional Gs interface.

It is also seen that LCS may take benefit of the Iur interface between RNCs, when uplink radio information and measurement results are collected.

The functional model presented in the figure includes functional entities for both CS and PS related LCS. In addition, it consists of all the entities needed for different positioning methods, i.e. network based, mobile based, mobile assisted, and network assisted positioning, exploiting either uplink or downlink measurements. Similarly, the velocity of a UE may be calculated in either the network or the UE. It is noted that the UE may use e.g. the GPS positioning mechanism, but still demand e.g. auxiliary measurements from the serving network. RAN specific functional entities are specified in TS 25.305 [1] for UTRAN and in TS 43.059 [16] for GERAN.

**********NEXT CHANGE**********

7 Signaling and Interfaces

7.1 LCS signaling between Access and Core Networks

The core network sends location requests to the access network, which then sends the corresponding responses back to the core network.

Communication between access and core networks is accomplished through Iu interface in UMTS whereas the A, Gb and Iu interfaces are used for the purpose in GSM (see TS 25.305 [1] and TS 43.059 [16]).

7.1.1 Core network Location Request

The core network request for a location estimate of a target UE shall contain sufficient information to enable location of the Target UE according to the required QoS using any positioning method supported by the PLMN and, where necessary, UE. For location services the core network may request the geographical co-ordinates and velocity of the Target UE.

In Iu mode the core network may also request in which Service Area the Target UE is located. The Service Area information may be used for routing of corresponding Emergency calls, or for CAMEL services.

In A/Gb mode this corresponds to the usage of Cell ID in the core network.It should be noted that the Service Area concept is different from the Localized Service Area concept used for SoLSA services.

When the location of a Target UE in Idle Mode is requested, the core network shall determine which RAN entity is associated with the Target UE.

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.
- velocity estimate of the Target UE, if available
- achieved quality level of the velocity estimate of the Target UE, if available

**********NEXT CHANGE**********

7.3 MAP Interfaces

The following interfaces are based on MAP in LCS.

- Lh interface: interface between GMLC and HSS. This interface is used by the GMLC to request the address of the H-GMLC, and/or the address of the visited MSC or SGSN for a particular target UE whose location has been requested
- Lg interface: interface between GMLC MSC and GMLC - SGSN. This interface is used by the GMLC to convey a location request to the MSC or SGSN currently serving a particular target UE whose location was requested. The interface is used by the MSC or SGSN to return location results to the GMLC.
- Lc interface: interface between GMLC and gsmSCF, CAMEL. This interface is used to get location information for CAMEL based services.

The following MAP services are defined for LCS.

- MAP-SEND-ROUTING-INFO-FOR-LCS Service.

This service is used between the GMLC and the HLR/HSS to retrieve the routing information needed for routing a location service request to the serving VMSC , SGSN. The service may be used in GMLC - HSS interface to retrieve routing information in order to route the location service request to the correct VMSC, SGSN and MSC Server.

In case the service is used between the R-GMLC and the HSS, the H-GMLC address of the target UE to be located is retrieved. The address of the V-GMLC associated with the serving node and PPR may also be retrieved.

- MAP-PROVIDE-SUBSCRIBER-LOCATION Service.

This service is used by a GMLC to request the location and, optionally, velocity, of a target UE from the visited MSC, SGSN or MSC Server at any time.

- MAP-SUBSCRIBER-LOCATION-REPORT Service.

This service is used by a VMSC, SGSN or MSC Server to provide the location of a target UE to a GMLC when a request for location is either implicitly administered or made at some earlier time.

The MAP Subscriber Location Report could also be used to send information about location and, if requested and available, velocity of the Target UE (for MO-LR) to an external client.

**********NEXT CHANGE**********

7.4.1 LCS Authorisation Request

Via the LCS Authorisation Request, the H-GMLC can request the PPR to perform the privacy check. There exist two types of LCS Authorisation Request:

- LCS Authorisation Request without location estimate (send by H-GMLC before location request);
- LCS Authorisation Request with location estimate (to check location related privacy settings).

The following attributes are identified for LCS Authorisation Request information flow:

- Target UE identity, (one or both of MSISDN and IMSI), if needed;
- If PPR contains PMD functionality the LCS Authorisation Request may contain the same information as the LCS Identity request, i.e. the pseudonym of the target UE, if needed.
- Indication on call/session related MT-LR;
- 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;
- Codeword, if needed;
- Requestor identity, if needed (and type of Requestor identity if available);
- Type of location, i.e. “current location”, “current or last known location” or “initial location”;
- Velocity of the UE, if needed
- LCS capability sets of serving nodes, if needed;
- Location estimate, if needed and available (This is only relevant for LCS Authorisation Request with location estimate).

**********NEXT CHANGE**********

9 General Network Positioning Procedures

The generic network positioning procedure of providing the location information of an UE subscriber can be partitioned into the following procedures.

Location Preparation Procedure

This generic procedure is concerned with verifying the privacy restrictions of the UE subscriber, reserving network resources, communicating with the UE to be located and determining the positioning method to be used for locating the UE subscriber based on the requested QoS and the UE and network capabilities.

Positioning Measurement Establishment Procedure

This procedure is concerned with performing measurements by involving the necessary network and/or UE resources. Depending on the positioning method to be used for locating the UE the internals of this procedure can be positioning method dependent. The procedure is completed with the end of the positioning measurements.

Location Calculation and Release Procedure

This generic procedure is initiated after the measurements are completed and is concerned with calculating the location and, optionally, velocity of the UE and releasing all network and/or UE resources involved in the positioning.

9.1 Mobile Terminating Location Request

The MT-LR procedures for the location request from the LCS client which does not have the privacy override capability are described in the chapter 9.1.1.
The MT-LR procedures for the location request from the LCS client which has the privacy override capability (e.g. the request is come from the emergency service provider) are described in the chapter 9.1.1A. In this case the H-GMLC is not involved to the location procedures and the privacy check procedures in H-GMLC/PPR are skipped.

It is noted that R-GMLC handles the periodicity of location requests as requested by the LCS client both in CS and PS domain.

9.1.1 Common MT-LR procedure in PS and CS domain

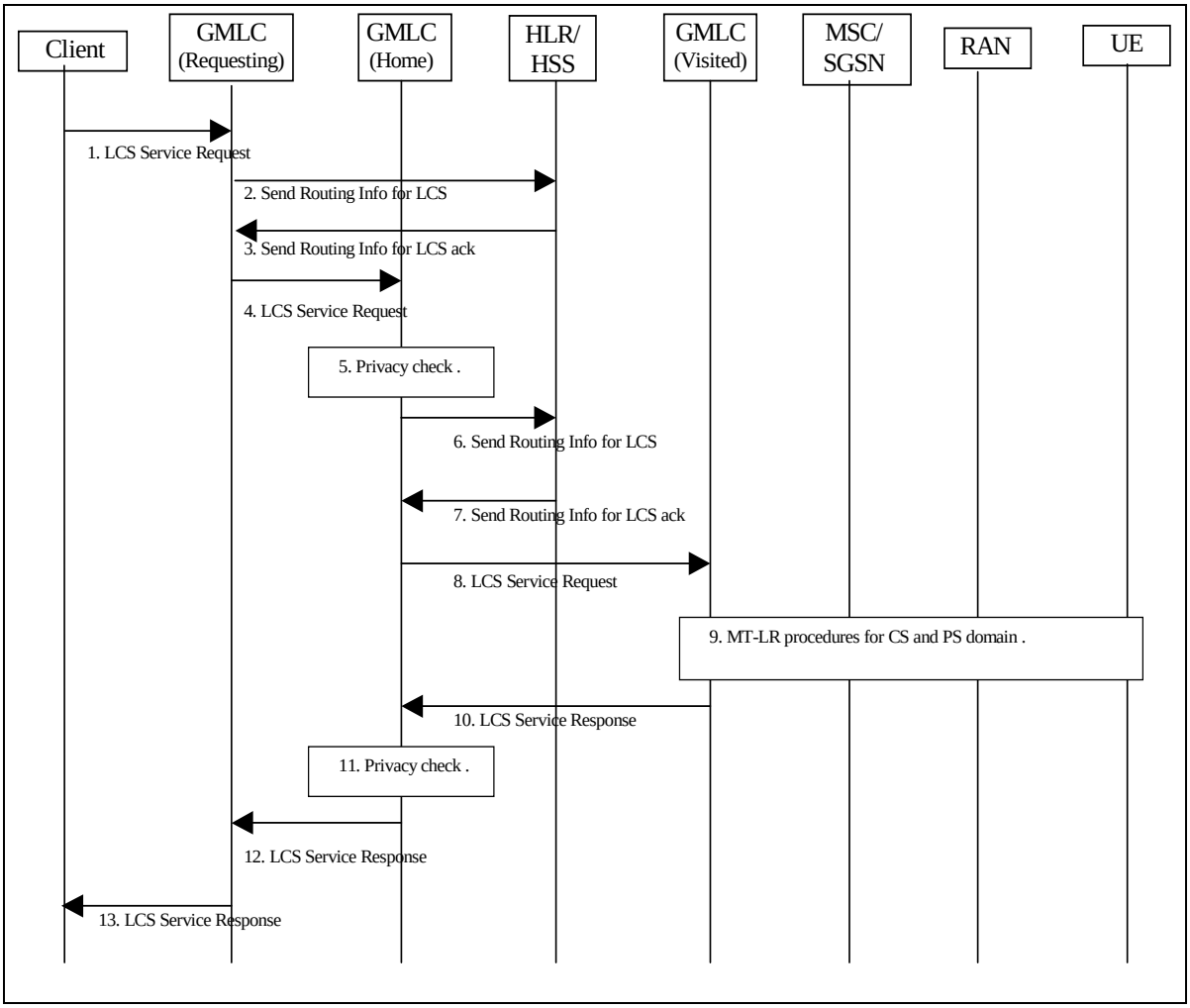


Figure 9.1: General Network Positioning for a MT-LR

1) An external LCS client requests the current location and, optionally, velocity 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 , the V-GMLC address associated with 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, if available.

Note: HLR/HSS may prioritise 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 , the V-GMLC address associated with the serving nodes, if available 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, if available.

Note: HLR/HSS may prioritise 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 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 in accordance with the requested LCS QoS Class. If the requested LCS QoS class was Assured, V-GMLC sends the result only if the result has been indicated to fulfil the requested accuracy, otherwise V-GMLC sends a LCS service response with a suitable error cause. If the UE requested LCS QoS class was Best Effort, V-GMLC sends whatever result it received with an appropriate indication if the requested accuracy was not met. 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 and the indication whether the obtained location estimate satisfies the requested accuracy or not. 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 charging information both for 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 and the indication whether the obtained location estimate satisfies the requested accuracy or not.

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 CHANGE**********

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.

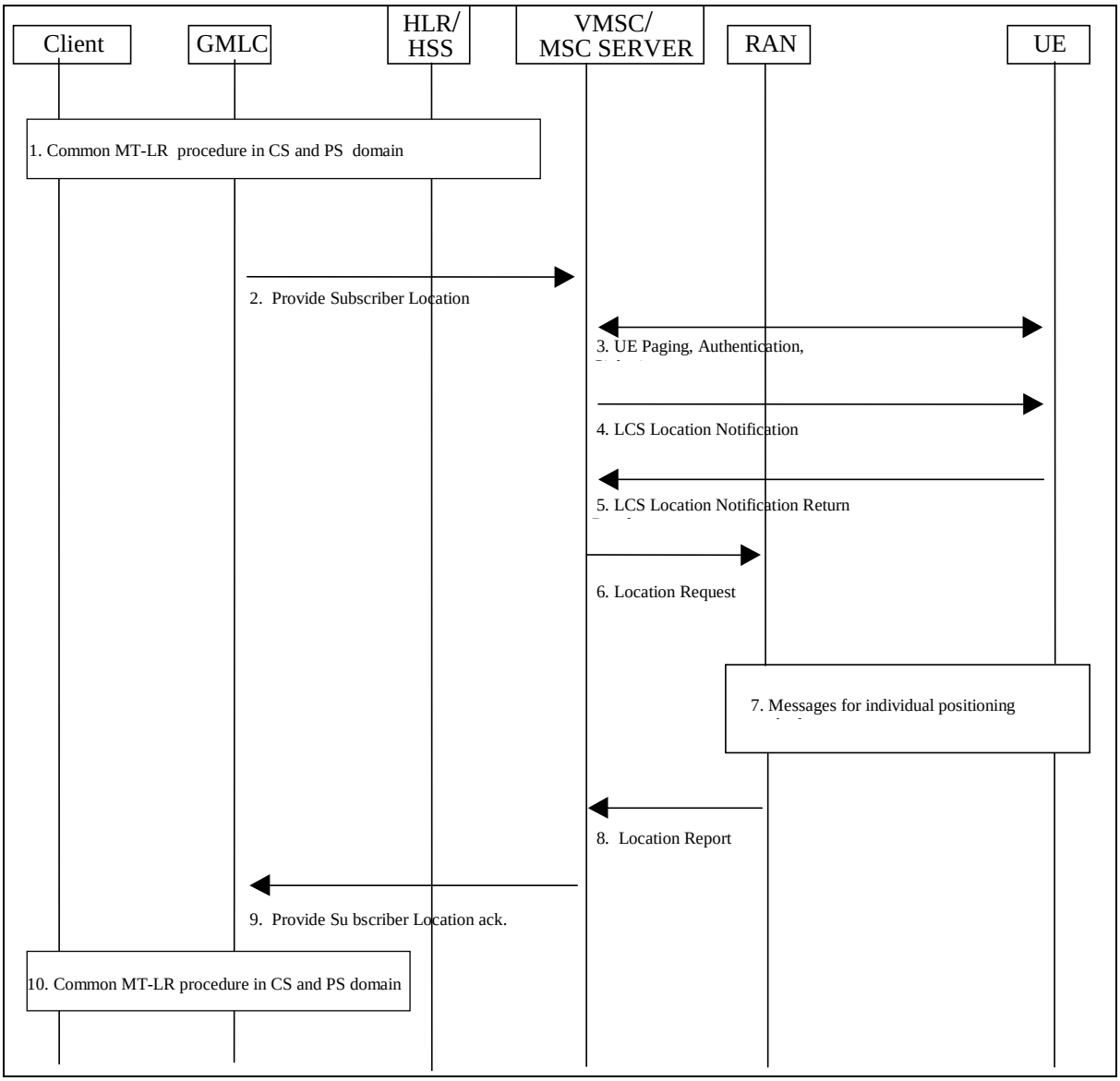


Figure 9.2: Network Positioning for a CS-MT-LR

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 and, optionally, velocity), 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.

**********NEXT CHANGE**********

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 and, optionally, velocity. 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.

**********NEXT CHANGE**********

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.

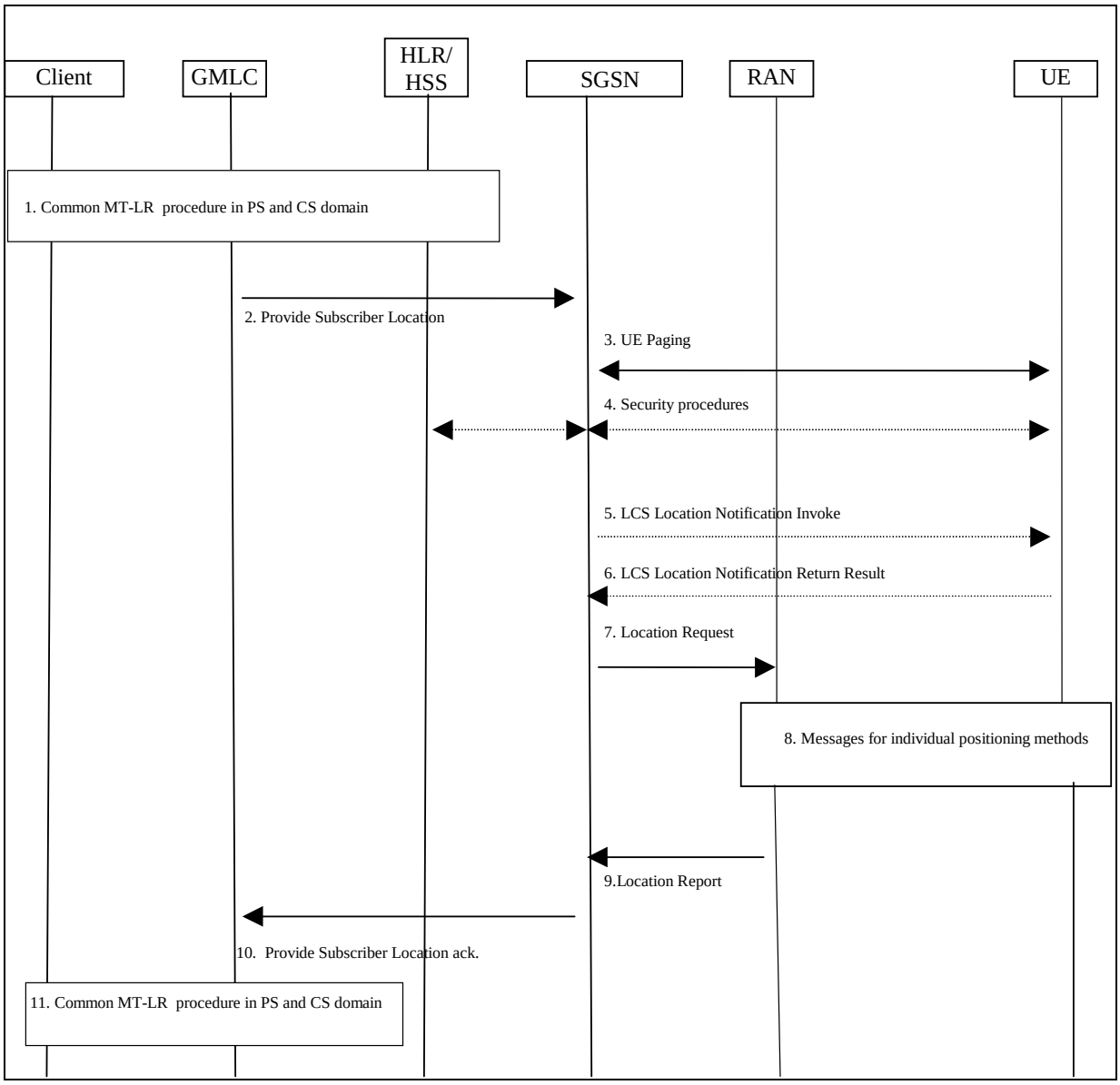


Figure 9.5: General Network Positioning for Packet Switched MT-LR

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 and, optionally, velocity), 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.

**********NEXT CHANGE**********

9.2 Mobile Originating Location Request

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 and, optionally, velocity, 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.

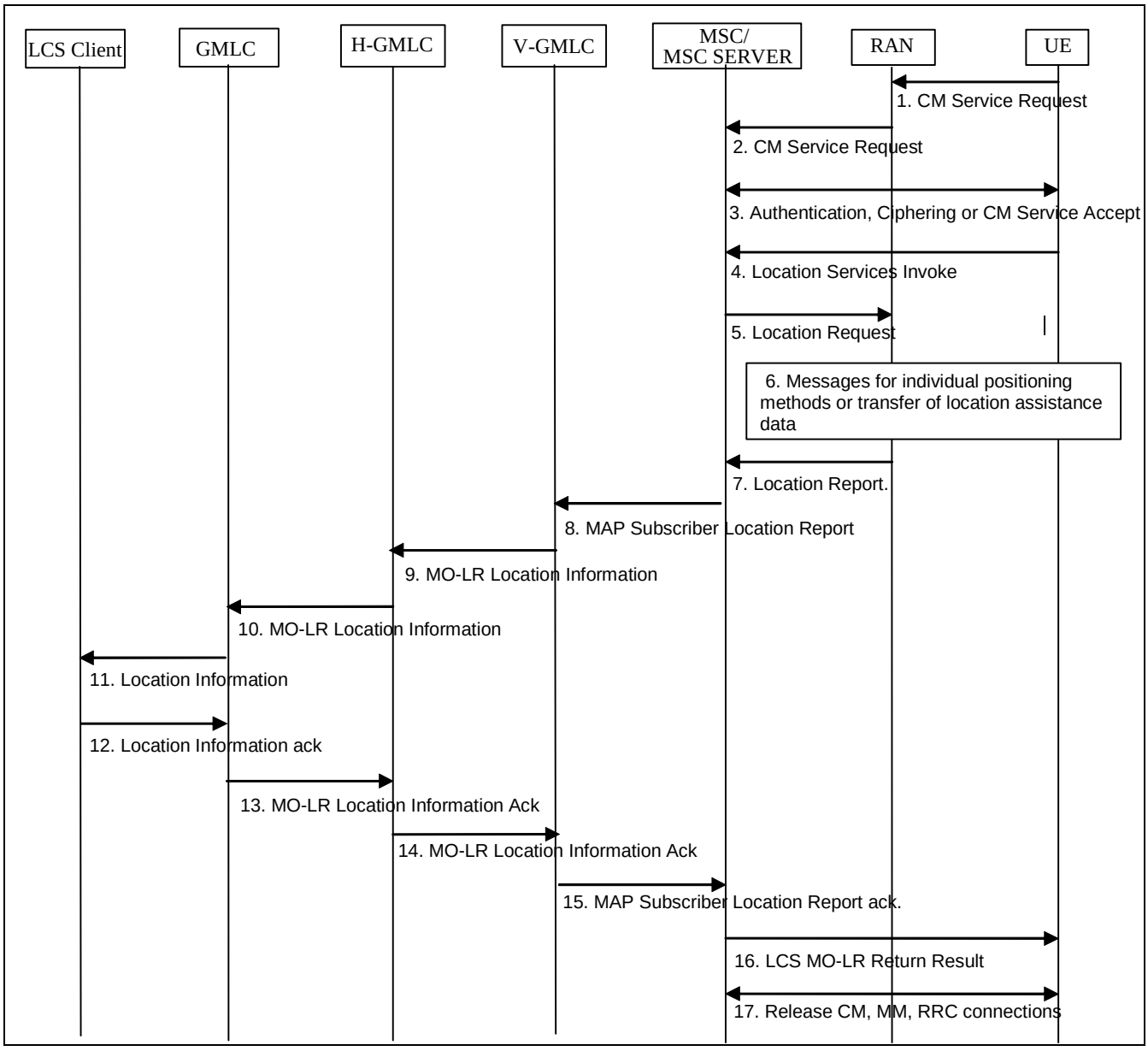


Figure 9.7: General Network Positioning for CS-MO-LR

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 estimate of the UE, location estimate 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, LCS QoS Class), 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 estimate 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. In addition, a Service Identity indicates which MO-LR service of the LCS Client is requested by the UE may be included. The message also may include a pseudonym indicator to indicate a pseudonym should be assigned by the network and transferred to the LCS Client as the UE's identity. 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. For an LCS CS-MO-LR Location Services invoke, the VMSC/MSC server shall assign a GMLC address, i.e. V-GMLC address, which is stored in the VMSC/MSC server. If a V-GMLC address is not available, the VMSC/MSC server may reject the location request. 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 with an indication whether the obtained location estimate satisfies the requested accuracy or not. 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 location estimate was successfully obtained, the VMSC/MSC server shall send a MAP Subscriber Location Report to the V-GMLC assigned in the step 4, carrying the MSISDN/IMSI of the UE, the event causing the location estimate (CS-MO-LR) and the location estimate, its age, obtained accuracy indication and the LCS QoS Class requested by the target UE. In addition, the MAP Subscriber Location Report may include the pseudonym indicator, the identity of the LCS Client, the GMLC address and the Service Identity specified by the UE, if available.

9) Upon receipt of the MAP Subscriber Location Report, the V-GMLC shall determine whether the UE requests transfer of its location estimate to an external LCS Client. If the identity of the LCS Client is not available, this step and steps 10 to 14 are skipped. Otherwise, the V-GMLC shall send the MO-LR Location Information to the H-GMLC (the V-GMLC may query the HLR/HSS of the UE to obtain the address of the H-GMLC), carrying the MSISDN/IMSI of the UE, the event causing the location estimate (CS-MO-LR), the location estimate and its age and the identity of the LCS Client. The pseudonym indicator and/or the GMLC address specified by the UE may also be included if available.

10) If the pseudonym indicator is included in the MO-LR Location Information, the H-GMLC assigns or asks the PMD to assign a pseudonym to the UE. If the identity of the LCS Client and the GMLC address access to the

LCS Client are available, the H-GMLC shall send the MO-LR Location Information to the specified GMLC. If the identity of the LCS Client is available but the GMLC address access to the LCS Client is not available, the H-GMLC determines whether the specified LCS Client is accessible. If yes, the H-GMLC shall send the Location Information to the LCS Client, then the H-GMLC itself act as the specified GMLC, this step and step 13 are skipped. If not, according to the LCS Client identity, the H-GMLC shall determine a GMLC that can access the LCS Client, and send the MO-LR Location Information to the GMLC, carrying the MSISDN or the pseudonym of the UE, the identity of the LCS client, the event causing the location estimate (CS-MO-LR), location estimate and its age.

11) If the identified LCS Client is not accessible, this step and step 12 are skipped. Otherwise the GMLC transfers the location information to the LCS client, carrying the MSISDN/IMSI or the pseudonym of the UE, the event causing the location estimate (CS-MO-LR), the Service Identity, if available, and the location estimate and its age, in accordance with the LCS QoS Class requested by the target UE. If the UE requested LCS QoS class was Assured, GMLC sends the result to the LCS client only if the result has been indicated to fulfil the requested accuracy. If the UE requested LCS QoS class was Best Effort, GMLC sends whatever result it received to the LCS client with an appropriate indication if the requested accuracy was not met.

12) If the LCS Client does not support MO-LR (for temporary or permanent reasons) or can not handle the location estimate of the UE, e.g. the LCS Client does not know the Service Identity, or the UE does not register to the LCS Client, the LCS Client have no corresponding data of the UE, the LCS Client shall return the Location Information ack message to the GMLC or the H-GMLC (in case the LCS Client received Location Information is sent from H-GMLC) with a suitable error cause. Otherwise, the LCS Client handles the location estimate according to the Service Identity, sends the GMLC or the H-GMLC the Location Information ack message signalling that the location estimate of the UE has been handled successfully.

13) If the identified LCS Client is not accessible, the GMLC sends MO-LR Location Information Acknowledgement to the H-GMLC with an appropriate error cause. Otherwise, the GMLC shall send MO-LR Location Information Acknowledgement to the H-GMLC. 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 12. The GMLC may record charging information both for the LCS Client and inter-operator revenue charges.

14) In case the H-GMLC receives the MO-LR Location Information Acknowledgement from the GMLC, it shall forward the MO-LR Location Information Acknowledgement from the GMLC to the V-GMLC, and record charging information both for the UE and inter-working revenue charges.

In case the H-GMLC receives the Location Information Acknowledgement from the LCS Client, it shall send MO-LR Location Information Acknowledgement to the V-GMLC. 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 12. The H-GMLC shall record charging information both for the UE and inter-working revenue charges.

15) In case the V-GMLC receives the MO-LR Location Information Acknowledgement from the H-GMLC, the V-GMLC shall record charging information both for the UE and inter-working revenue charges and send the MAP Subscriber Location Report Acknowledgement to the VMSC/MSC server, carrying the information specifies whether the location estimate of the UE has been handled successfully by the identified LCS Client, and if not success, the corresponding error cause obtained in step 14.

In case the V-GMLC receives the MAP Subscriber Location Report from the VMSC/MSC server and it is not required to send to any LCS Client, the V-GMLC shall record charging information for the UE and response the MAP Subscriber Location Report Acknowledgement to the VMSC/MSC server.

16) The VMSC/MSC server returns a CS-MO-LR Return Result to the UE carrying any location estimate requested by the UE including the indication received from RAN whether the obtained location estimate satisfies the requested accuracy or not, 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 15.

17) 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 charging information.

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 and, optionally, velocity; 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.

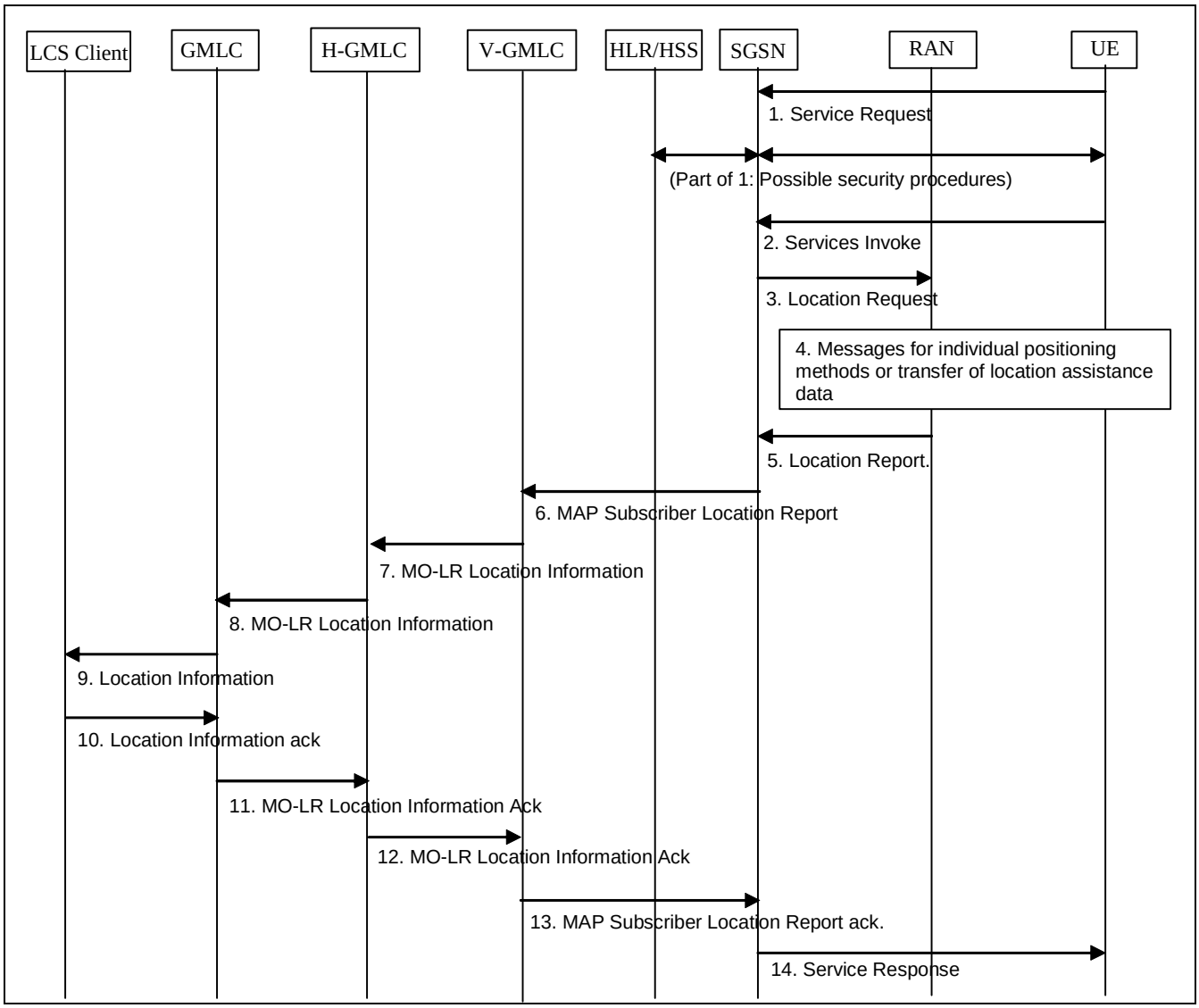


Figure 9.8: General Network Positioning for packet switched MO-LR

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 estimate of the UE, location estimate 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, LCS QoS Class), 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. In addition, a Service Identity indicates which MO-LR service of the LCS Client is requested by the UE may be included. The message also may include a pseudonym indicator to indicate a pseudonym should be assigned by the network and transferred to the LCS Client as the UE’s identity. 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. For an LCS PS-MO-LR Location Services invoke, the SGSN shall assign a GMLC address, i.e. V-GMLC address, which is stored in the SGSN. If a V-GMLC address is not available, the SGSN may reject the location request. 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 with an indication whether the obtained location estimate satisfies the requested accuracy or not. 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 location estimate was successfully obtained, the SGSN shall send a MAP Subscriber Location Report to the V-GMLC assigned in the step 2, carrying the MSISDN/IMSI of the UE, the event causing the location estimate (PS-MO-LR) and the location estimate, its age, obtained accuracy indication and the LCS QoS Class requested by the target UE. In addition, the MAP Subscriber Location Report may include the pseudonym indicator, the identity of the LCS Client, the GMLC address and the Service Identity specified by the UE, if available.

7) Upon receipt of the MAP Subscriber Location Report, the V-GMLC shall determine whether the UE requests transfer of its location estimate to an external LCS Client. If the identity of the LCS Client is not available, this step and steps 8 to 12 are skipped. Otherwise, the V-GMLC shall send the MO-LR Location Information to the H-GMLC (the V-GMLC may query the HLR/HSS of the UE to obtain the address of the H-GMLC), carrying the MSISDN/IMSI of the UE, the event causing the location estimate (PS-MO-LR), the location estimate and its age, and the identity of the LCS Client. The pseudonym indicator and/or the GMLC address specified by the UE may also be included if available.

8) If the pseudonym indicator is included in the MO-LR Location Information, the H-GMLC assigns or asks the PMD to assign a pseudonym to the UE. If the identity of the LCS Client and the GMLC address access to the LCS Client are available, the H-GMLC shall send the MO-LR Location Information to the specified GMLC. If the identity of the LCS Client is available but the GMLC address access to the LCS Client is not available, the H-GMLC determines whether the specified LCS Client is accessible. If yes, the H-GMLC shall send the Location Information to the LCS Client, then the H-GMLC itself act as the specified GMLC, this step and step 11 are skipped. If not, according to the LCS Client identity, the H-GMLC shall determine a GMLC that can access the LCS Client, and send the MO-LR Location Information to the GMLC, carrying the MSISDN or the pseudonym of the UE, the identity of the LCS client, the event causing the location estimate (PS-MO-LR), location estimate and its age.

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, carrying the MSISDN/IMSI or the pseudonym of the UE, the event causing the location estimate (PS-MO-LR), the Service Identity, if available, and the location estimate and its age, in accordance with the LCS QoS Class requested by the target UE. If the UE requested LCS QoS class was Assured, GMLC sends the result to the LCS client only if the result has been indicated to fulfil the requested accuracy. If the UE requested LCS QoS class was Best Effort, GMLC sends whatever result it received to the LCS client with an appropriate indication if the requested accuracy was not met.

10) If the LCS Client does not support MO-LR (for temporary or permanent reasons) or can not handle the location estimate of the UE, e.g. the LCS Client does not know the Service Identity, or the UE does not register to the LCS Client, the LCS Client have no corresponding data of the UE, the LCS Client shall return the Location Information ack message to the GMLC or the H-GMLC (in case the LCS Client received Location Information is sent from H-GMLC) with a suitable error cause. Otherwise, the LCS Client handles the location estimate according to the Service Identity, sends the GMLC or the H-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 MO-LR Location Information Acknowledgement to the H-GMLC with an appropriate error cause. Otherwise, the GMLC shall send MO-LR Location Information Acknowledgement to the H-GMLC. 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. The GMLC may record charging information both for the LCS Client and inter-operator revenue charges.

12) In case the H-GMLC receives the MO-LR Location Information Acknowledgement from the GMLC, it shall forward the MO-LR Location Information Acknowledgement from the GMLC to the V-GMLC, and record charging information both for the UE and inter-working revenue charges.

    In case the H-GMLC receives the Location Information Acknowledgement from the LCS Client, it shall send MO-LR Location Information Acknowledgement to the V-GMLC. 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. The H-GMLC shall record charging information both for the UE and inter-working revenue charges.

13) In case the V-GMLC receives the MO-LR Location Information Acknowledgement from the H-GMLC, the V-GMLC shall record charging information both for the UE and inter-working revenue charges and send the MAP Subscriber Location Report Acknowledgement to the SGSN, carrying the information specifies whether the location estimate of the UE has been handled successfully by the identified LCS Client, and if not success, the corresponding error cause obtained in step 12.

    In case the V-GMLC receives the MAP Subscriber Location Report from the SGSN and it is not required to send to any LCS Client, the V-GMLC shall record charging information for the UE and response the MAP Subscriber Location Report Acknowledgement to the SGSN.

14) The SGSN returns a Service Response message to the UE carrying any location estimate requested by the UE including the indication received from RAN whether the obtained location estimate satisfies the requested accuracy or not, 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 Service Response 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 13. The SGSN may record charging information.

**********END OF CHANGES**********

3GPP TSG-WG2 Meeting #44
Budapest, Hungary. 26th Jan. - 2nd Feb. 2005.

Tdoc ⌘ S2-050526

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.271** **CR** **297** ⌘ **rev** **2** ⌘ Current version: **6.10.0** ⌘

*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:	⌘	Clarification of LDR reference number
Source:	⌘	3GPP TSG_SA WG2
Work item code:	⌘	LCS2
Date:	⌘	20/01/2005
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:
Ph2 *(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)*
Rel-7 *(Release 7)*

Reason for change: ⌘

In the current TS 23.271, the LDR reference number is assigned by the R-GMLC. This LDR reference number is expected to be unique to identify each LDR request to every receiver, i.e. H-GMLC, V-GMLC, MSC/SGSN and target UE. However. In the MAP interface (TS 29.002), the LDR reference number is defined only one byte.

```
LCS-ReferenceNumber::= OCTET STRING (SIZE(1))
```

Obviously, as the LDR reference number is one byte it is impossible to add e.g. R-GMLC address in order to make it unique. Thus the receiver could possibly receive two different LDR requests with same LDR reference number.

The OMA LOC WG is aware of this problem, so a solution that allows the receiver to assign the appropriate LDR reference number is introduced. In the RLP, it states the LDR reference number is assigned by the V-GMLC, and the entities in the chain should use the LDR reference number together with the UE identity to distinguish the different LDR requests.

However, since the UE is mobile, in case of change of area event, when a V-GMLC assigns one LDR reference number, e.g. LCS_ref=17, for a LDR request, this LCS_ref shall be stored in the UE for this request. Then as the UE moves to another MSC/SGSN associated to another V-GMLC, the new V-GMLC may still assign the same LDR reference number to another LDR request, e.g. LCS_ref = 17. Therefore, it is possible that the UE can be confused since the LCS_ref = 17 is used by two different requests.

The H-GMLC is the home GMLC of the UE, it is the only fixed entity in the chain,

		if the LDR reference number is assigned by the H-GMLC, with the identity of the UE, the different LDR requests may uniquely identified.
Summary of change:	⌘	The assignment of the LDR reference number is moved from R-GMLC to the H-GMLC. In order to keep consistency, for the periodical request, the periodical timer is monitored by the H-GMLC; for the change of area event request, the requested location estimate and relevant parameters such as QoS are stored in the H-GMLC.
Consequences if not approved:	⌘	The LDR reference number is still assigned by the R-GMLC, it shall be possible to receive a same LDR reference number from different R-GMLC for different triggered requests, and this may make some confusion in the Lg interface.

Clauses affected:	⌘	3.1, 9.1.8.1, 9.1.8.2, 9.1.8.3, 9.1.9			
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘	Current RLP and MLP may be affected.			

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 >>

3.1 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 QoS Class: The QoS class determines the degree of adherence to the quality of service information as required by the source of a location request

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~~ the identity ~~of a Location Deferred Request~~, which is assigned and maintained by the ~~R-GMLC~~ H-GMLC and circulated between the LCS Client, R-GMLC, H-GMLC, V-GMLC, MSC/SGSN and UE. With the identity of the UE, the LDR reference number can unique identify a Location Deferred Request. 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 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. Country code in this context means E.164 country code for a geographic area [35a].

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 the LCS client and is expressed as geographical area using a shape defined in TS 23.032 [11], as a geographical area using local coordinate system, as an E.164 country code for a geographic area [35a], 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', as defined in 3GPP TS 21.905 [3]. 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 3GPP TS 22.101 [8].

<< 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.

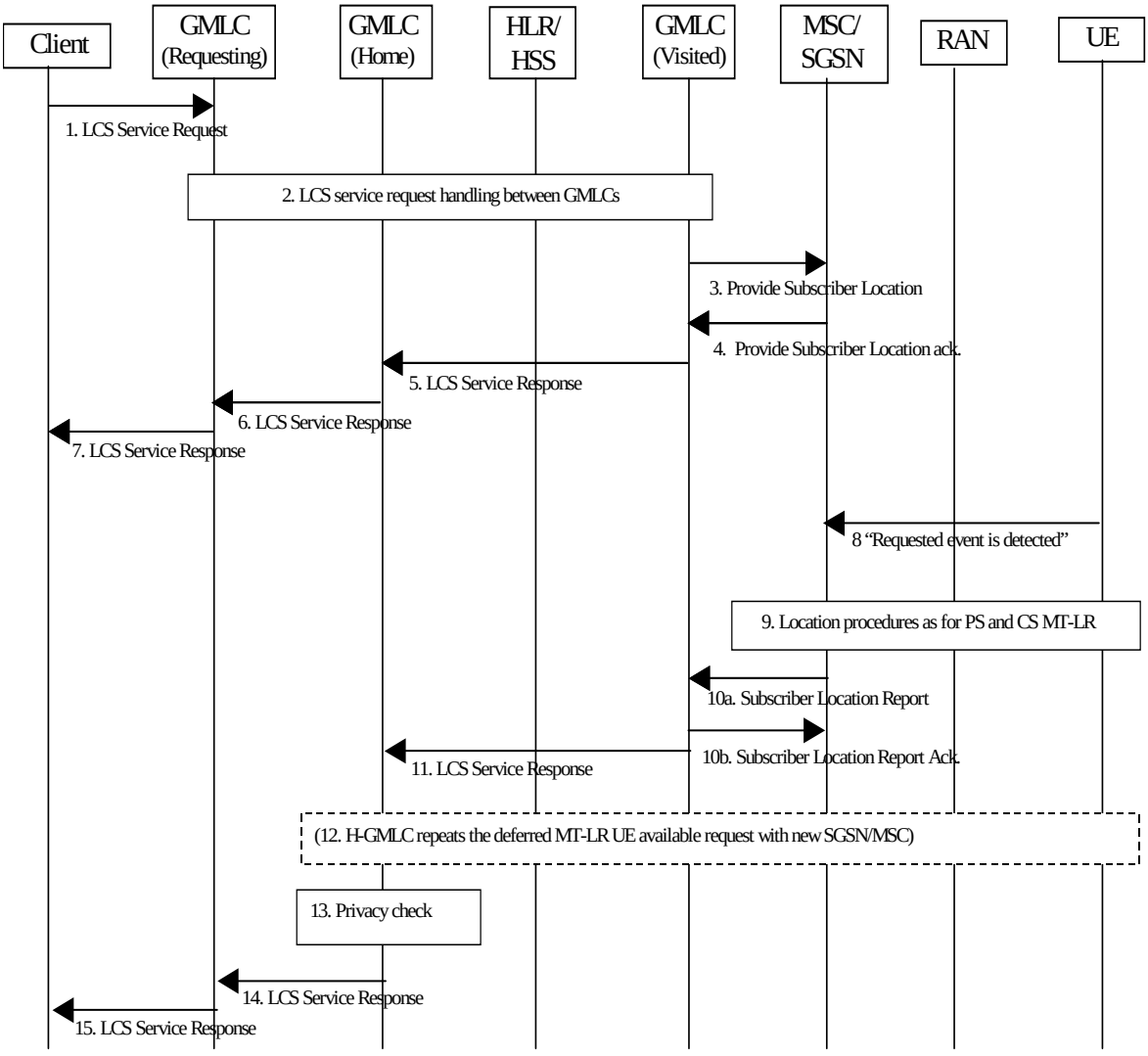


Figure 9.6a: General Network Positioning for a Deferred MT-LR with UE available event

9.1.8.1 Deferred Location Request Procedure

1) 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~~,~~. The H-GMLC assigns a LDR reference number to this LCS Service request and transfers the information to the V-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), or if either the security or privacy check related actions fail, then 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. When the H-GMLC returns the LCS Service Response to the R-GMLC, the LDR reference number assigned by the H-GMLC shall be included. The H-GMLC may record charging information for an accepted deferred location request.

7) The R-GMLC then returns the LCS Service Response with LDR reference number 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.

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. The report shall include the reference number and H-GMLC address that were included in the Provide Subscriber Location request and the information that the MT-LR must be reinitiated against the new SGSN/MSC. It shall also include the address of the new SGSN/MSC, if available. If the V-GMLC is associated with the new MSC/SGSN, it re-issues the location request to the new MSC/SGSN. Otherwise the V-GMLC forwards the responses to the H-GMLC. If the H-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 the V-GMLC it reinitiates the MT-LR to the new SGSN/MSC of the new V-GMLC. Otherwise, the H-GMLC shall then issue a SEND_ROUTING_INFO_FOR_LCS message to get the address of the V-GMLC associated with the new SGSN/MSC and reinitiate the MT-LR with the new SGSN/MSC through the new V-GMLC, 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, 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, an indication that this is a response to a previously sent deferred location request and may also include the indication whether the obtained location estimate satisfies the requested accuracy or not (provided that this indication is obtained from RAN with the location estimate). 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. The LCS Service Response is sent in accordance with the requested QoS Class, as described in clause 9.1.1 for common MT-LR.

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, When the H-GMLC returns the LCS Service Response to the R-GMLC, the LDR reference number that was sent to the R-GMLC in step 6 shall be included..

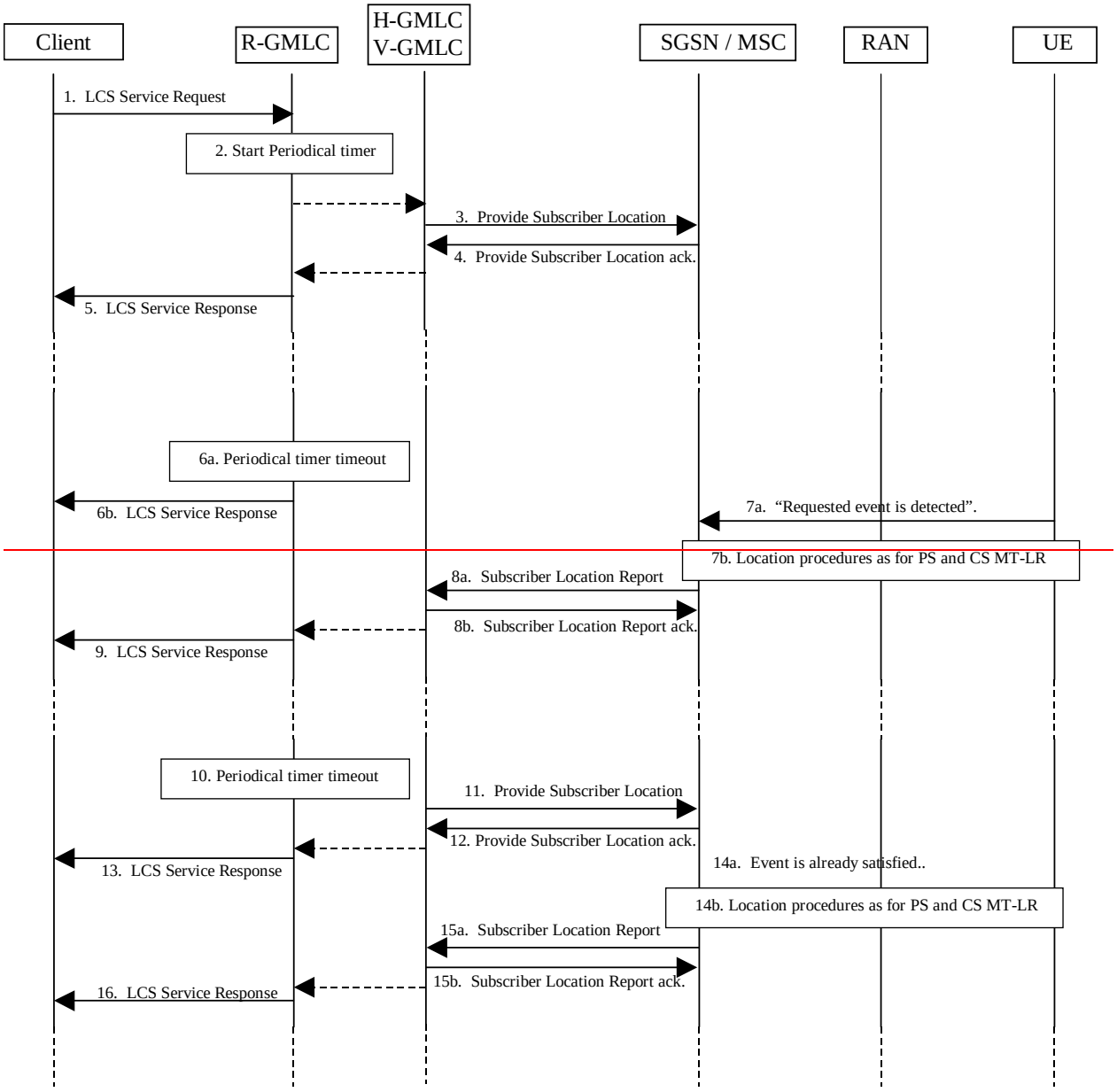
15) The R-GMLC sends the LCS Service Response with the LDR reference number to the LCS Client. ~~When the R-GMLC returns the LCS Service Response to the LCS Client, the LDR reference number that was sent to the LCS Client in step 3 shall be included.~~

<< 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”.


Client
R-GMLC
H-GMLC
V-GMLC
SGSN / MSC
RAN
UE
1. LCS Service Request
2. Start Periodical timer
3. Provide Subscriber Location
4. Provide Subscriber Location ack.
5. LCS Service Response
6a. Periodical timer timeout
6b. LCS Service Response
7a. "Requested event is detected".
7b. Location procedures as for PS and CS MT-LR
8a. Subscriber Location Report
8b. Subscriber Location Report ack.
9. LCS Service Response
10. Periodical timer timeout
11. Provide Subscriber Location
12. Provide Subscriber Location ack.
13. LCS Service Response
14a. Event is already satisfied..
14b. Location procedures as for PS and CS MT-LR
15a. Subscriber Location Report
15b. Subscriber Location Report ack.
16. LCS Service Response

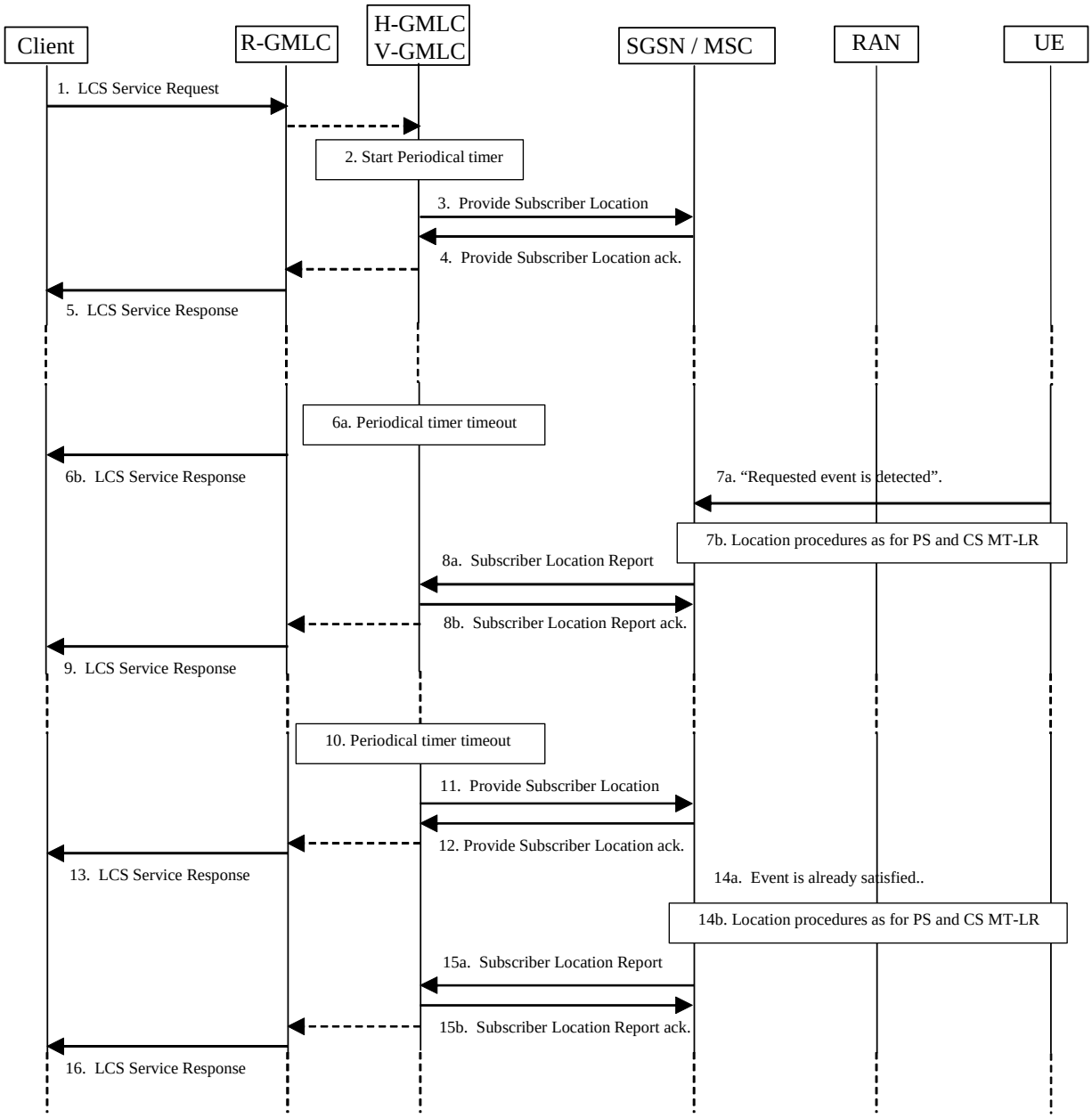


Figure 9.6b: General Network Positioning for a Combined Periodical/Deferred MT-LR

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, then the R-GMLC transfers the periodical request to the H-GMLC.

2) The ~~R~~H-GMLC starts the periodical timer and assigns a LDR reference number for this periodical request, 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~~H-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~~H-GMLC returns the LCS Service Response to the LCS Client via R-GMLC , the LDR reference number assigned by the ~~R~~H-GMLC shall be included.

6) When the periodical timer expires, if the ~~R~~H-GMLC is still waiting for the event, the ~~R~~H-GMLC shall send a LCS Service Response to the LCS client via R-GMLC, 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~~H-GMLC returns the LCS Service Response to the LCS Client via R-GMLC, 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~~H-GMLC is not waiting for the event, the ~~R~~H-GMLC initiates the common LCS procedures as described in 9.1.1. The ~~R~~H-GMLC should use the same LDR reference number assigned in the step ~~3~~2, 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 >>

9.1.9 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 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

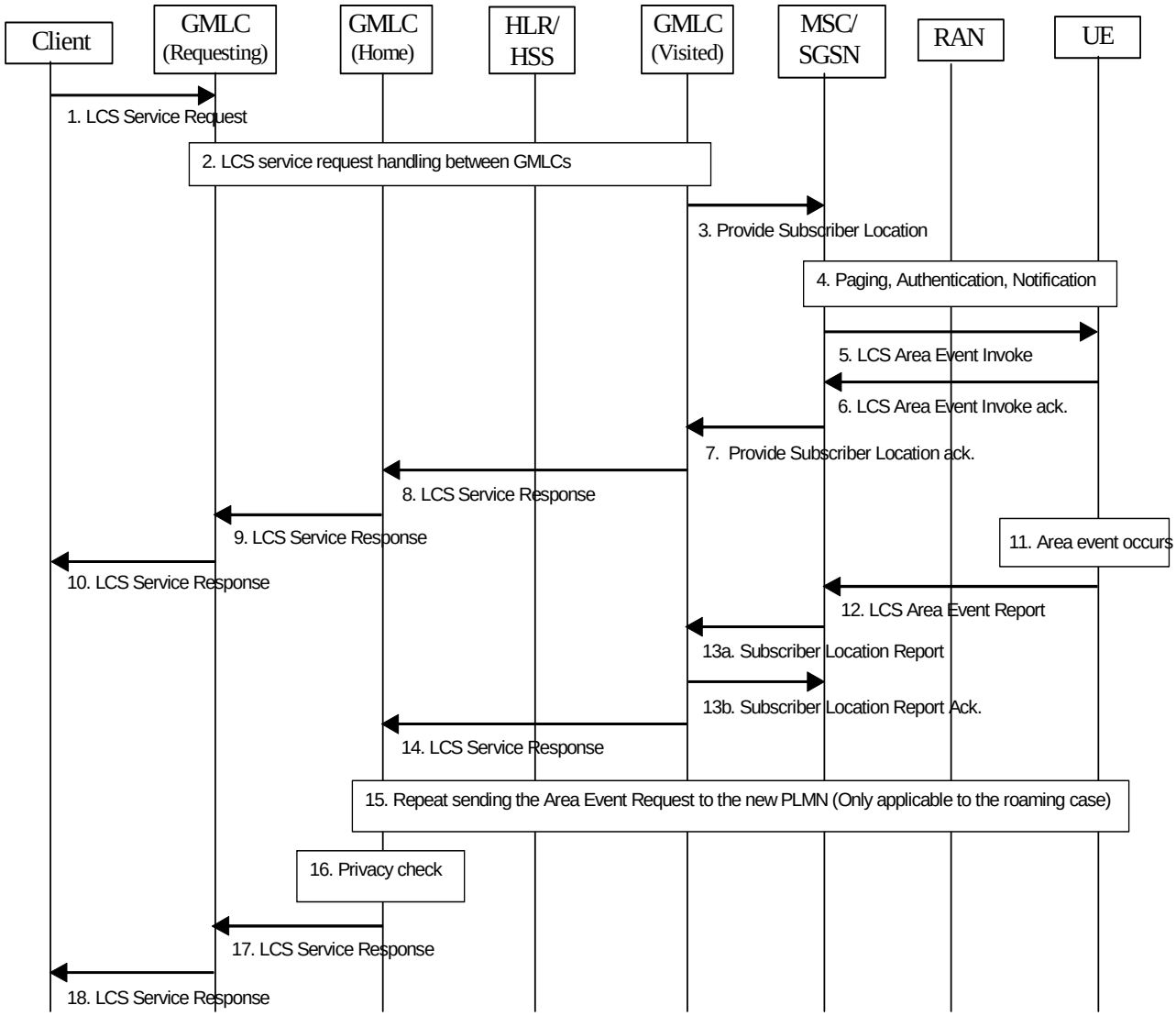


Figure 9.6d: Deferred MT-LR procedure for the Area event

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 TS 23.032 [11]. 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~~H-GMLC~~, via the H-GMLC,~~ If indication of the requested location estimate is included in the area event request, the H-GMLC should record this indication and any relevant parameters such as QoS. The H-GMLC assigns a LDR reference number to this LCS Service request then transfers the information to the V-GMLC, including the LDR reference number 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.

3) If the received target area is expressed by a shape defined in TS 23.032 [11], 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 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 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 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~~H-GMLC returns the LCS Service Response to the R-GMLC~~LCS Client~~, the LDR reference number assigned by the ~~R~~H-GMLC shall be included, then the R-GMLC shall transfer the LDR reference number to the LCS Client in the LCS Service Response. 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 and the H-GMLC address. The report shall also include the result of the notification/verification procedure, if the notification/verification is needed.

When the MSC/SGSN receives the report and it can handle this report, an acknowledgement as a response should be sent to the UE. If the UE does not receive any response from the MSC/SGSN after sending the report, i.e. the current MSC/SGSN does not support the deferred location request for the area event (for temporary or permanent reasons), the UE may re-send the report more times. If the UE always does not receive the response, the UE shall stop sending the report, then record a corresponding flag to indicate that a report has been sent unsuccessfully. When the UE performs location update and detects the LAI or RA is changed, if the flag has been set, the UE shall send the report to the corresponding MSC/SGSN, and the flag will be cleared upon a success of the sending.
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) 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 H-GMLC address and may also include the indication whether the obtained location estimate satisfies the requested accuracy or not (provided that this indication is obtained from RAN with the location estimate). V-GMLC sends an acknowledgement to MSC/SGSN in step 13b and the MSC/SGSN may record charging information.

14) The V-GMLC sends the LCS Service Response to the H-GMLC with an indication of the event occurrence, the LDR reference number and the H-GMLC address. The LCS Service Response is sent in accordance with the requested QoS Class, as described in clause 9.1.1 for common MT-LR. The LDR reference number 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) In case the UE moves to another PLMN of the PLMN identities list, according to the PLMN identity the UE shall determine whether the Area Definition of the target area is available. If it is not available, the UE shall report that it has roamed into a new PLMN, including the new PLMN identity and the LDR reference number. The H-GMLC shall transfer the original area event request to the V-GMLC of the new PLMN. The procedure should be continued as described in step 2 and onwards where the Area Definition of the new PLMN shall be downloaded to the UE. Otherwise, the UE monitors the area event in the new PLMN, does not inform the H-GMLC that it has entered into a new PLMN.

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

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

The H-GMLC sends the LCS Service Response to R-GMLC with the LDR reference number. If the location estimate of the target UE is requested in the request and the location estimate was successfully obtained, the H-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 H-GMLC sends the LCS Service Response without the location estimate. 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.

18) ~~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.

<< End of changed clause >>

3GPP TSG-SA WG2 Meeting #44
Budapest, Hungary. 26th Jan. - 2nd Feb. 2005.

Tdoc ⌘S2-050363

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.271** **CR** **298** ⌘ **rev** **1** ⌘ Current version: **6.10.0** ⌘

*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 in Location Report Procedure
Source:	⌘	3GPP TSG_SA WG2
Work item code:	⌘	LCS2
Date:	⌘	27/01/2005
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:
Ph2 *(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)*
Rel-7 *(Release 7)*

Reason for change:	⌘	CR 292 on "Corrections to the Mobile Terminating Deferred Location request – UE available event" was agreed at SA2 #43. However, after looking at the agreed text in TS 23.271 in subclause 9.1.8.2 it seems still a little bit unclear.
Summary of change:	⌘	To make the text more clear it would be good to indicate that the H-GMLC re-initiates the MT-LR *through* the new V-GMLC. Currently you may get the impression that the H-GMLC re-intiates the MT-LR directly to the new MSC/SGSN.
Consequences if not approved:	⌘	Text remains unclear.

Clauses affected:	⌘	9.1.8.2

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.

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. The report shall include the reference number and H-GMLC address that were included in the Provide Subscriber Location request and the information that the MT-LR must be reinitiated against the new SGSN/MSC. It shall also include the address of the new SGSN/MSC, if available. If the V-GMLC is associated with the new MSC/SGSN, it re-issues the location request to the new MSC/SGSN. Otherwise the V-GMLC forwards the responses to the H-GMLC. If the H-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 the V-GMLC, it reinitiates the MT-LR to the new SGSN/MSC through ~~of~~ the new V-GMLC. Otherwise, the H-GMLC shall then issue a SEND_ROUTING_INFO_FOR_LCS message to get the address of the V-GMLC associated with the new SGSN/MSC and reinitiate the MT-LR with the new SGSN/MSC through the new V-GMLC, 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, 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, an indication that this is a response to a previously sent deferred location request and may also include the indication whether the obtained location estimate satisfies the requested accuracy or not (provided that this indication is obtained from RAN with the location estimate). 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. The LCS Service Response is sent in accordance with the requested QoS Class, as described in clause 9.1.1 for common MT-LR.

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.