Source: **TSG SA WG2**
Title: **CRs on 03.71, 23.171 and 23.271 (LCS Stage 2)**
Agenda Item: **7.2.3**

The following Change Requests (CRs) have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #23.

S2 doc #	Title	Spec	CR #	cat	Version in	REL	WI	S2 meeting	Clauses affected
S2-040781	Routing of Emergency Calls based on Geographical Coordinates	03.71	**045**	B	8.7.0	99	LCS	S2 #38	3.2, 5.8, 7.6.4 New 5.4.1.3, 7.6.4A
S2-040324	Routing of Emergency Calls based on Geographical Coordinates	23.171	**030**	B	3.10.0	99	LCS2	S2 #37	3.3, 6.2, 8.7.3 New 5.4.1.4, 8.7.3A
S2-040355	R4 Mirror CR: Routing of Emergency Calls based on Geographical Coordinates	23.271	**245**	B	4.10.0	4	LCS2	S2 #37	3.3, 6.2, 9.1.5 New 5.4.1.4, 9.1.5A
S2-040356	Routing of Emergency Calls based on Geographical Coordinates	23.271	**246**	A	5.9.0	5	LCS2	S2 #37	3.3, 6.2, 9.1.5 New 5.4.1.4, 9.1.5A
S2-040157	Roaming support for Area Event LDR	23.271	**242r2**	B	6.6.0	6	LCS2	S2 #37	9.1.9
S2-040152	Clarification on the privacy check procedure in Rel-6, regarding the PLMN Operator service	23.271	**243r1**	F	6.6.0	6	LCS2	S2 #37	9.5.3.4, 9.5.4
S2-040370	Integration of IMS Users into the LCS Architecture	23.271	**244r1**	B	6.6.0	6	LCS2	S2 #37	3.2, 3.3, 5.2, 5.4.2.6 (new), 5.6.1, 6, 6.2, 6.4.1, 7.6 (new), 7.6.1 (new), 7.6.2 (new), 9.8 (new), 9.8.1 (new), 9.8.2 (new) 9.8.3 (new), 10.6 (new)
S2-041061	Introduction of LCS QoS Class and Enhencement of MO-LR	23.271	**252r1**	B	6.6.0	6	LCS2	S2 #38	3.1, 5.5.1, 5.5.2, 5.6.1, 5.6.2, Additional Section 6.5, 9.1.1, 9.1.2, 9.1.5, 9.1.6, 9.1.7, 9.2.1, 9.2.2, 10.3.1, 11.1

3GPP TSG-SA2 Meeting #38 ***Tdoc ⌘S2-040781***
Atlanta, USA, 16-20 February 2004

CR-Form-v7

CHANGE REQUEST

⌘ **03.71** **CR** **045** ⌘**rev** ⌘ Current version: **8.7.0** ⌘

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

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

Title:	⌘	Routing of Emergency Calls based on Geographical Coordinates
Source:	⌘	SA2 (Nortel Networks, AWS)
Work item code:	⌘	LCS
Date:	⌘	2/6/2004
Category:	⌘	**B**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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

Reason for change: ⌘ Accurate routing of emergency calls to the correct Emergency Service Provider is required. Enabling routing based on the geographical coordinates of the calling party will increase the probability of more accurate routing.

A high level requirement has been added to LCS stage 1, 22.071 to optionally route Emergency calls to Emergency Service Providers based on the geographical coordinates (latitude and longitude) of the calling party. The LCS stage2, specifications need to be updated accordingly to satisfy the stage 1 requirement.

At SA#22 it was decided that the functionality agreed for R6 should be provided as far back as possible to R97 (as originally requested by T1P1). Hence, this is a R99 CR for the change that has been already agreed for R6. Changes to 23.171 and 23.271 were agreed at the last SA2 meeting (SA2#37), where it was requested that a CR to 03.71 should also be developed.

Summary of change: ⌘ dded new functionality in the GMLC, LCZTF. The LCZTF performs ransformations of a location into a zone identity.

dded a new flow on NI-LR using Location Based Routing to the LCS Client.

lso, clarified that in North America either NA-ESRD or NA-ESRK (not both) is sent o the emergency services client in the emergency call origination.

Consequences if not approved: ⌘ The LCS stage 1 requirement will not be met.

The probability of routing Emergency Calls to the correct Emergency Service Provider may be reduced, timeliness and availability of emergency services may

	be adversely impacted.

Clauses affected:	⌘	3.2, 5.8, 7.6.4 New 5.4.1.3, 7.6.4A				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	*TS 09.02*
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:

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

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

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

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

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

3.2 Abbreviations

Certain abbreviations used in the present document are also listed in GSM 01.04.

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

ANM	Answer Message (ISUP)
BSSAP-LE	BSSAP LCS Extension for Lb, Lp and Ls interfaces
BSSLAP	BSS LCS Assistance Protocol
BSSMAP-LE	BSSMAP LCS Extension
CC	SCCP Connection Confirm
CR	SCCP Connection Request
CREF	SCCP Connection Refused
DT1	SCCP Data Form 1 message
FEC	Forward Error Correction
GPRS	General Packet Radio Service
IAM	Initial Address Message (ISUP)
LIR	Location Immediate Request
LDR	Location Deferred Request
LCF	Location Client Function
~~LCCF~~	~~Location Client Control Function~~
LCAF	Location Client Authorization Function
LCCF	Location Client Control Function
LCZTF	Location Client Zone Transformation Function
LLP	LMU LCS Protocol
LMMF	LMU Mobility Management Function
LMU	Location Measurement Unit
LSCF	Location System Control Function
LSAF	Location Subscriber Authorization Function
LSPF	Location Subscriber Privacy Function
LSBcF	Location System Broadcast Function
LSBF	Location System Billing Function
LSOF	Location System Operations Function
LCCTF	Location Client Coordinate Transformation Function
MO-LR	Mobile Originating Location Request
MT-LR	Mobile Terminating Location Request
NI-LR	Network Induced Location Request
MLC	Mobile Location Center
PRAF	Positioning Radio Assistance Function
PRCF	Positioning Radio Coordination Function
PCF	Positioning Calculation Function
PSMF	Positioning Signal Measurement Function
RA	Rate Adaptation
REL	Release (ISUP)
RLC	Release Complete (ISUP or SCCP)
RLP	Radio Link Protocol (GSM 04.22)
RLSD	SCCP Released message
RRLP	RR LCS Protocol to a target MS (defined in GSM 04.31)
SGSN	Serving GPRS Support Node
SLPP	Subscriber LCS Privacy Profile
SMLCPP	SMLC Peer Protocol (messages on Lp interface in GSM 08.31)
TA	Timing Advance (between an MS and its serving BTS)
TOA	Time of Arrival
UDT	SCCP Unitdata message

***** New clause *****

5.4.1.3 Location Client Zone Transformation Function (LCZTF)

The Location Client Zone Transformation Function (LCZTF) performs transformations of a location (latitude and longitude) into a zone identity, which in North America identifies a particular emergency services zone.

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

5.8 Assignment of functions to general logical architecture

Table 1: Mapping of LCS Functions into Network Elements

	MS	LMU	BTS	BSC	GMLC	SMLC	MSC		HLR	gsmSCF	LCS Client
LCF	X						X			X	X
LCCF					X						
LCAF					X						
LCZTF					X						
LMMF						X					
LSCF							X				
LSPF									X		
LSAF							X				
LSBF					X		X				
LSBcF						X					
LSOF		X		X	X	X	X				
LCCTF					X						
PRAF				X							
PRCF						X					
PCF	X					X					
PSMF	X	X	X								

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

7.6.4 Network Induced Location Request (NI-LR)

Figure 31 illustrates positioning for an emergency service call.

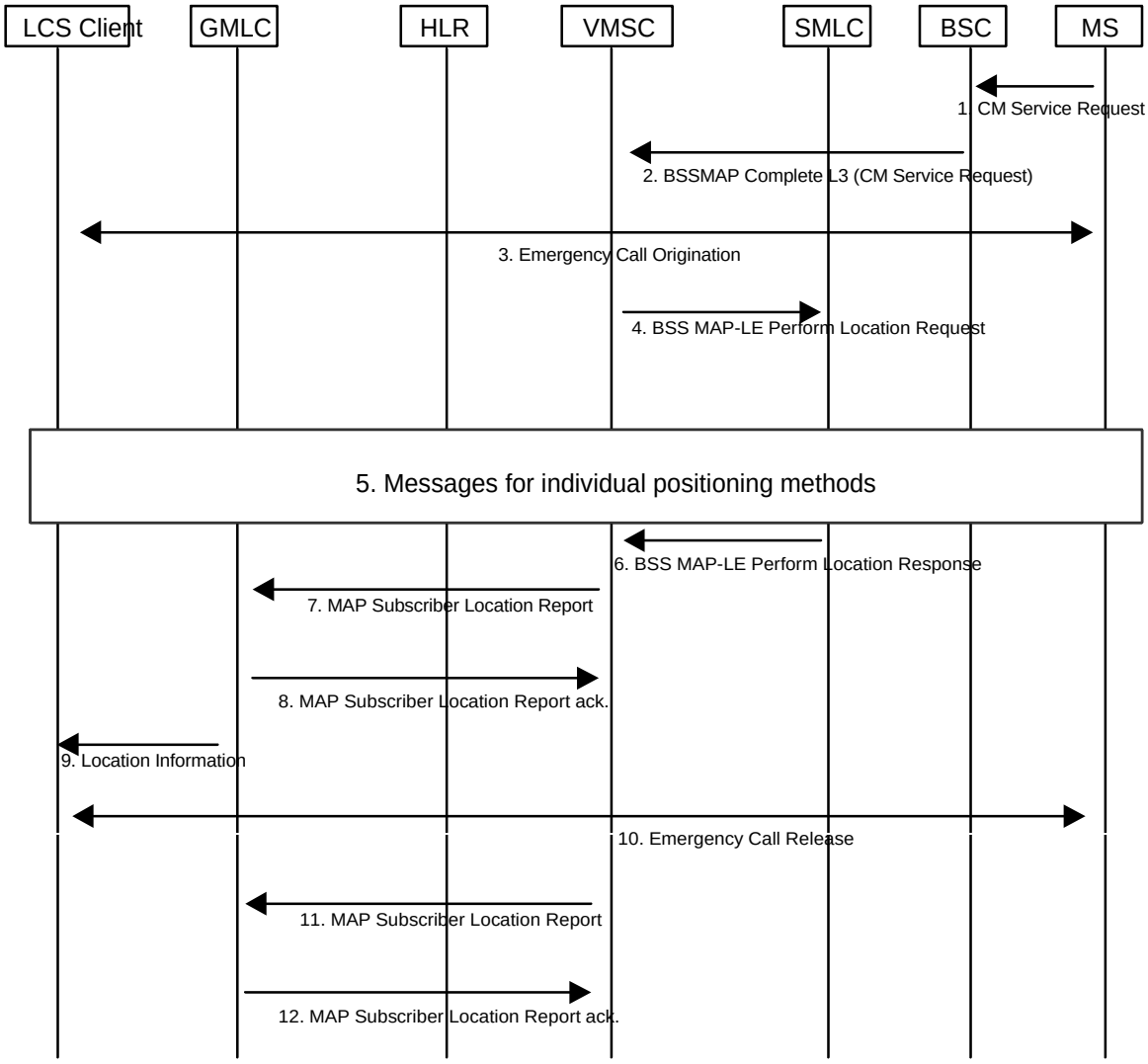


Figure 31: Positioning for a NI-LR Emergency Service Call

7.6.4.1 Location Preparation Procedure

1) An initially idle MS requests an SDCCH and sends a DTAP CM Service Request indicating a request for an Emergency Service call to the VMSC via the BSC.

2) The BSC includes the current cell ID and may include certain other location information (e.g. the TA value) within the BSSMAP Complete Layer 3 Information message used to convey the CM service request across the A-interface. The MS may identify itself using a TMSI, IMSI or IMEI.

3) The VMSC determines based on the serving cell the appropriate emergency services client. The VMSC, BSC and MS continue the normal procedure for emergency call origination towards that ~~the appropriate~~ emergency services client. Depending on local regulatory requirements, the sending of call setup information into the PSTN may be delayed until either the MS'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 may delay call setup and invoke location based

routing procedures described in section 7.6.4A. Call setup information sent into the PSTN may include the MS location (if already obtained) plus information that will enable the emergency service provider to request MS location at a later time (e.g. NA-ESRD or ~~and~~ NA-ESRK in North America).

4) At any time after step 2~~1~~ and after sufficient time has been allowed to enable completion of early classmark sending to the BSC and MSC where the MS supports any MS assisted or MS based positioning method(s), the VMSC may initiate procedures to obtain the MS's location. These procedures may run ~~either~~ in parallel with the emergency call origination ~~or while emergency call origination is suspended to delay sending of call setup information into the PSTN according to step 3~~. The VMSC sends a BSSMAP-LE :Perform Location Request message to the SMLC associated with the MS's current location area – either directly or via the serving BSC (see steps 8-10 for an MT-LR). This message includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID and any location information including the TA value received in step 2.

7.6.4.2 Positioning Measurement Establishment Procedure

5) The actions described under step 11 for a MT-LR are performed. If a speech compatible traffic channel is required for network based positioning (e.g. TOA), the same traffic channel may be used for both the positioning and the emergency call. In that case, the traffic channel may be allocated by either the positioning procedure or emergency call origination procedure.

7.6.4.3 Location Calculation and Release Procedure

6) When a location estimate best satisfying the requested QoS has been obtained, the SMLC returns it to the VMSC – either directly or via the serving BSC (see steps 12-14 for an MT-LR).

7) Depending on local regulatory requirements, the VMSC may send a MAP Subscriber Location report to a GMLC associated with the emergency services provider to which the emergency call has been or will be sent. This message shall carry any location estimate returned in step 6, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling MS. In North America, any NA-ESRD and any NA-ESRK that may have been assigned by the VMSC shall be included. The message shall also indicate the event that triggered the location report. If location failed (i.e. an error result was returned by the SMLC in step 8), an indication of failure rather than a location estimate may be sent to the GMLC: the indication of failure is conveyed by not including a location estimate in the MAP Subscriber Location Report.

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

9) The GMLC may optionally forward the information received in step 7 to the emergency services LCS client. For a North American emergency services call the client is expected to obtain the location information by requesting it from the GMLC

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

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

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

***** New clause *****

7.6.4A NI-LR using Location Based Routing – applicable to North American Emergency Calls only

Figure 31A illustrates positioning for an emergency service call using location based routing.

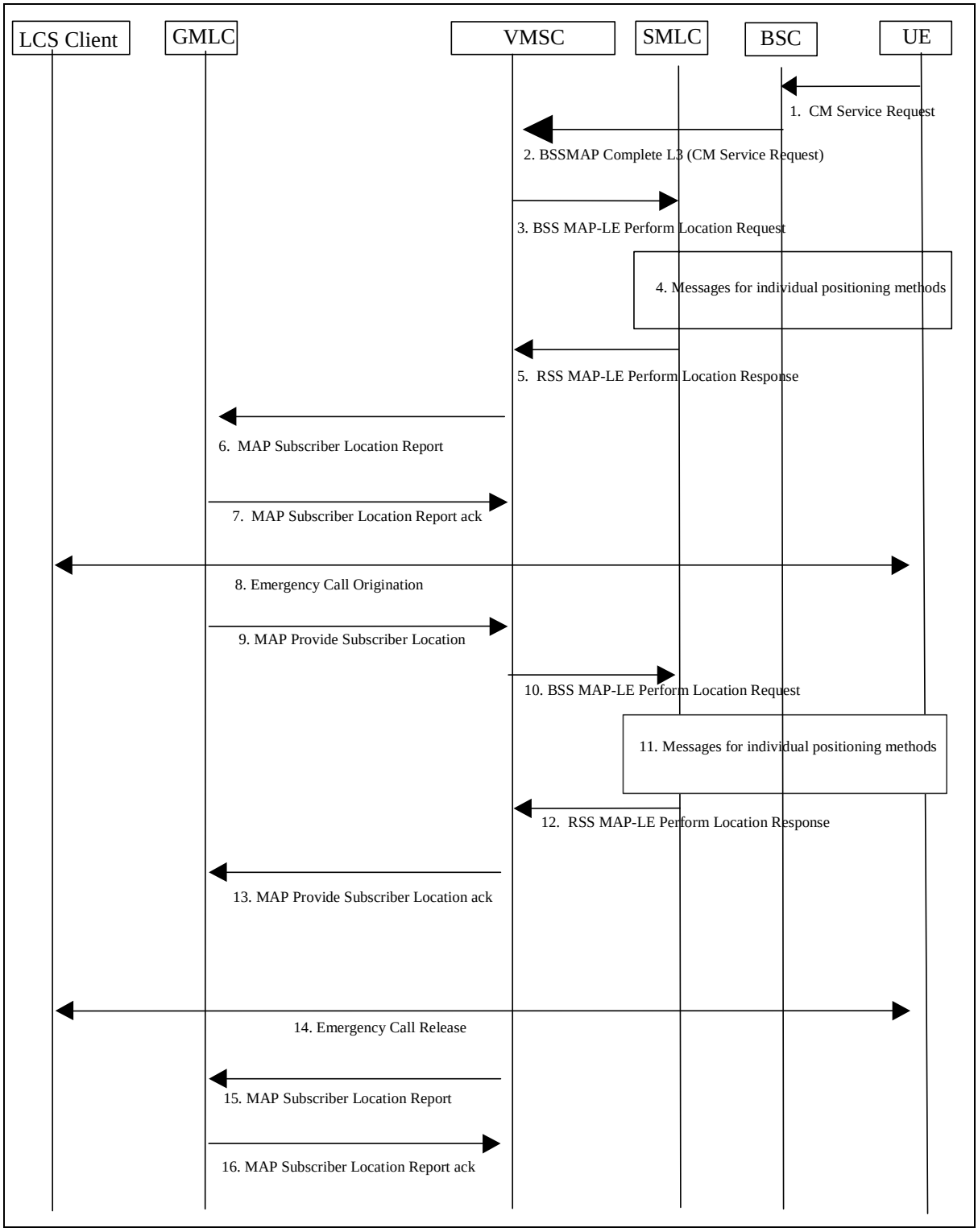


Figure 31A: Positioning for a NI-LR Emergency Service Call using Location Based Routing

7.6.4A.1 Location Preparation Procedure

1) An initially idle MS requests an SDCCH and sends a DTAP CM Service Request indicating a request for an Emergency Service call to the VMSC via the BSC.

2) The BSC includes the current cell ID and may include certain other location information (e.g. the TA value) within the BSSMAP Complete Layer 3 Information message used to convey the CM service request across the A-interface. The MS may identify itself using a TMSI, IMSI or IMEI.

3) The VMSC determines that the serving cell serves an area that contains portions of multiple emergency services zones. Therefore, the VMSC delays call setup and initiates procedures to obtain the MS's location for routing the emergency call to the emergency services LCS client. The VMSC sends a BSSMAP-LE: Perform Location Request message to the SMLC associated with the MS's current location area – either directly or via the serving BSC. This message includes the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the QoS required for an emergency call and the current Cell ID.

7.6.4A.2 Positioning Measurement Establishment Procedure

4) The actions described under step 11 for a MT-LR are performed.

7.6.4A.3 Location Calculation and Release Procedure

5) When a location estimate best satisfying the requested QoS has been obtained, the SMLC returns it to the VMSC – either directly or via the serving BSC. If a failure is received, the VMSC initiates emergency call setup using the normal NI-LR procedures.

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

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

7.6.4A.4 Location Preparation Procedure

8) The emergency call procedure is applied. The VMSC, BSC and MS continue the normal procedure for emergency call origination towards the appropriate emergency services client. Call setup information sent into the PSTN may include the MS location plus information that will enable the emergency service provider to request MS location at a later time (NA-ESRD or NA-ESRK in North America). The NA-ESRK used shall be the one received from the GMLC. If a NA-ESRK is not received from the GMLC then the VMSC shall use the default NA-ESRK for the call as in 7.6.4 step 3.

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

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

10) The VMSC sends a BSSMAP-LE: Perform Location Request message to the SMLC. This message includes the type of location information requested, the MS's location capabilities and requested higher accuracy QoS.

7.6.4A.5 Positioning Measurement Establishment Procedure

11) Same as step 4.

7.6.4A.6 Location Calculation and Release Procedure

12) Same as step 5.

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

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

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

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

3GPP TSG-SA2 Meeting #37 ***Tdoc ⌘S2-040324***
Innsbruck, Austria, 12-16 January 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.171** **CR** **030** ⌘**rev** ⌘ Current version: **3.10.0** ⌘

*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 ☒

Title:	⌘	Routing of Emergency Calls based on Geographical Coordinates
Source:	⌘	SA2 (Nortel Networks, AWS)
Work item code:	⌘	LCS2
Date:	⌘	1/6/2004
Category:	⌘	**B**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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

Reason for change: ⌘ Accurate routing of emergency calls to the correct Emergency Service Provider is required. Enabling routing based on the geographical coordinates of the calling party will increase the probability of more accurate routing.

A high level requirement has been added to LCS stage 1, 22.071 to optionally route Emergency calls to Emergency Service Providers based on the geographical coordinates (latitude and longitude) of the calling party. The LCS stage2, 23.271 need to be updated accordingly to satisfy the stage 1 requirement.

At SA#22 it was decided that the functionality agreed for R6 should be provided as far back as possible to R97 (as originally requested by T1P1). Hence, this is a R99 CR for the change that has been already agreed for R6.

Summary of change: ⌘ dded new functionality in the GMLC, LCZTF. The LCZTF performs ransformations of a location into a zone identity.

dded a new flow on NI-LR using Location Based Routing to the LCS Client.

lso, clarified that in North America either NA-ESRD or NA-ESRK (not both) is ent to the emergency services client in the emergency call origination.

Consequences if not approved: ⌘ The LCS stage 1 requirement will not be met.

The probability of routing Emergency Calls to the correct Emergency Service Provider may be reduced, timeliness and availability of emergency services may be adversely impacted.

Clauses affected:	⌘	3.3, 6.2, 8.7.3 New 5.4.1.4, 8.7.3A				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	*TS 29.002*
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:

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

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

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

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

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

3.3 Abbreviations

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

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

MO-LR	Mobile Originated Location Request
UE	Mobile Station
MSC	Mobile services Switching Centre
MSISDN	Mobile Station Integrated Services Data Network
MT-LR	Mobile Terminated Location Request
NI-LR	Network Induced Location Request
OSA	Open Service Architecture
OTDOA	Observed Time Difference Of Arrival
PC	Power Control
PCF	Power Calculation Function
PLMN	Public Land Mobile Network
PRCF	Positioning Radio Co-ordination Function
PRRM	Positioning Radio Resource Management
PSE	Personal Service Environment
PSMF	Positioning Signal Measurement Function
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RA	Routing Area
RACH	Random Access Channel
RAN	Radio Access Network
RANAP	Radio Access Network Application Part
RIS	Radio Interface Synchronization
RNC	Radio Network Controller
RRM	Radio Resource Management
RTD	Real Time Difference
SAT	SIM Application Tool-Kit
SGSN	Serving GPRS Support Node
SI	Service Interface (prefix to interface class method)
SIM	Subscriber Identity Module
SMS	Short Message Service
SIR	Signal Interference Ratio
SP	Service Point
SRNC	Serving RNC
SS7	Signalling System No 7
TA	Timing Advance
TMSI	Temporary Mobile Subscriber Identity
TOA	Time Of Arrival
U-…..	UMTS-(LCS functional block)
UDT	SCCP Unitdata message
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunication System
USIM	User Service Identity Module
UTRAN	Universal Terrestrial Radio Access Network
VASP	Value Added Service Provider
VHE	Virtual Home Environment
WCDMA	Wideband Code Division Multiple Access

Further GSM related abbreviations are given in GSM 01.04. Further UMTS related abbreviations are given in UMTS TS 22.101.

***** New clause *****

5.4.1.4 Location Client Zone Transformation Function (LCZTF)

The Location Client Zone Transformation Function (LCZTF) performs transformations of a location (latitude and longitude) into a zone identity, which in North America identifies a particular emergency services zone.

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

6.2 Allocation of LCS functions to UMTS network elements

Table 6.1 shows a summary of the Functional Groups and Functional Blocks for Location services in UMTS. Table 6.2 and Figure 6.2 show the generic configuration for LCS in UMTS and the distribution of LCS functional blocks to UMTS 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 mobile station.

LCS is logically implemented on the UMTS 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 in UMTS

Funct. Group	Functional component	Full name of Functional Block	Abbrev.
Loc. Client	Location Client component	(External) Location Client Function	LCF
		Internal Location Client Function	U-LCF -internal
LCS Server in PLMN	Client handling component	Location Client Control Function	LCCF
		Location Client Authorization Function	LCAF
		Location Client Zone Transformation Function	LCZTF
	System handling component	Stand-alone LMU Mobility Management Function	LMMF
		Location System Control Function	LSCF
		Location System Control Function in RNC	U-LSCF
		Location System Billing Function	LSBF
		Location System Operations Function	LSOF
	Subscr. handling component	Location Subscriber Authorization Function	LSAF
		Location Subscriber Privacy function	LSPF
	Positioning component	UMTS- Positioning Radio Control Function	U-PRCF
		UMTS- Positioning Calculation Function	U-PCF
		UMTS- Positioning Signal Measurement Function	U-PSMF
		UMTS- Positioning Radio Resource Management	U-PRRM

Table 6.2 and Figure 6.2 illustrate the allocation of functional entities in the reference configuration of LCS in UMTS. 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 in UMTS shall take benefit of the standardized Iur interface between RNSs, when uplink radio information and measurement results are collected.

The functional model presented in the figure includes functional entities for CS 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.

Table 6.2: Allocation of LCS functional entities to network elements

	UE	RAN	GMLC	3G-MSC	Client
Location client functions					
LCF	X			X	X
U-LCF Internal	ffs	X			
Client handling functions					
LCCTF			X		
LCCF			X		
LCAF			X		
LCZTF			X		
System handling functions					
LMMF				?	
LSCF				X	
U-LSCF		X			
LSBF			X	X	
LSOF	X	X	X	X	
Subscriber handling functions					
LSAF				X	
LSPF				X	
Positioning functions					
PRCF		X			
PCF	X	X			
PSMF	X	X			
PRRM		X			
	UE	**RAN**	**GMLC**	**3G-MSC**	**Client**

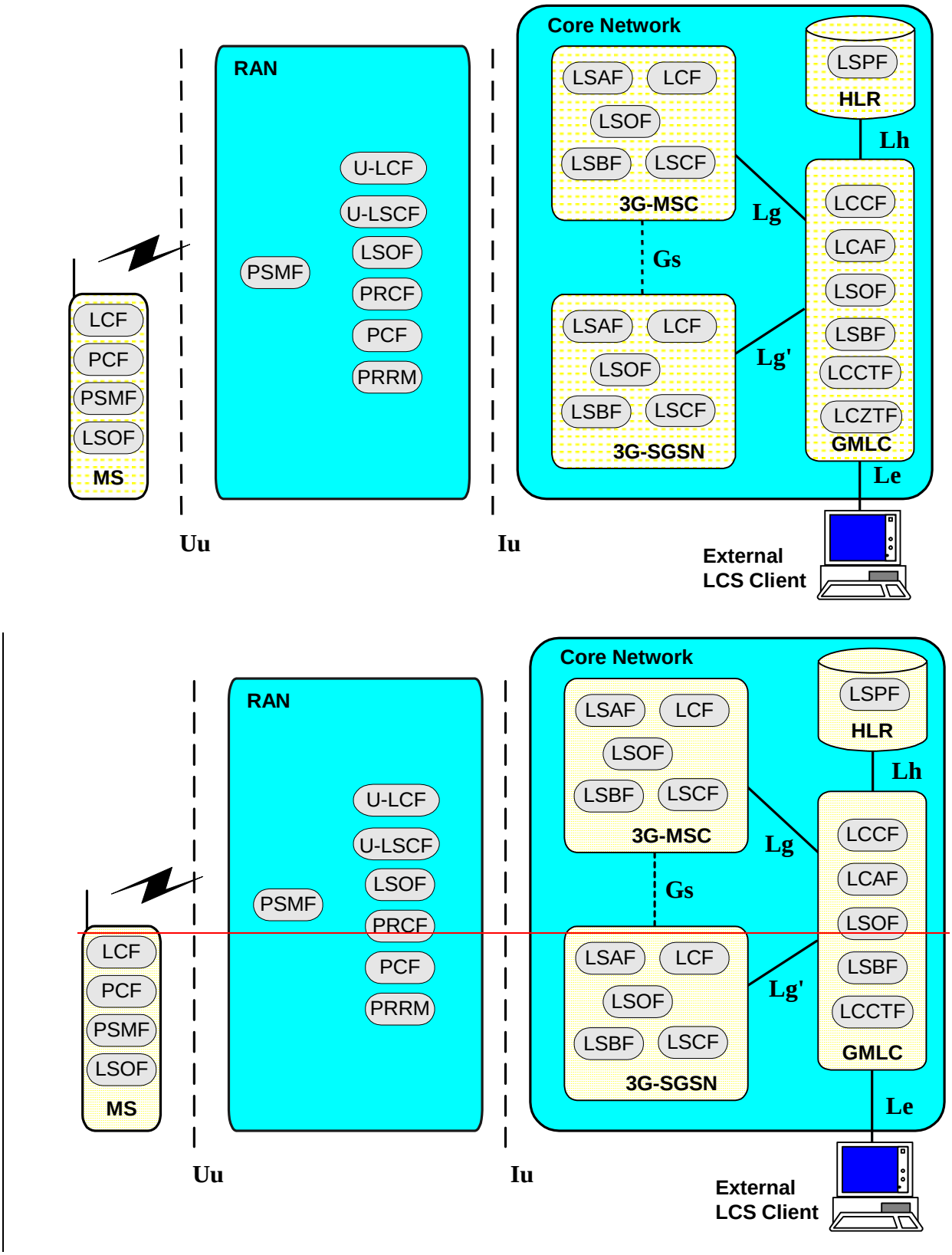


Figure 6.2: Generic LCS Logical Architecture

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

8.7.3 Network Induced Location Request (NI-LR)

Figure 8.5 illustrates positioning for an emergency service call.

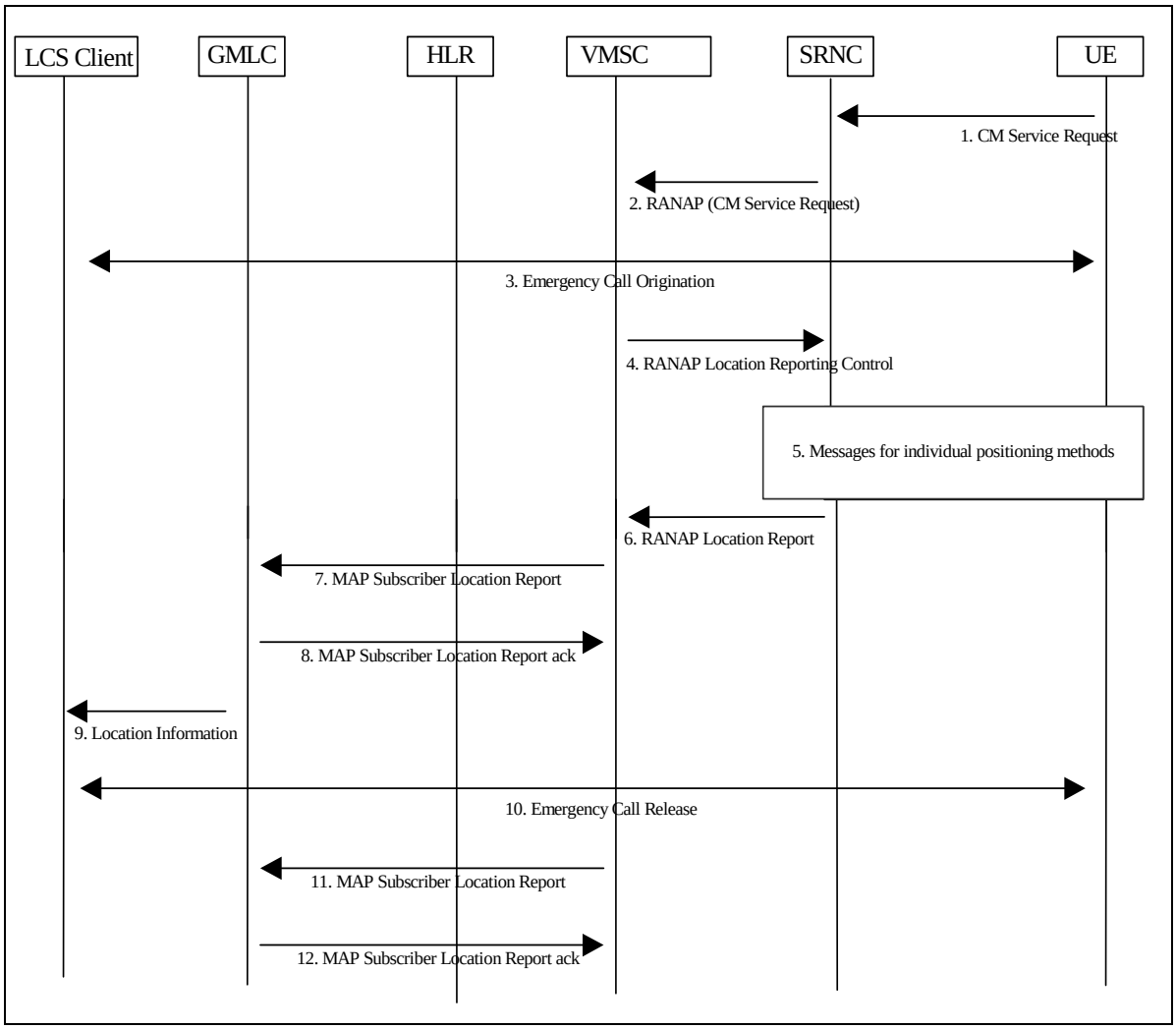


Figure 8.5: Positioning for a NI-LR Emergency Service Call

8.7.3.1 Location Preparation Procedure

1) An initially idle UE requests RRC setup (RACH) Service Request indicating a request for an Emergency Service call to the 3G-VMSC via the SRNC.

2) The SRNC shall convey the CM service request across the Iu-interface. (Before having a CM connection there must be a RRC connection.) The UE may identify itself using a TMSI, IMSI or IMEI.

3) The emergency call procedure is applied.

~~4)~~ The 3G-VMSC determines based on the serving cell the appropriate emergency services client. The 3G-VMSC, ~~,~~ SRNC and UE continue the normal procedure for emergency call origination towards ~~the appropriate~~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 8.7.3A. Call setup information sent into the

PSTN may include the UE location (if already obtained) plus information that will enable the emergency service provider to request UE location at a later time (e.g. NA-ESRD ~~and~~ or NA-ESRK in North America).

4~~5~~) At any time after step 2~~1~~ and after sufficient time has been allowed to enable completion of early classmark sending to the SRNC and MSC where the UE supports any UE assisted or UE based positioning method(s), the 3G-VMSC may initiate procedures to obtain the UE's location. These procedures may run ~~either~~ in parallel with the emergency call origination ~~or while emergency call origination is suspended to delay sending of call setup information into the PSTN according to step 3~~. The 3G-VMSC sends a RANAP Location ~~Request~~ Reporting Control message to the SRNC associated with the UE's current location area (see step 8 for a MT-LR). This message includes indication about the UE's location capabilities, and the QoS required for an emergency call.

8.7.3.2 Positioning Measurement Establishment Procedure

5~~6~~) The actions described under step 9 for a MT-LR are performed. If a speech compatible traffic channel is established, the same traffic channel may be used for both the positioning and the emergency call. In that case, the traffic channel may be allocated by either the positioning procedure or emergency call origination procedure.

8.7.3.3 Location Calculation and Release Procedure

6~~7~~) When a location estimate best satisfying the requested QoS has been obtained, the SRNC returns it to the 3G-VMSC.

7~~8~~) Depending on local regulatory requirements, the 3G-VMSC may send a MAP Subscriber Location report to a GMLC associated with the emergency services provider to which the emergency call has been or will be sent. This message shall carry any location estimate returned in step 6~~7~~, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling UE. In North America, any NA-ESRD and any NA-ESRK that may have been assigned by the 3G-VMSC shall be included. The message shall also indicate the event that triggered the location report. If location failed (i.e. an error result was returned by the SRNC in step 6~~7~~), an indication of failure rather than a location estimate may be sent to the GMLC: the indication of failure is conveyed by not including a location estimate in the MAP Subscriber Location Report.

8~~9~~) The GMLC acknowledges receipt of the location information. For a North American Emergency Services call, the GMLC shall store the location information for later retrieval by the emergency services LCS client.

~~10~~9) The GMLC may optionally forward the information received in step 8 to the emergency services LCS client. For a North American emergency services call the client is expected to obtain the location information by requesting it from the GMLC.

10~~1~~) At some later time, the emergency services call is released.

11~~2~~) For a North American Emergency Services call, the 3G-MSC sends another MAP Subscriber Location Report to the GMLC. This message may include the same parameters as before except that there is no position estimate and an indication of emergency call termination is included.

12~~3~~) The GMLC acknowledges the 3G-MSC notification and may then release all information previously stored for the emergency call.

***** New clause *****

8.7.3A NI-LR using Location Based Routing – applicable to North American Emergency Calls only

Figure 8.5A illustrates positioning for an emergency service call using location based routing.

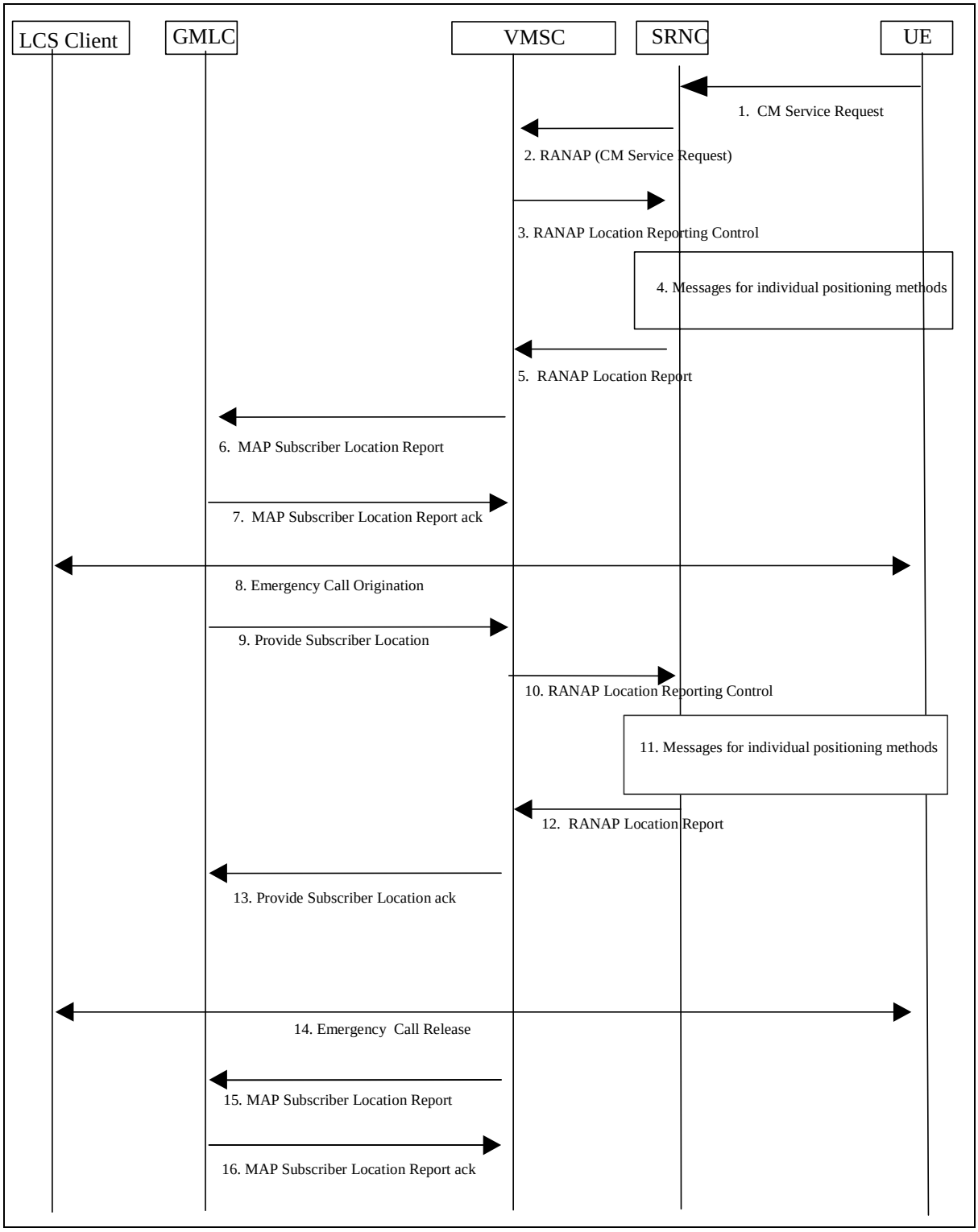


Figure 8.5A: Positioning for a NI-LR Emergency Service Call using Location Based Routing

8.7.3A.1 Location Preparation Procedure

1) An initially idle UE requests RRC setup (RACH) Service Request indicating a request for an Emergency Service call to the 3G-VMSC via the SRNC.

2) The SRNC shall convey the CM service request across the Iu-interface. (Before having a CM connection there must be a RRC connection.) The UE may identify itself using a TMSI, IMSI or IMEI.

3) The 3G-VMSC determines that the serving cell serves an area that contains portions of multiple emergency services zones. Therefore, the 3G-VMSC delays call setup and initiates procedures to obtain the UE's location for routing the emergency call to the emergency services LCS client. The 3G-VMSC sends a RANAP Location Reporting Control message to SRNC associated with the UE's current location area. This message includes indication about the UE's location capabilities and the QoS required for an emergency call.

8.7.3A.2 Positioning Measurement Establishment Procedure

4) The actions described under step 9 for a MT-LR are performed.

8.7.3A.3 Location Calculation and Release Procedure

5) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the 3G-VMSC. If a failure is received, the 3G-VMSC initiates emergency call setup using the normal NI-LR procedures.

6) The 3G-VMSC sends a MAP Subscriber Location Report to a GMLC associated with the emergency services client to which the emergency call will be sent. This message shall carry any location estimate returned in step 5, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling UE. Any NA-ESRD and NA-ESRK that was assigned by the 3G-VMSC shall be included. The message shall also include a request for an NA-ESRK value based on the UE position.

7) The GMLC translates the location estimate into a zone identity and assigns a NA-ESRK, which was requested by the 3G-VMSC. The GMLC shall include the NA-ESRK value in the MAP Subscriber Location Report ack and send it to the 3G-VMSC. The GMLC stores the assigned NA- ESRK and any NA-ESRD that was sent by the 3G-VMSC in step 6.

8.7.3A.4 Location Preparation Procedure

8) The emergency call procedure is applied. The 3G-VMSC, RAN and UE continue the normal procedure for emergency call origination towards the appropriate emergency services client. Call setup information sent into the PSTN may include the UE location plus information that will enable the emergency service provider to request UE location at a later time (NA-ESRD or NA-ESRK in North America). The NA-ESRK used shall be the one received from the GMLC. If a NA-ESRK is not received from the GMLC then the 3G-VMSC shall use the default NA-ESRK for the call as in 8.7.3.1 step 3.

9) At any time after step 6, the GMLC may send a MAP Provide Subscriber Location message to the 3G-VMSC. This message includes a QoS with higher delay and higher accuracy required for an emergency call.

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

10) The 3G-VMSC sends a RANAP Location Reporting Control message to SRNC. This message includes the type of location information requested, the UE's location capabilities and requested higher accuracy QoS.

8.7.3A.5 Positioning Measurement Establishment Procedure

11) same as step 4.

8.7.3A.6 Location Calculation and Release Procedure

12) same as step 5.

13) The 3G-VMSC returns the location information and its age to the GMLC. The GMLC shall replace the previously stored low accuracy location information with the higher accuracy information for later retrieval by the emergency services LCS client.

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

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

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

3GPP TSG-SA2 Meeting #37 ***Tdoc ⌘S2-040355***
Innsbruck, Austria, 12-16 January 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **245** ⌘ **rev** ⌘ Current version: **4.10.0** ⌘

*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 ☒

Title:	⌘	R4 Mirror CR: Routing of Emergency Calls based on Geographical Coordinates
Source:	⌘	SA2 (Nortel Networks, AWS)
Work item code:	⌘	LCS2 ***Date:*** ⌘ 1/6/2004
Category:	⌘	**B** ***Release:*** ⌘ Rel-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

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

Reason for change:	⌘	Accurate routing of emergency calls to the correct Emergency Service Provider is required. Enabling routing based on the geographical coordinates of the calling party will increase the probability of more accurate routing. A high level requirement has been added to LCS stage 1, 22.071 to optionally route Emergency calls to Emergency Service Providers based on the geographical coordinates (latitude and longitude) of the calling party. The LCS stage2, 23.271 need to be updated accordingly to satisfy the stage 1 requirement. At SA#22 it was decided that the functionality agreed for R6 should be provided as far back as possible to R97 (as originally requested by T1P1). Hence, this is a R4 mirror CR for the change that has been already agreed for R6.
Summary of change:	⌘	dded new functionality in the GMLC, LCZTF. The LCZTF performs ransformations of a location into a zone identity. dded a new flow on NI-LR using Location Based Routing to the LCS Client. lso, clarified that in North America either NA-ESRD or NA-ESRK (not both) is ent to the emergency services client in the emergency call origination.
Consequences if not approved:	⌘	The LCS stage 1 requirement will not be met. The probability of routing Emergency Calls to the correct Emergency Service Provider may be reduced, timeliness and availability of emergency services may be adversely impacted.

Clauses affected:	⌘	3.3, 6.2, 9.1.5 New 5.4.1.4, 9.1.5A				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	*TS 29.002*
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:

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

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

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

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

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

3.3 Abbreviations

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

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

ME	Mobile Equipment
MExE	Mobile Execution Environment
MLC	Mobile Location Center
MM	Mobility Management
MO-LR	Mobile Originated Location Request
MS	Mobile Station
MSC	Mobile Services switching Center
MSC	Mobile services Switching Centre
MSISDN	Mobile Station Integrated Services Data Network
MT-LR	Mobile Terminated Location Request
NA-ESRD	North American Emergency Service Routing Digits
NA-ESRK	North American Emergency Service Routing Key
NI-LR	Network Induced Location Request
OSA	Open Service Architecture
OTDOA	Observed Time Difference Of Arrival
PC	Power Control
PCF	Power Calculation Function
PLMN	Public Land Mobile Network
POI	Privacy Override Indicator
PRCF	Positioning Radio Co-ordination Function
PRRM	Positioning Radio Resource Management
PSE	Personal Service Environment
PSMF	Positioning Signal Measurement Function
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RA	Routing Area
RACH	Random Access Channel
RAN	Radio Access Network
RANAP	Radio Access Network Application Part
RIS	Radio Interface Synchronization
RNC	Radio Network Controller
RRM	Radio Resource Management
RTD	Real Time Difference
SAT	SIM Application Tool-Kit
SCCP	Signalling Connection Control Part
SCS	Service Capability Server
SGSN	Serving GPRS Support Node, SGSN in this specification normally refers to 3G-SGSN only, SGSN in GSM is noted 2G-SGSN
SI	Service Interface (prefix to interface class method)
SIM	Subscriber Identity Module
SIR	Signal Interference Ratio
SLPP	Subscriber LCS Privacy Profile
SMLC	Serving Mobile Location Center
SMS	Short Message Service
SP	Service Point
SRNC	Serving RNC
SS7	Signaling System No 7
TA	Timing Advance
TMSI	Temporary Mobile Subscriber Identity
TOA	Time Of Arrival
UDT	SCCP Unitdata message
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunication System
USIM	Universal Subscriber Identity Module
UTRAN	Universal Terrestrial Radio Access Network
VASP	Value Added Service Provider
VHE	Virtual Home Environment
WCDMA	Wideband Code Division Multiple Access

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

***** New clause *****

5.4.1.4 Location Client Zone Transformation Function (LCZTF)

The Location Client Zone Transformation Function (LCZTF) performs transformations of a location (latitude and longitude) into a zone identity, which in North America identifies a particular emergency services zone.

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

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 Zone Transformation Function	LCZTF
	System handling component	Location System Control Function	LSCF
		Location System Billing Function	LSBF
		Location System Operations Function	LSOF
	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. 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.

Table 6.2: Allocation of LCS functional entities to network elements

	UE	RAN	GMLC	SGSN	MSC/MSC Server	HLR	Client
Location client functions							
LCF	X			X	X		X
LCF Internal	Ffs	X					
Client handling functions							
LCCTF			X				
LCCF			X				
LCAF			X				
LCZTF			X				
System handling functions							
LSCF		X		X	X		
LSBF			X	X	X		
LSOF	X	X	X	X	X		
Subscriber handling functions							
LSAF				X	X		
LSPF				X	X	X	
Positioning functions							
PRCF		X					
PCF	X	X					
PSMF	X	X					
PRRM		X					
	UE	**RAN**	**GMLC**	**SGSN**	**MSC/MSC Server**		**Client**

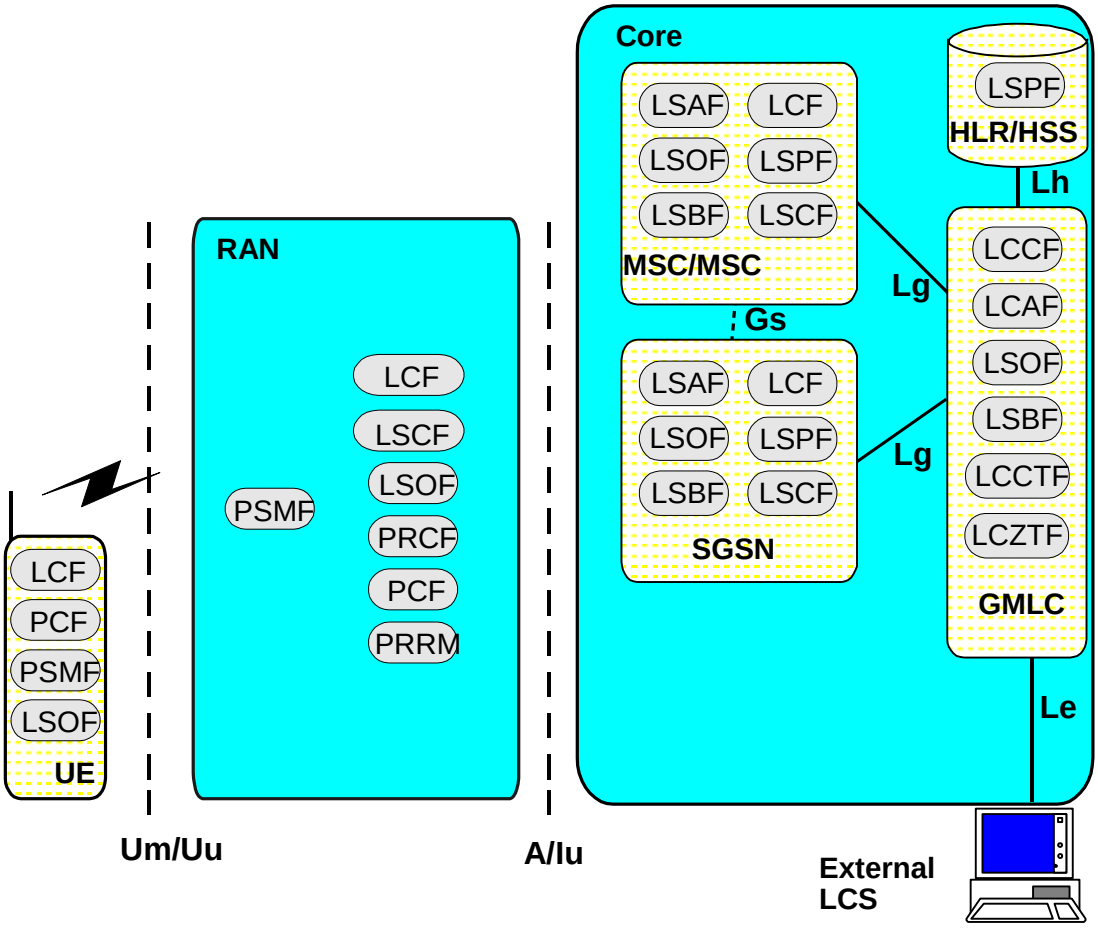


Figure 6.2: Generic LCS Logical Architecture

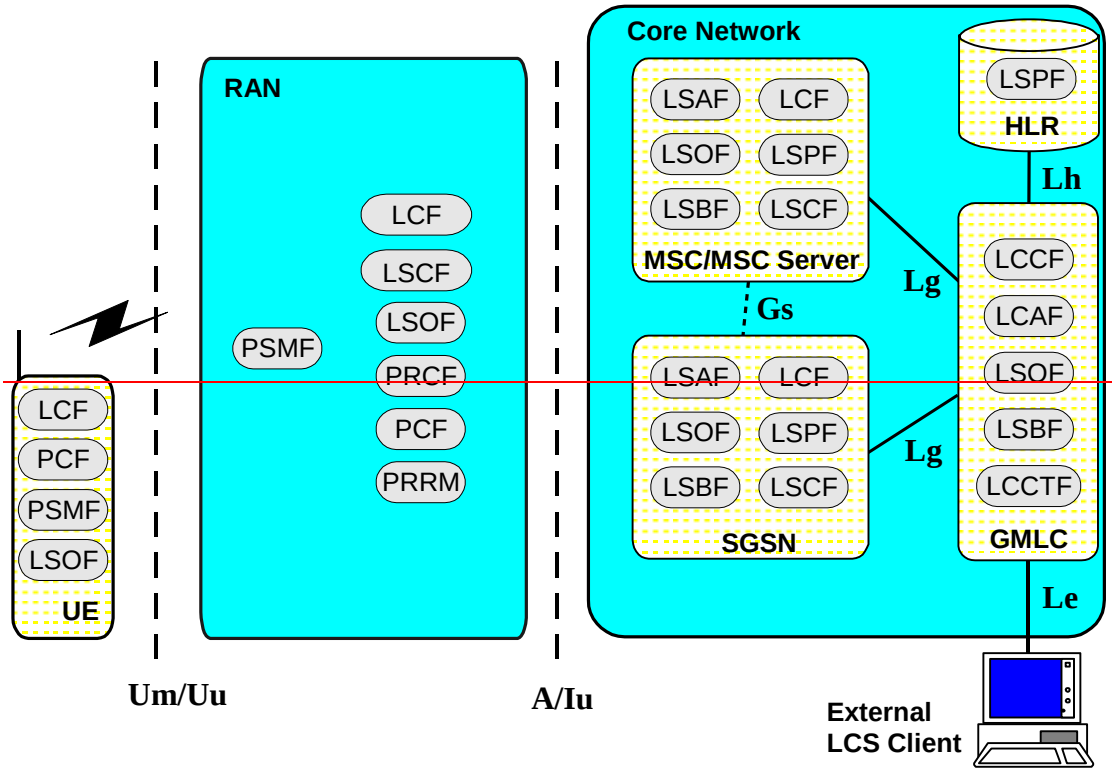


Figure 6.2: Generic LCS Logical Architecture

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

9.1.5 Network Induced Location Request (NI-LR)

Figure 9.4 illustrates positioning for an emergency service call.

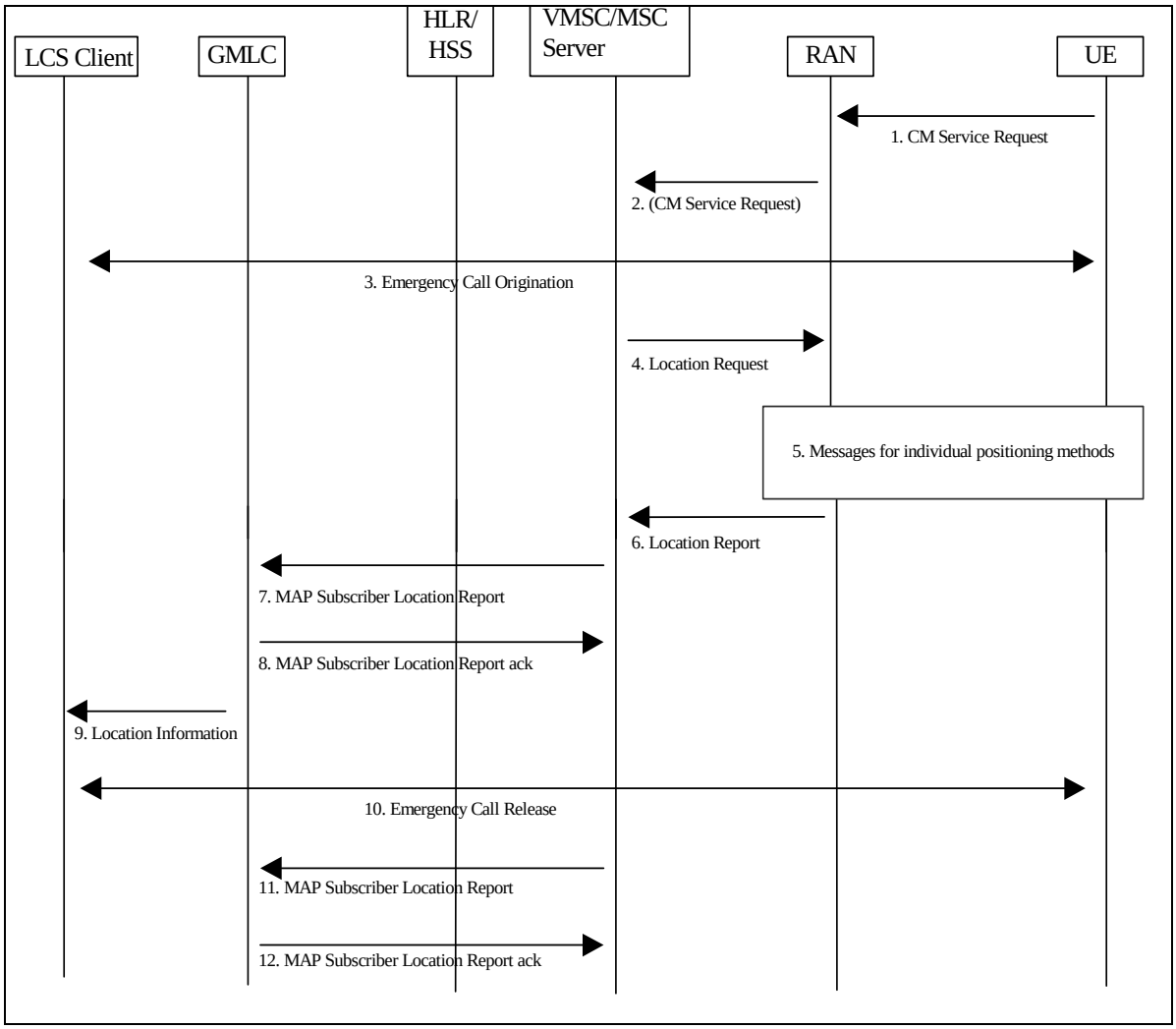


Figure 9.4: Positioning for a NI-LR Emergency Service Call

9.1.5.1 Location Preparation Procedure

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

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

3) The emergency call procedure is applied. The VMSC/MSC server determines based on the serving cell the appropriate emergency services client. The VMSC/MSC server, RAN and UE continue the normal procedure for emergency call origination towards ~~the appropriate~~ 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 ~~and~~ or NA-ESRK in North America).

4) At any time after step ~~1~~2, the VMSC/MSC server may initiate procedures to obtain the UE's location. These procedures may run either in parallel with the emergency call origination ~~or while emergency call origination is suspended to delay sending of call setup information into the PSTN according to step 3~~. The VMSC/MSC server sends a Location Request message to RAN associated with the UE's current location area (see step 6 for a MT-LR). This message includes the QoS required for an emergency call.

9.1.5.2 Positioning Measurement Establishment Procedure

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

9.1.5.3 Location Calculation and Release Procedure

6) When a location estimate best satisfying the requested QoS has been obtained, RAN returns it to the VMSC/MSC server. If a location estimate could not be obtained, the RAN returns a location response containing a failure cause and no location estimate.

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

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

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

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

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

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

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

***** New clause *****

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

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

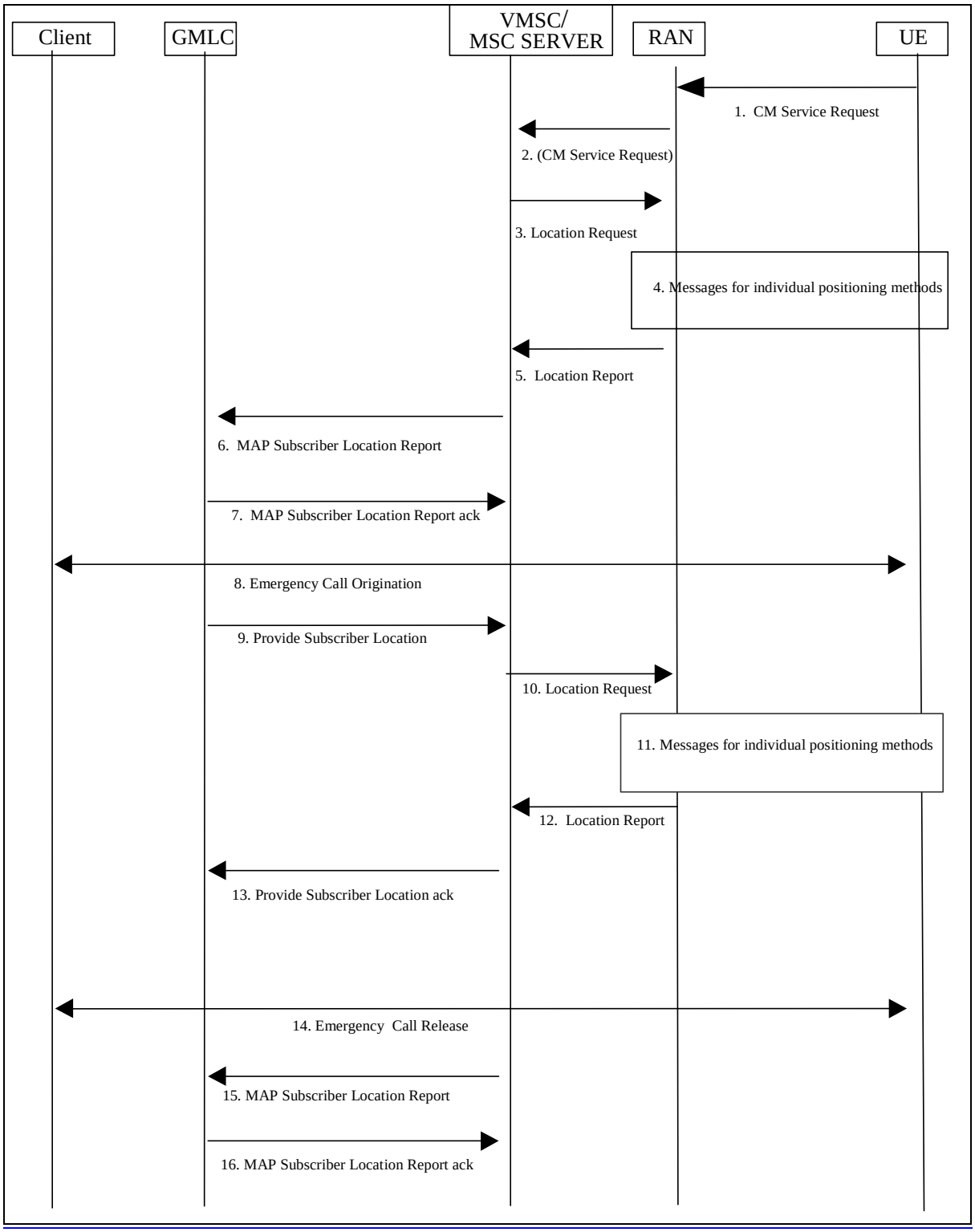


Figure 9.4A: Positioning for a NI-LR Emergency Service Call using Location Based Routing

9.1.5A.1 Location Preparation Procedure

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

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

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

9.1.5A.2 Positioning Measurement Establishment Procedure

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

9.1.5A.3 Location Calculation and Release Procedure

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

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

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

9.1.5A.4 Location Preparation Procedure

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

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

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

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

9.1.5A.5 Positioning Measurement Establishment Procedure

11) same as step 4.

9.1.5A.6 Location Calculation and Release Procedure

12) same as step 5.

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

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

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

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

3GPP TSG-SA2 Meeting #37 ***Tdoc ⌘S2-040356***
Innsbruck, Austria, 12-16 January 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **246** ⌘ **rev** ⌘ Current version: **5.9.0** ⌘

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

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

Title:	⌘	Routing of Emergency Calls based on Geographical Coordinates
Source:	⌘	SA2 (Nortel Networks, AWS)
Work item code:	⌘	LCS2 ***Date:*** ⌘ 1/6/2004
Category:	⌘	**A** ***Release:*** ⌘ Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

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

Reason for change:	⌘	Accurate routing of emergency calls to the correct Emergency Service Provider is required. Enabling routing based on the geographical coordinates of the calling party will increase the probability of more accurate routing. A high level requirement has been added to LCS stage 1, 22.071 to optionally route Emergency calls to Emergency Service Providers based on the geographical coordinates (latitude and longitude) of the calling party. The LCS stage2, 23.271 need to be updated accordingly to satisfy the stage 1 requirement. At SA#22 it was decided that the functionality agreed for R6 should be provided as far back as possible to R97 (as originally requested by T1P1). Hence, this is a R5 CR for the change that has been already approved for R6.
Summary of change:	⌘	dded new functionality in the GMLC, LCZTF. The LCZTF performs ransformations of a location into a zone identity. dded a new flow on NI-LR using Location Based Routing to the LCS Client. lso, clarified that in North America either NA-ESRD or NA-ESRK (not both) is ent to the emergency services client in the emergency call origination.
Consequences if not approved:	⌘	The LCS stage 1 requirement will not be met. The probability of routing Emergency Calls to the correct Emergency Service Provider may be reduced, timeliness and availability of emergency services may be adversely impacted.

Clauses affected:	⌘	3.3, 6.2, 9.1.5 New 5.4.1.4, 9.1.5A				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	*TS 29.002*
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:

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

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

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

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

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

3.3 Abbreviations

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

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

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

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

***** New clause *****

5.4.1.4 Location Client Zone Transformation Function (LCZTF)

The Location Client Zone Transformation Function (LCZTF) performs transformations of a location (latitude and longitude) into a zone identity, which in North America identifies a particular emergency services zone.

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

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 Zone Transformation Function	LCZTF
	System handling component	Location System Control Function	LSCF
		Location System Billing Function	LSBF
		Location System Operations Function	LSOF
	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. 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.

Table 6.2: Allocation of LCS functional entities to network elements

	UE	RAN	GMLC	SGSN	MSC/MSC Server	HLR/HSS	Client
Location client functions							
LCF	X			X	X		X
LCF Internal	Ffs	X					
Client handling functions							
LCCTF			X				
LCCF			X				
LCAF			X				
LCZTF			X				
System handling functions							
LSCF		X		X	X		
LSBF			X	X	X		
LSOF	X	X	X	X	X		
Subscriber handling functions							
LSAF				X	X		
LSPF				X	X	X	
Positioning functions							
PRCF		X					
PCF	X	X					
PSMF	X	X					
PRRM		X					
	UE	**RAN**	**GMLC**	**SGSN**	**MSC/MSC Server**		**Client**

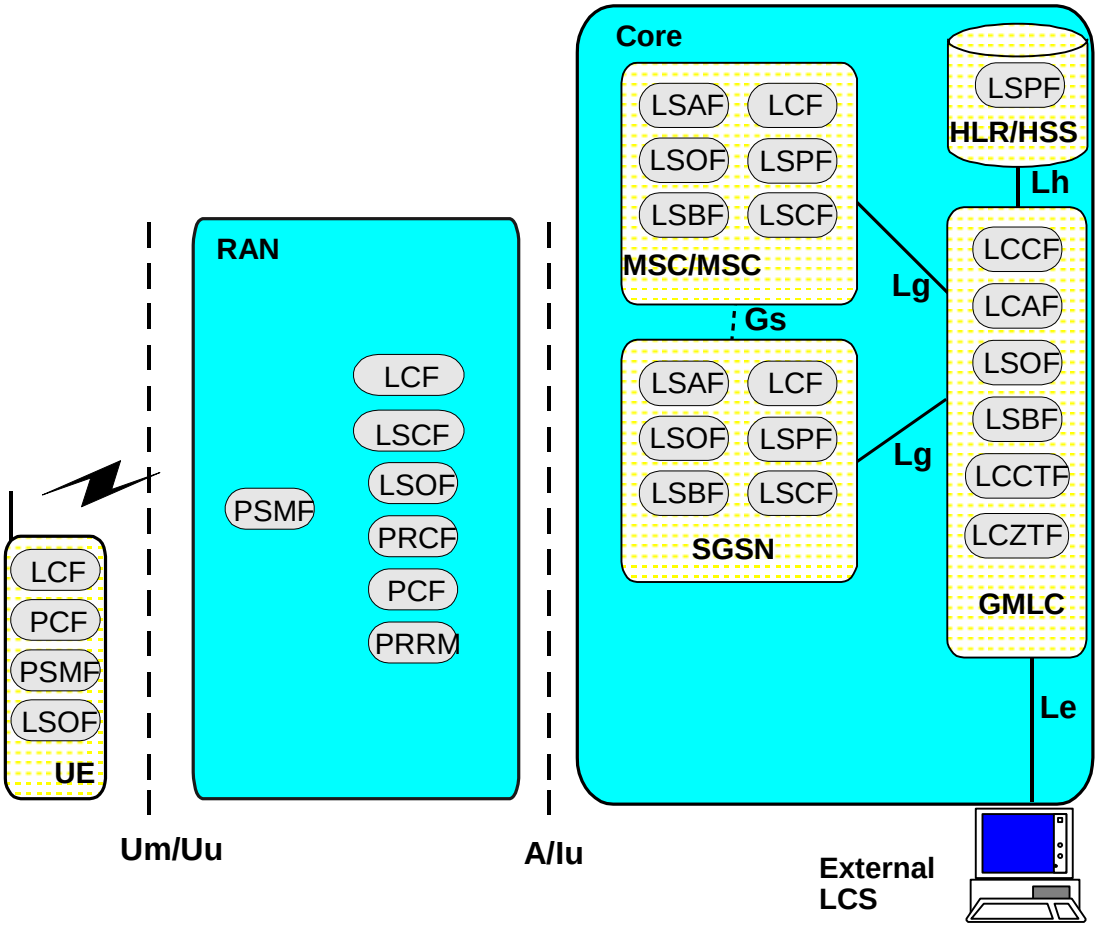


Figure 6.2: Generic LCS Logical Architecture

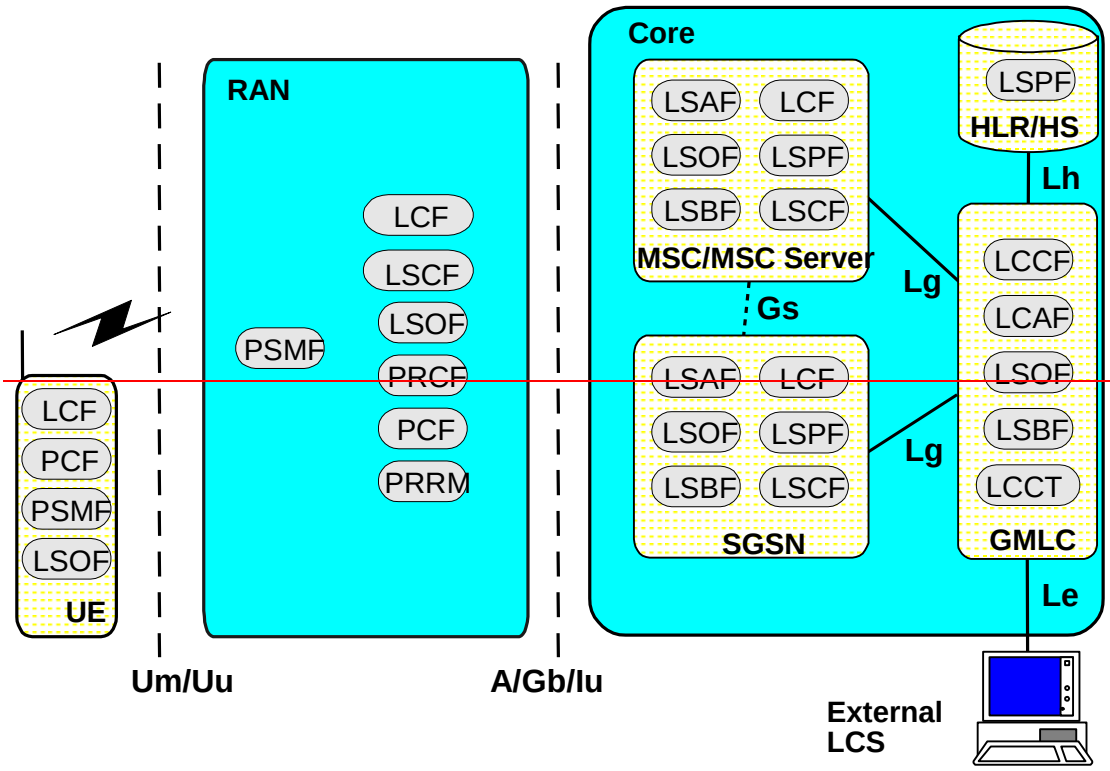


Figure 6.2: Generic LCS Logical Architecture

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

9.1.5 Network Induced Location Request (NI-LR)

Figure 9.4 illustrates positioning for an emergency service call.

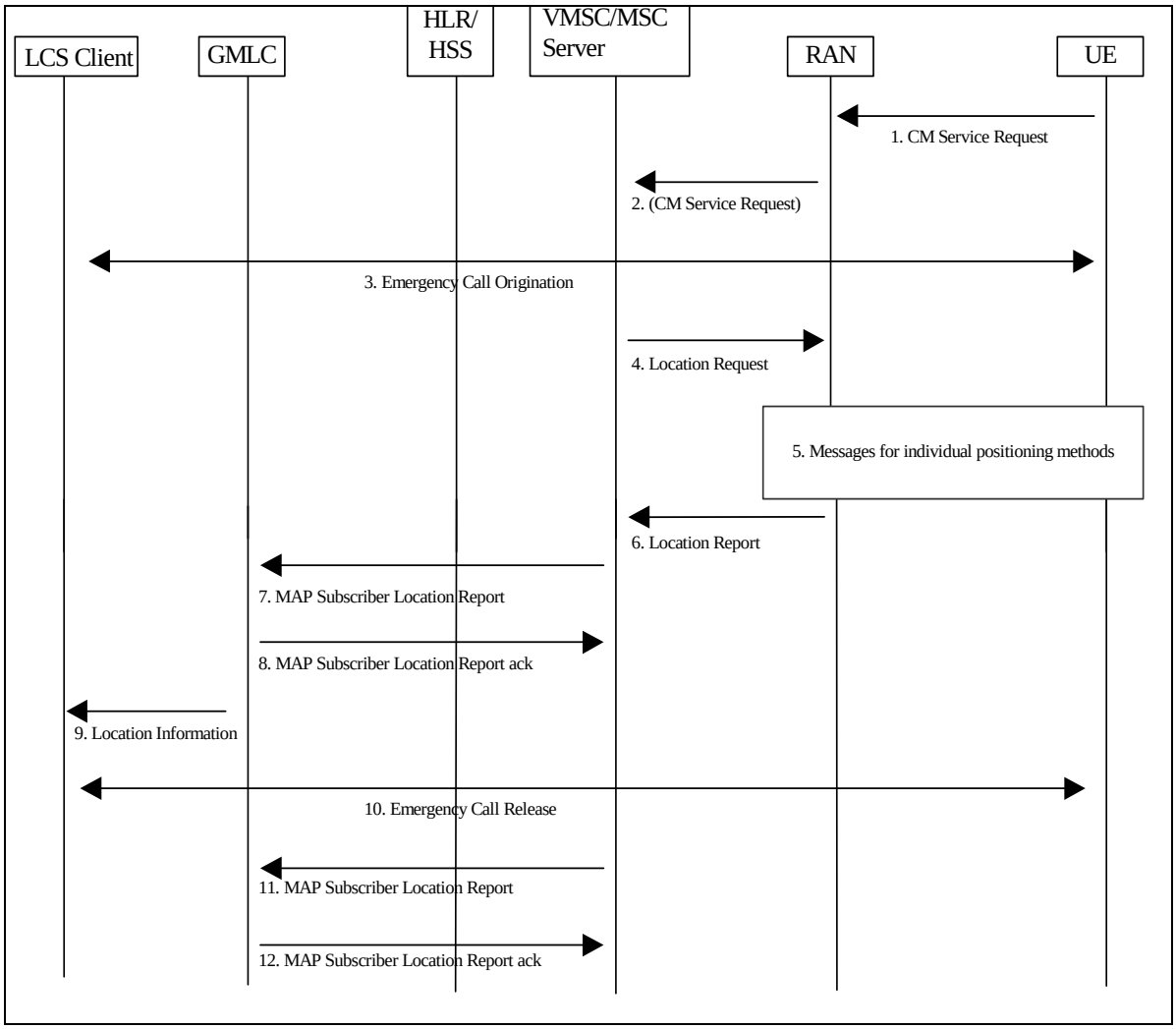


Figure 9.4: Positioning for a NI-LR Emergency Service Call

9.1.5.1 Location Preparation Procedure

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

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

3) The emergency call procedure is applied. The VMSC/MSC server determines based on the serving cell the appropriate emergency services client. The VMSC/MSC server, RAN and UE continue the normal procedure for emergency call origination towards ~~the appropriate~~ 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 ~~and~~ or NA-ESRK in North America).

4) At any time after step ~~1~~2, the VMSC/MSC server may initiate procedures to obtain the UE's location. These procedures may run either in parallel with the emergency call origination ~~or while emergency call origination is suspended to delay sending of call setup information into the PSTN according to step 3~~. The VMSC/MSC server sends a Location Request message to RAN associated with the UE's current location area (see step 6 for a MT-LR). This message includes the QoS required for an emergency call.

9.1.5.2 Positioning Measurement Establishment Procedure

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

9.1.5.3 Location Calculation and Release Procedure

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

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

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

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

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

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

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

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

***** New clause *****

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

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

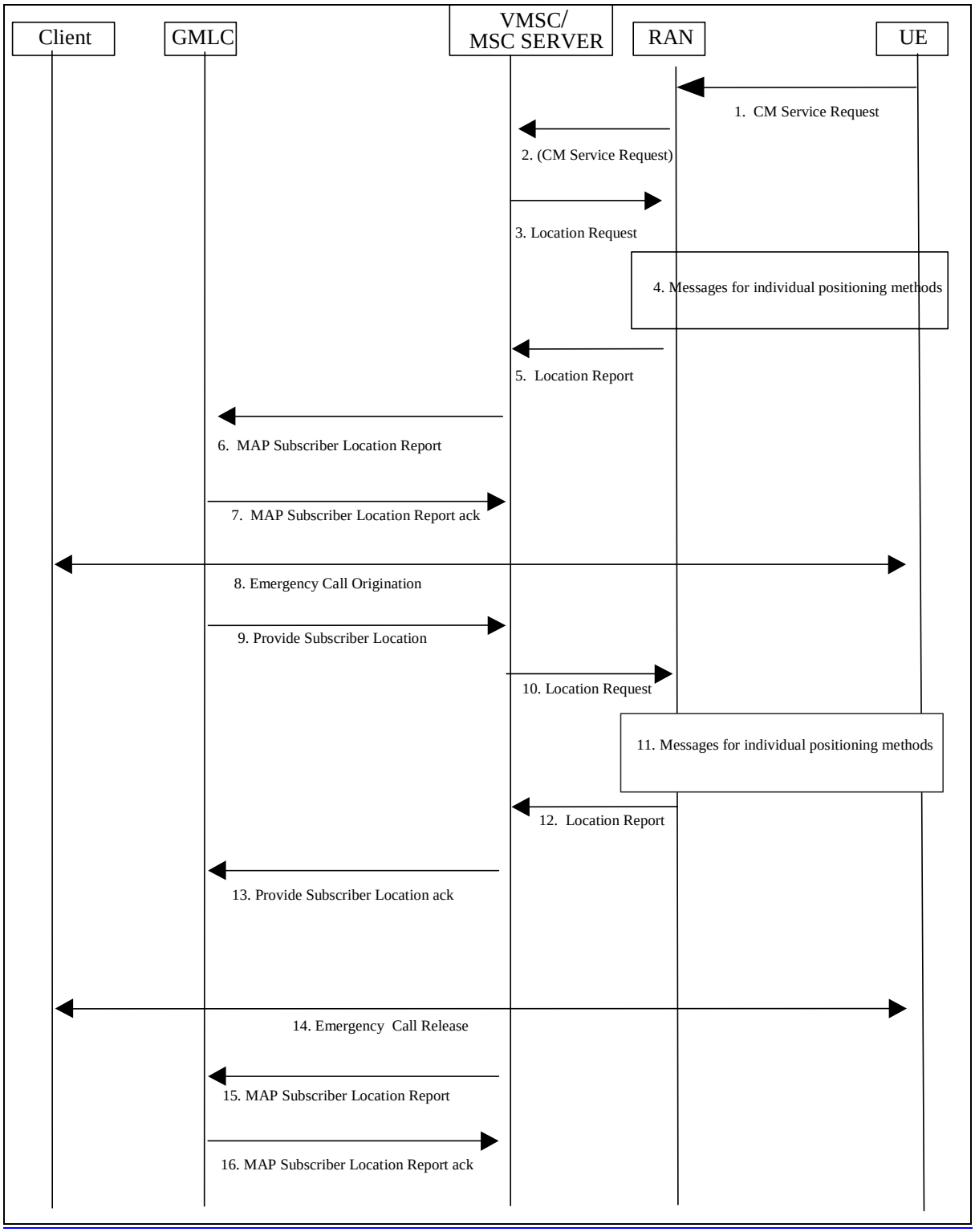


Figure 9.4A: Positioning for a NI-LR Emergency Service Call using Location Based Routing

9.1.5A.1 Location Preparation Procedure

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

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

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

9.1.5A.2 Positioning Measurement Establishment Procedure

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

9.1.5A.3 Location Calculation and Release Procedure

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

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

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

9.1.5A.4 Location Preparation Procedure

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

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

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

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

9.1.5A.5 Positioning Measurement Establishment Procedure

11) same as step 4.

9.1.5A.6 Location Calculation and Release Procedure

12) same as step 5.

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

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

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

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

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **242** ⌘ **rev** **2** ⌘ Current version: **6.6.0** ⌘

*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:	⌘	Roaming support for Area Event LDR
Source:	⌘	SA2 (Huawei, China Mobile)
Work item code:	⌘	LCS2
Date:	⌘	13/01/2004
Category:	⌘	**B**
Release:	⌘	REL-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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

Reason for change: ⌘[H14]

In the current area event procedure, there are three main problems:

1: If a PLMN supports area event service in some parts except the target area, in this case it's rather useless to download the cell ID list to the UE.

2: If a PLMN supports area event service in the target area part, but some of other parts do not support, in this case the current procedure does't work because the report sent by the UE to notifiy the H-GMLC that the UE entered into the PLMN shall be discarded by the low LCS capabality's MSC/SGSN or V-GMLC.

3: In case more than one PLMN cover the target area, e.g. the UE entered into the PLMN A first but when the UE entered into the target area, it chooses the PLMN B. In this scenario, the current procedure does not describe how the UE gets the cell ID list of PLMN B then send the report to the H-GMLC.

This proposed solution is not efficient to solve all above problems, it tends to solve the problem 2 and 3. the problem 1 is still left.

Summary of change: ⌘

1) in step 12 the report mechanism is enhanced: In case the UE does not receive the acknowledgment from the MSC/SGSN after sending the report to inform the H-GMLC that it has entered into a new PLMN of the PLMN list, the UE shall re-send the report more times, if the UE always does not receive the response, the UE shall stop sending the report, record a corresponding flag to indicate that a report be sent unsuccessfully. When the UE performs location update and detects the LAI or RA is changed, according to the flag the UE shall send the report to the corresponding MSC/SGSN.

2) A new step 15 is added: 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 not, 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 Area Definition of the new PLMN shall be downloaded to the UE, the procedure should be continued as described in step 2 and onwards. 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.
Consequences if not approved:	⌘	In some cases there are more than one GMLC with different LCS capabilities in the target PLMN, the area event LDR may needlessly fail.

Clauses affected:	⌘	9.1.9			
		Y	**N**		
Other specs Affected:	⌘	**X**		Other core specifications	⌘ TS 24.080
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

How to create CRs using this form:

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

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

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

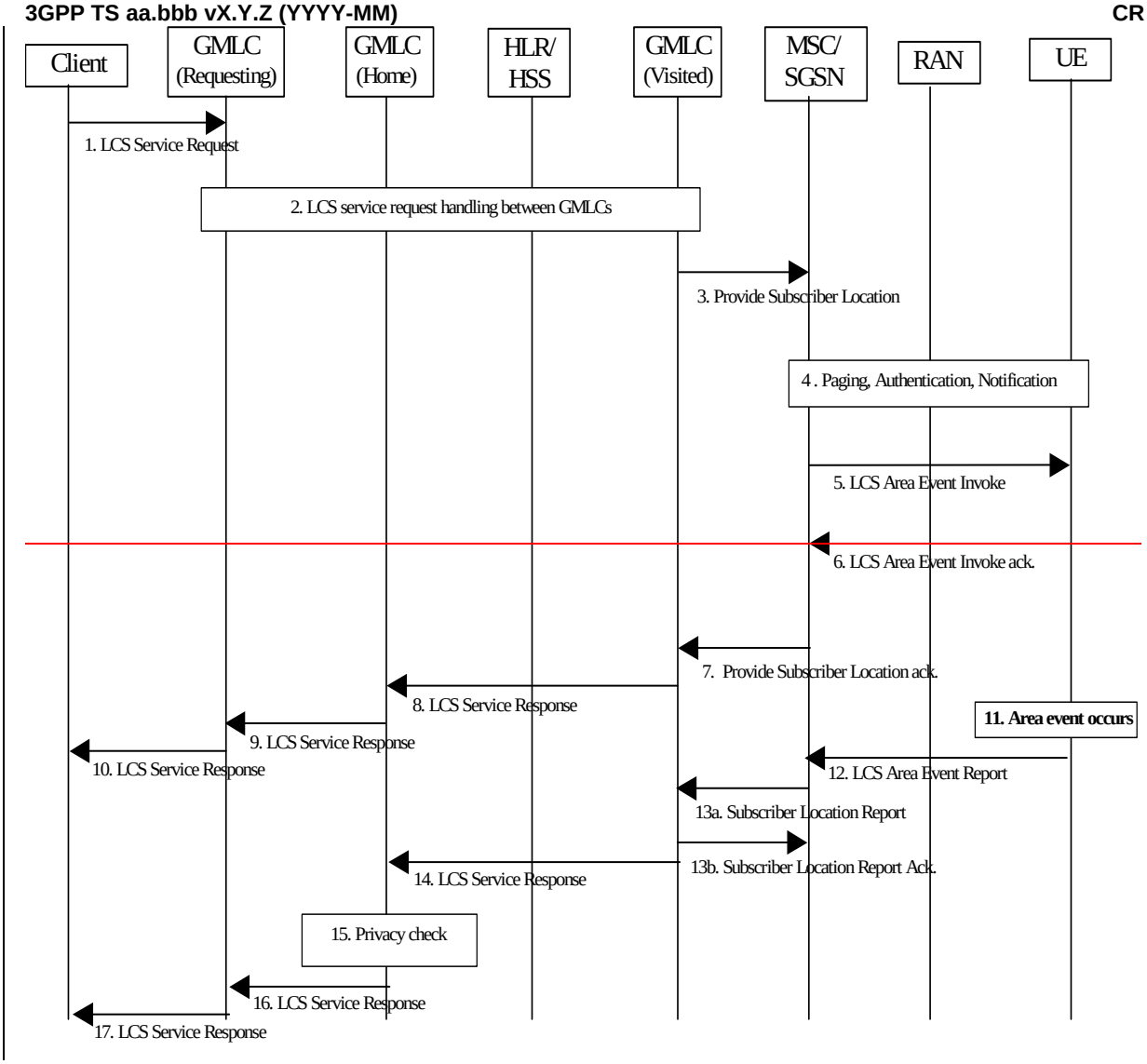
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< First changed clause >>

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


Client
GMLC (Requesting)
GMLC (Home)
HLR/ HSS
GMLC (Visited)
MSC/ SGSN
RAN
UE
1. LCS Service Request
2. LCS service request handling between GMLCs
3. Provide Subscriber Location
4 . Paging, Authentication, Notification
5. LCS Area Event Invoke
6. LCS Area Event Invoke ack.
7. Provide Subscriber Location ack.
8. LCS Service Response
9. LCS Service Response
10. LCS Service Response
11. Area event occurs
12. LCS Area Event Report
13a. Subscriber Location Report
13b. Subscriber Location Report Ack.
14. LCS Service Response
15. Privacy check
16. LCS Service Response
17. LCS Service Response

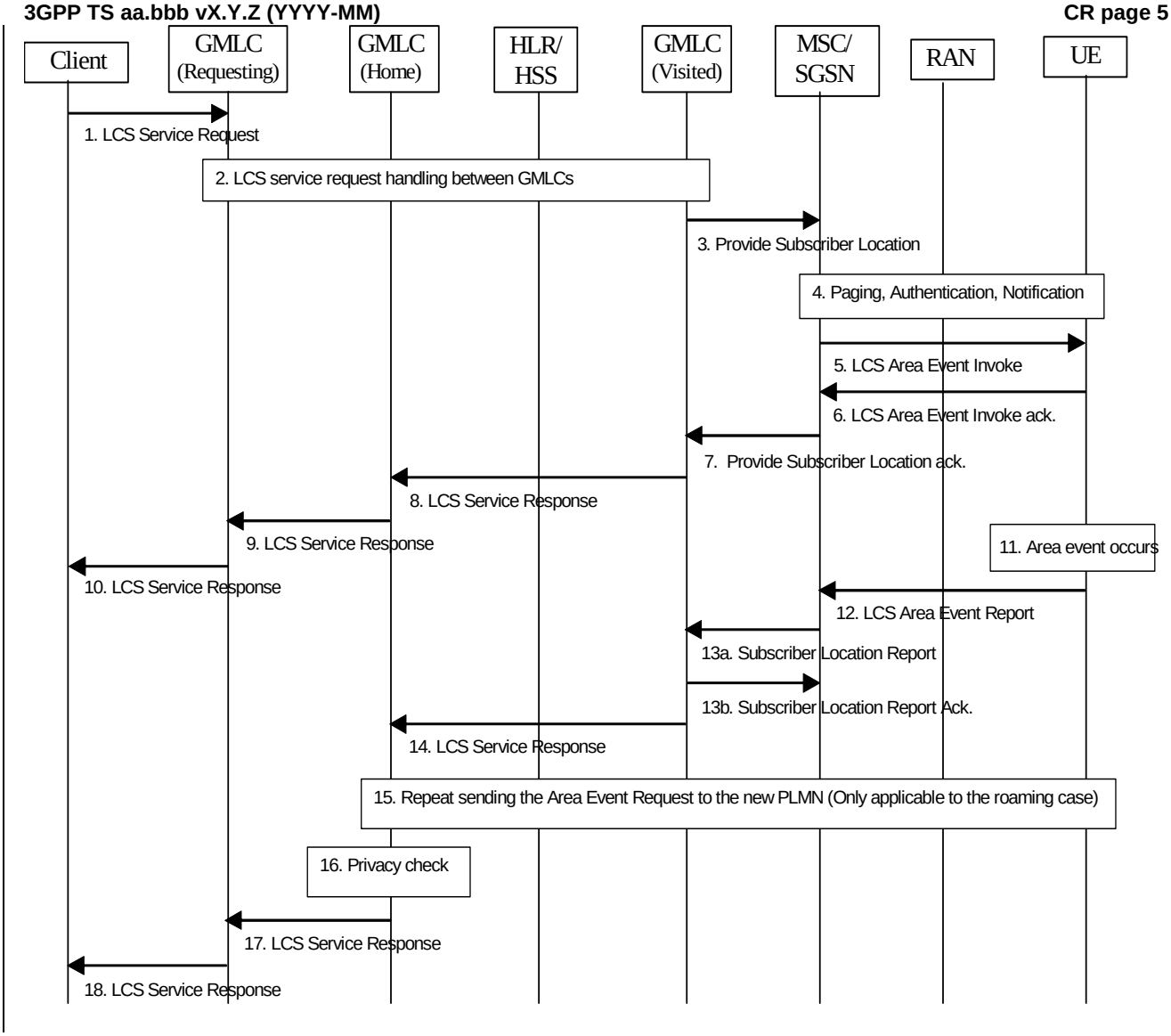


Figure 9.6d: Deferred MT-LR procedure for the Area event

1) The LCS Service Request contains the change of area type deferred location request information, i.e. details of the target area and the nature of the event, whether the event to be reported is the UE being inside, entering into or leaving the target area. The LCS service request may specify the validity time, i.e. start time and stop time, for the deferred location request and R-GMLC may cancel the deferred location request as described in clause 9.1.9.1. In addition, when validity time of a pending area event request in the target UE expires, the UE shall delete the pending deferred location request. The LCS Service Request shall contain an indication of the minimum interval time between area event reports, if applicable. The LCS service request shall contain the information whether the deferred area event may be reported one time only, or several times. If the change of area event is reported one time only, the Location Service request shall be completed after the first area event has occurred. The R-GMLC assigns a LDR reference number to this LCS Service request. If the target area is expressed by local coordinate system or geopolitical name, the R-GMLC shall convert the target area to geographical area expressed by a shape defined in TS23.032. In addition to the target area definition, the LCS Client may include the country code of the target area in the area event request.

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

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

estimated coverage. The H-GMLC then generates a new location request with the new defined area event and the same rest of the information in the original request.

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

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

3) If the received target area is expressed by a shape defined in TS23.032, V-GMLC converts the target area into an Area Definition consisting of the corresponding list of cell identities, location areas or routing area. If the V-GMLC is not able to translate the target area into network identities, it shall reject the request and send an LCS service response to H-GMLC with the appropriate error cause.
If the received target area is expressed by country code or PLMN identity, the V-GMLC shall use the country code or PLMN identity as the Area Definition.The V-GMLC sends the Area Definition to MSC/SGSN in the Provide Subscriber Location request (deferred) and includes the LDR reference number 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-GMLC returns the LCS Service Response to

the LCS Client, the LDR reference number assigned by the R-GMLC shall be included. After sending the LCS Service Response to the H-GMLC, the deferred location request shall be completed in the V-GMLC. The V-GMLC or R-GMLC may record charging information for an accepted area event request.

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

12) Before sending the LCS Area Event Report the UE shall establish either a CS radio connection or PS signalling connection as specified in clauses 9.2.1 and 9.2.2. The UE sends the LCS Area Event Report to the VMSC/SGSN including the original LDR reference number 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) ~~If the MSC/SGSN does not supports the deferred location request for the change of area event (for temporary or permanent reasons), the MSC/SGSN sends the subscriber location report to its associated V-GMLC with a suitable error cause. Otherwise, t~~The MSC/SGSN sends the subscriber location report to its associated V-GMLC with an indication of the event occurrence, the LDR reference number and the H-GMLC address. V-GMLC sends an acknowledgement to MSC/SGSN in step 13band the MSC/SGSN may record charging information.

14) ~~If the V-GMLC does not supports the deferred location request for the change of area event (for temporary or permanent reasons), the V-GMLC sends an LCS Service Response to the H-GMLC with a suitable error cause. Otherwise, t~~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 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.

~~15~~16) The H-GMLC performs the privacy check as described in clause 9.1.1.

~~16~~17) The H-GMLC sends the LCS Service Response to R-GMLC. Unless multiple reports were requested, the deferred location request shall be completed in the H-GMLC after sending the LCS Service Response to the R-GMLC. The H-GMLC may record charging information.

~~17~~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-SA2 Meeting #37

Tdoc ⌘S2-040152
(Revised S2-040306)

Innsbruck, Austria, 12th-16th January 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **243** ⌘**rev** **1** ⌘ Current version: **6.6.0** ⌘

*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 on the privacy check procedure in Rel-6, regarding the PLMN Operator service.
Source:	⌘	SA2 (Ericsson)
Work item code:	⌘	LCS2
Date:	⌘	3/1/2004
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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

Reason for change:	⌘	In Rel-6, the privacy check function is moved from MSC/SGSN to the H-GMLC/PPR. However, the current specification does not describe how GMLC handles the case when the UE subscribes to the PLMN Operator service and the incoming request is of PLMN type.
Summary of change:	⌘	Clauses 9.5.3.4 and 9.5.4 are modified, in order to state that the privacy related action indicator for the call/session unrelated class is set to 'allowed without notification', for the case of PLMN subscription.
Consequences if not approved:	⌘	The description of the privacy check procedures remains incomplete. This may cause wrong interpretation of the specification and therefore, wrong implementations, for the case that the UE subscribes to the PLMN Operator service.

Clauses affected:	⌘	9.5.3.4, 9.5.4

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

Other comments:	⌘	

How to create CRs using this form:

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

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

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

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

<< First Modified Clause >>

9.5.3.4 PLMN operator class

When the user of the UE subscribes to the " PLMN operator Class" the CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR positioning is allowed in the following cases:

Allow positioning by specific types of client within or associated with the VPLMN, with the following types of client identified:

* clients providing a location related broadcast service;
* O&M client in the HPLMN (when the UE is currently being served by the HPLMN);
* O&M client in the VPLMN;
* clients recording anonymous location information without any UE identifier;
* clients enhancing or supporting any supplementary service, IN service, bearer service or teleservice subscribed to by the target UE subscriber.

If the UE subscribes to the PLMN class, an NI-LR/PS-NI-LR or CS-MT-LR/PS-MT-LR shall be allowed if the client within the VPLMN, for an NI-LR/PS-NI-LR, or the client identified by the GMLC, for an CS-MT-LR/PS-MT-LR, either matches a generic type of client contained in the UE's SLPP or is otherwise authorized by local regulatory requirements to locate the UE. If H-GMLC/PPR knows that the serving node supports LCS capability set 4, then H-GMLC/PPR will send the indicators for call/session unrelated class, which indicates 'location allowed without notification'. If H-GMLC/PPR is notified that the serving node does not support the LCS capability set 4, then it will not send any indicator.

<< Next Modified Clause >>

9.5.4 Indicator of privacy check related action

When the client type indicates value added service and the serving node supports LCS capability set 4, H-GMLC/PPR shall select indicators for privacy check related action and the indicators shall be included in the Provide_Subscriber_Location request towards the serving node. The indication is sent to the serving node directly from the H-GMLC or via V-GMLC. There shall be an indicator for the call/session unrelated. Another indicator for the call/session related is optional and it shall be sent only if call/session related identity, i.e. the number dialled by UE or APN-NI, is sent to the serving node.

The possible values of the indicator of privacy check related action for call/session unrelated case shall be:

- Location allowed without notification
- Location allowed with notification
- Location with notification and privacy verification; location allowed if no response
- Location with notification and privacy verification; location restricted if no response
- Location not allowed (only applicable when the indicator for call/session related case is sent.)

The possible values of the indicator of privacy check related action for call/session related case shall be:

- Location allowed without notification
- Location allowed with notification
- Location with notification and privacy verification; location allowed if no response
- Location with notification and privacy verification; location restricted if no response

If both indicators are sent but indicating different actions and the call/session related criteria met in the serving node then an action according to the indicator with the looser action according to the definition in Annex A shall be chosen as shown in Annex A.3.

If the UE subscribes either to PLMN class or to the universal class, H-GMLC/PPR sends the indicator for call/session unrelated class with the value of “Location allowed without notification”.

3GPP TSG-SA WG2 Meeting #37
Innsbruck, Austria, 12-16 January 2004

Tdoc ⌘S2-040370

CR-Form-v7

CHANGE REQUEST

⌘ **23.271** **CR** **244** ⌘**rev** **1** ⌘ Current version: **6.6.0** ⌘

*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:	⌘	Integration of IMS Users into the LCS Architecture
Source:	⌘	SA2(Siemens)
Work item code:	⌘	LCS2
Date:	⌘	14/01/2004
Category:	⌘	**B**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

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

Reason for change:	⌘	Currently the standard LCS procedures are using the MSISDN as address of the target UE. The MSISDN enables the R-GMLC to retrieve the H-GMCL address via a MAP procedure from the HLR. If no MSISDN is present in the LCS service request, the R-GMLC is not able to route the request to the H-GMLC via Lr interface. Thus, IMS users that are addressed through their SIP-URI can not be located.
Summary of change:	⌘	An interworking function is introduced that enables routing of LCS service request messages to the user's home network and translation of an SIP-URI (or other Internet-like addressing schemes) into a MSISDN. This interworking function can easily implemented in an existing GMLC.
Consequences if not approved:	⌘	Using SIP-URIs within a location application to address a target UE will not be possible. As a consequence, all location applications have to provide the MSISDN when generating an LCS request.

Clauses affected:	⌘	3.2, 3.3, 5.2, 5.4.2.6 (new), 5.6.1, 6, 6.2, 6.4.1, 7.6 (new), 7.6.1 (new), 7.6.2 (new), 9.8 (new), 9.8.1 (new), 9.8.2 (new) 9.8.3 (new), 10.6 (new)

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

Other comments:	⌘	OMA specifications for MLP and RLP have to be enhanced so that SIP-URIs are allowed as address of a target UE. This CR is partly based on S2-034218 presented at SA2#36.

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 MODIFICATION ********

3.2 Symbols

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

Dh	Interface between LIMS-IWF and SLF
Gb	Interface between 2G-SGSN and BSS
Gs	Interface between MSC and SGSN
Lc	Interface between gateway MLC and gsmSCF (CAMEL interface)
Le	Interface between External User and MLC (external interface)
Lg	Interface between Gateway MLC - VMSC, GMLC - MSC Server, GMLC - SGSN (gateway MLC interface)
Lh	Interface between Gateway MLC and HLR (HLR interface)
Lid	Interface between GMLC and PMD.
Lpp	Interface between GMLC(H-GMLC) and PPR entity.
Lr	Interface between Gateway MLCs
Sh	Interface between LIMS-IWF and HSS
Um	GERAN Air Interface
Uu	UTRAN Air Interface

3.3 Abbreviations

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

2G-	Second Generation
3G-	Third Generation
AC	Admission Control
AI	Application Interface (prefix to interface class method)
ANM	Answer Message (ISUP)
APN	Access Point Name
APN-NI	APN Network Identifier
ARIB	Association of Radio Industries and Business
ATD	Absolute Time Difference
BCCH	Broadcast Control Channel
BER	Bit Error Rate
BSS	Base Station Subsystem
BTS	Base Transceiver Station
CAMEL	Customised Application For Mobile Network Enhanced Logic
CAP	CAMEL Application Part
CM	Connection Management
CN	Core Network
CSE	Camel Service Environment
DL	Downlink
DNS	Domain Name System
DRNC	Drift RNC
E-OTD	Enhanced Observed Time Difference
FER	Frame Error Rate
GERAN	GSM EDGE Radio Access Network
GGSN	Gateway GPRS Support Node

GMLC	Gateway MLC
GPRS	General Packet Radio Service
GPS	Global Positioning System
HE	Home Environment
H-GMLC	Home-GMLC
H-LIMS-IWF	Home-LIMS-IWF
HSS	Home Subscriber Server
HLR	Home Location Register
HPLMN	Home Public Land Mobile Network
IMEI	International Mobile Equipment Identity
IMS	IP Multimedia Subsystem
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPDL	Idle Period Downlink
LA	Location Application
LAF	Location Application Function
LBS	Location Based Services
LCAF	Location Client Authorization Function
LCCF	Location Client Control Function
LCCTF	Location Client Co-ordinate Transformation Function
LCF	Location Client Function
LCZTF	Location Client Zone Transformation Function
LCS	LoCation Services
LDR	Location Deferred Request
LIMS-IWF	Location IMS – Interworking Function
LIR	Location Immediate Request,
LMU	Location Measurement Unit
LSAF	Location Subscriber Authorization Function
LSBcF	Location System Broadcast Function
LSBF	Location System Billing Function
LSCF	Location System Control Function
LSCTF	Location System Co-ordinate Transformation Function
LSOF	Location System Operation Function
LSPF	Location Subscriber Privacy Function
LSTF	Location Subscriber Translation Function
MAP	Mobile Application Part
ME	Mobile Equipment
MExE	Mobile Execution Environment
MLC	Mobile Location Center
MLP	Mobile Location Protocol
MM	Mobility Management
MO-LR	Mobile Originated Location Request
MS	Mobile Station
MSC	Mobile services Switching Centre
MSISDN	Mobile Station Integrated Services Data Network
MT-LR	Mobile Terminated Location Request
NA-ESRD	North American Emergency Service Routing Digits
NA-ESRK	North American Emergency Service Routing Key
NI-LR	Network Induced Location Request
OSA	Open Service Architecture
OTDOA	Observed Time Difference Of Arrival
PC	Power Control
PCF	Power Calculation Function
PLMN	Public Land Mobile Network
PMD	Pseudonym mediation device functionality
POI	Privacy Override Indicator

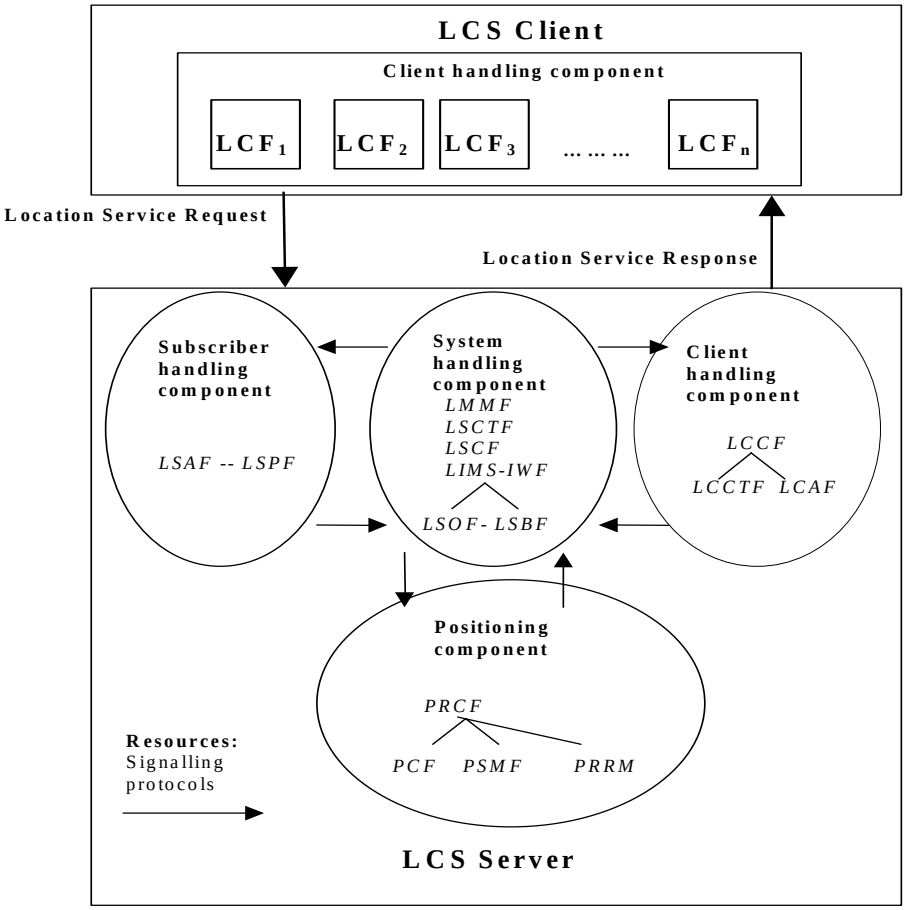
PPR	Privacy Profile Register
PRCF	Positioning Radio Co-ordination Function
PRRM	Positioning Radio Resource Management
PSE	Personal Service Environment
PSMF	Positioning Signal Measurement Function
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RA	Routing Area
RACH	Random Access Channel
RAN	Radio Access Network
RANAP	Radio Access Network Application Part
R-GMLC	Requesting-GMLC
RIS	Radio Interface Synchronization
R-LIMS-IWF	Requesting-LIMS-IWF
RNC	Radio Network Controller
RRM	Radio Resource Management
RTD	Real Time Difference
SAT	SIM Application Tool-Kit
SCCP	Signalling Connection Control Part
SCS	Service Capability Server
SGSN	Serving GPRS Support Node
SI	Service Interface (prefix to interface class method)
SIM	Subscriber Identity Module
SIP	Session Initiation Protocol
SIP-URI	SIP Uniform Resource Identifier
SIR	Signal Interference Ratio
SLF	Subscription Locator Function
SLPP	Subscriber LCS Privacy Profile
SMLC	Serving Mobile Location Center
SMS	Short Message Service
SP	Service Point
SRNC	Serving RNC
SS7	Signaling System No 7
TA	Timing Advance
TEL-URL	Telephone Uniform Resource Locator
TMSI	Temporary Mobile Subscriber Identity
TOA	Time Of Arrival
UDT	SCCP Unitdata message
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunication System
USIM	Universal Subscriber Identity Module
U-TDOA	Uplink Time Difference of Arrival
UTRAN	Universal Terrestrial Radio Access Network
VASP	Value Added Service Provider
V-GMLC	Visited -GMLC
VHE	Virtual Home Environment
WCDMA	Wideband Code Division Multiple Access

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

****** NEXT MODIFICATION ********

5.2 LCS Functional diagram, high level functions

TS 22.071 [4] describes LCS services from the LCS client point of view. In the present document, a more detailed description of LCS is given. The LCS functional diagram shown in figure 5.2 depicts the interaction of the LCS client and the LCS server within the PLMN. The PLMN uses the various LCS components within the LCS server to provide the target UE Location Information to the LCS client.



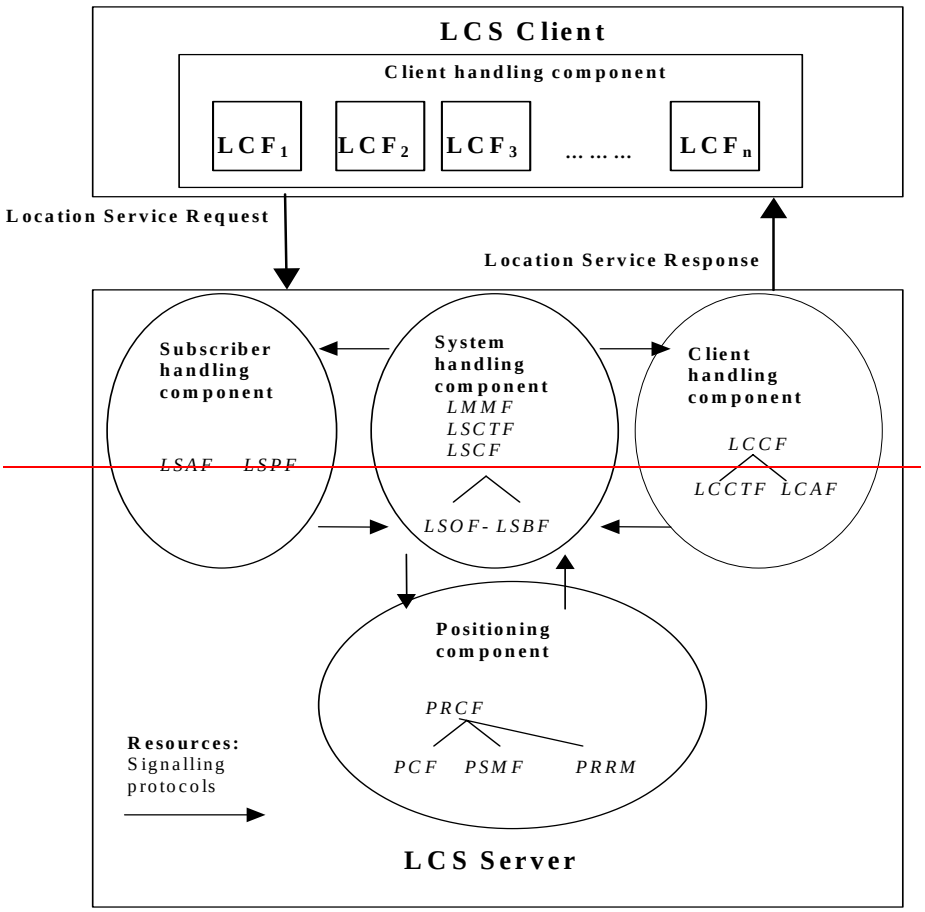


Figure 5.2: LCS capability server Functional Diagram

The following list gives the logical functional entities for the LCS. Two main functional groupings are defined which encompass a number of smaller functions.

The LCS Functional entities are grouped as follows:

- the LCS Client functional group;
- the LCS Server functional group consists of functions in the UMTS PLMN supporting LCS:
  - client handling component;
  - system handling component;
  - subscriber handling component;
  - positioning component.

The functions of the LCS Client and the LCS Server in the PLMN are described in more detail in this clause.

The allocation of LCS functions to network elements is specified in clause 6.

****** NEXT MODIFICATION ********

5.4.2.4 Location System Broadcast Function (LSBcF)

The Location System Broadcast Function (LSBcF) provides broadcast capability. The LSBcF capability is only used when broadcast data is required for E-OTD, OTDOA or assisted GPS positioning methods.

5.4.2.5 Location System Co-ordinate Transformation Function (LSCTF)

The Location System Co-ordinate Transformation Function (LSCTF) provides the conversion of an area definition, expressed in a geographic shape as defined in TS23.032, to network identities recognised only within a PLMN (such as Cell Identity, Location Area Identity). The area definition may convert to more than one network identity such as a collection of Cell Global Identities.

5.4.2.6 Location IMS – Interworking Function (LIMS-IWF)

The Location IMS – Interworking Function (LIMS-IWF) in the requesting network provides the capability to route LCS service requests based on an IMS Public User Identity (SIP-URI) to the home network of the target user. The LIMS-IWF in the home network of the target user is responsible to determine the appropriate HSS and to obtain the MSISDN associated with a IMS Public User Identity fom the HSS.

****** NEXT MODIFICATION ********

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 ;

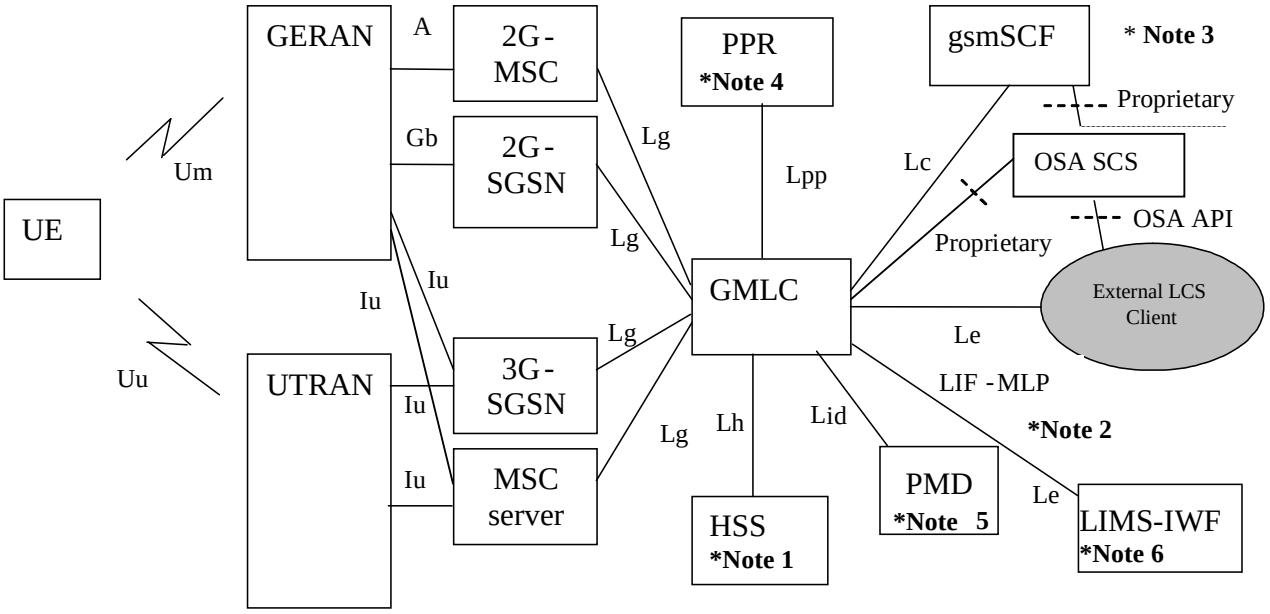
****** NEXT MODIFICATION ********

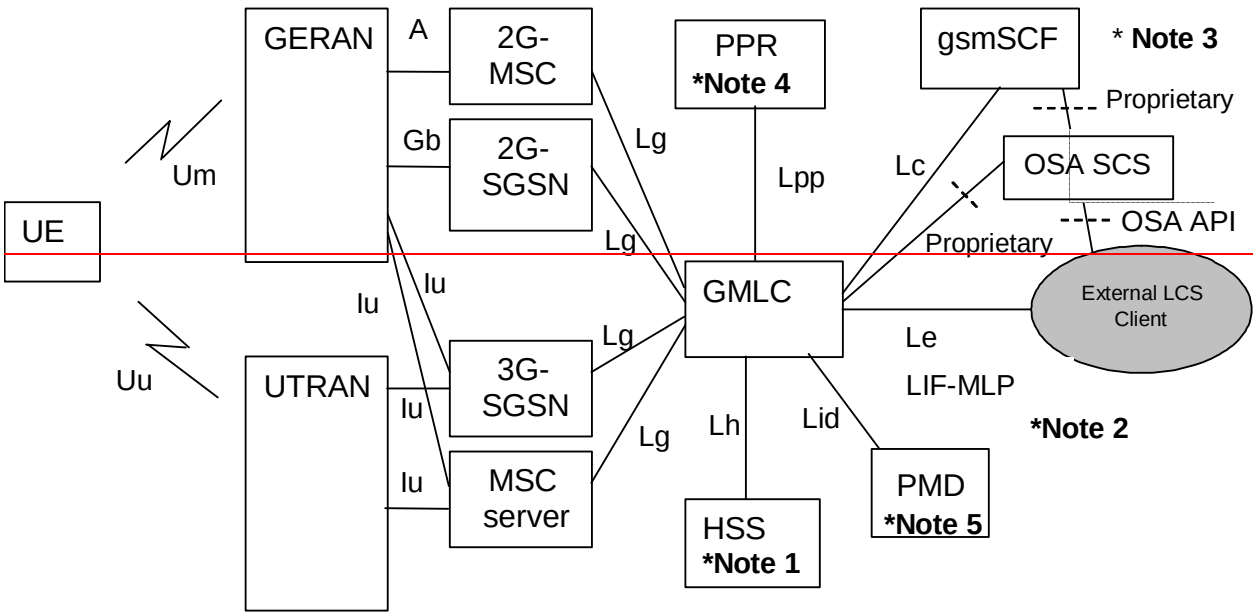
6 LCS Architecture

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 signaling 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).

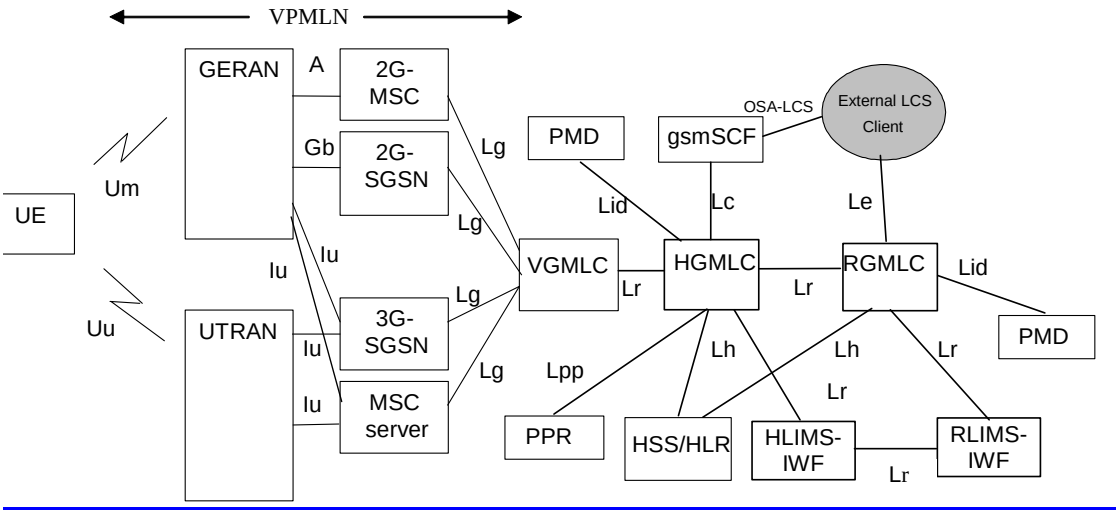
The clients make their requests to a LCS Server. There may be more than one LCS Server. The client must be authenticated and the resources of the network must be co-ordinated including the UE and the calculation functions, to estimate the location of the UE and result returned to the client. As part 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.


GERAN
A
2G-MSC
PPR
*Note 4
gsmSCF
* Note 3
Proprietary
Gb
2G-SGSN
Lg
Lpp
Lc
OSA SCS
OSA API
UE
Um
Proprietary
Iu
Iu
GMLC
External LCS Client
Lg
Le
Uu
UTRAN
3G-SGSN
LIF -MLP
Iu
Lg
Lh
Lid
*Note 2
Iu
MSC server
PMD
*Note 5
Le
HSS
*Note 1
LIMS-IWF
*Note 6


GERAN
A
2G-MSC
PPR
*Note 4
gsmSCF
* Note 3
Proprietary
Gb
2G-SGSN
Lg
Lpp
Lc
OSA SCS
OSA API
UE
Um
Proprietary
Iu
Iu
GMLC
External LCS Client
Lg
Le
Uu
UTRAN
3G-SGSN
LIF-MLP
Iu
Lg
Lh
Lid
*Note 2
Iu
MSC server
PMD
*Note 5
HSS
*Note 1

NOTE 1: HSS includes both 2G-HLR and 3G-HLR functionality. LCS is included in the overall network architecture in TS 23.002 [20].
NOTE 2: LIF-MLP may be used on the Le interface
NOTE 3: As one alternative the LCS client may get location information directly from GMLC, which may contain OSA Mobility SCS with support for the OSA user location interfaces. See TS 23.127 [26] and TS 29.198 [27, 28, 29 and 30].
NOTE 4: The PPR functionality may be integrated in GMLC
NOTE 5: The PMD functionality may be integrated in GMLC or PPR.
NOTE 6: The LIMS-IWF may optionally be located within the GMLC.

Figure 6.1-1: General arrangement of LCS



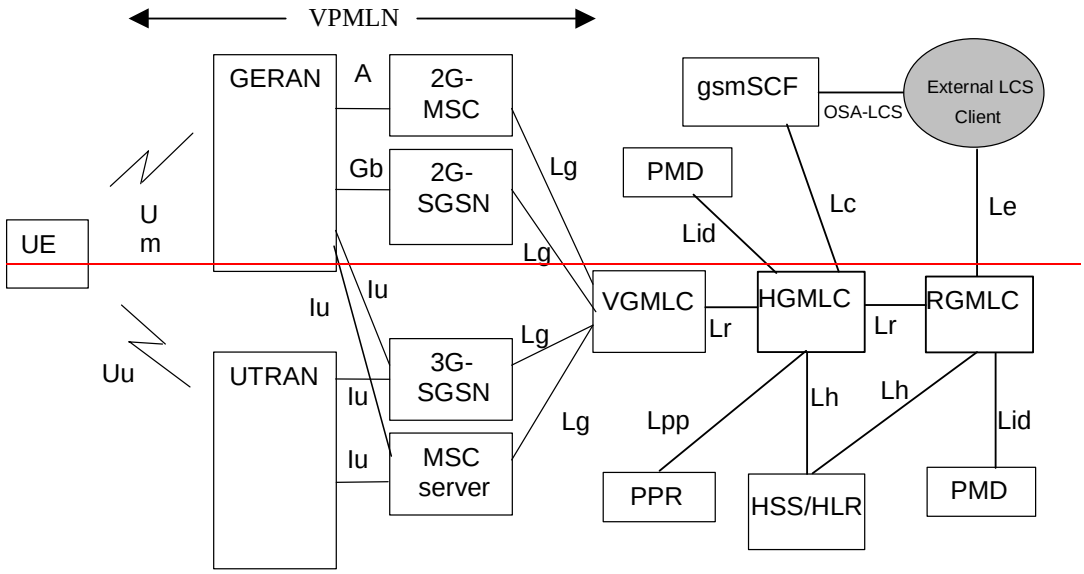


Figure 6.1-2: General arrangement of LCS with inter-GMLC and LIMS-IWF [Lr] interface

****** NEXT MODIFICATION ********

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.

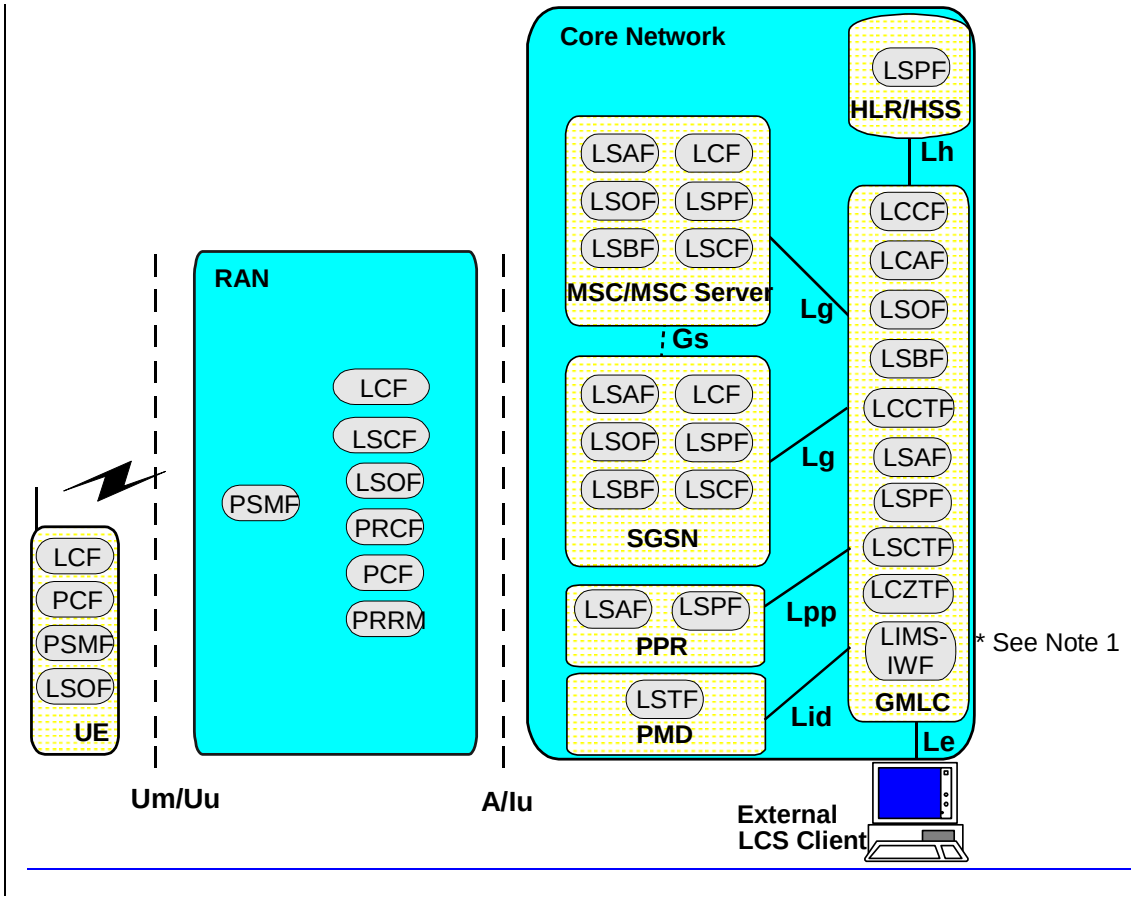
The functional model presented in the figure includes functional entities for both CS and PS related LCS. In addition, it consists of all the entities needed for different positioning methods, i.e. network based,

mobile based, mobile assisted, and network assisted positioning, exploiting either uplink or downlink measurements. 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.

Table 6.2: Allocation of LCS functional entities to network elements

	UE	RAN	GMLC	SGSN	MSC/MSC Server	HLR/HSS	PPR	PMD	Client
Location client functions									
LCF	X			X	X				X
LCF Internal		X							
Client handling functions									
LCCTF			X						
LCCF			X						
LCAF			X						
LCZTF			X						
System handling functions									
LSCF		X		X	X				
LSBF			X	X	X				
LSOF	X	X	X	X	X				
LSCTF			X						
LIMS-IWF			X (Note 1)						
Subscriber handling functions									
LSAF			X	X	X		X		
LSPF			X	X	X	X	X		
LSTF								X	
Positioning functions									
PRCF		X							
PCF	X	X							
PSMF	X	X							
PRRM		X							
	UE	**RAN**	**GMLC**	**SGSN**	**MSC/MSC Server**	**HLR/HSS**	**PPR**	**PMD**	**Client**

Note 1: The LIMS-IWF may optionally be located within the GMLC. If it is not located within the GMLC, it shall use the Le or Lr reference point to interface to the GMLC.


Core Network
LSPF
HLR/HSS
Lh
LSAF
LCF
LSOF
LSPF
LSBF
LSCF
MSC/MSC Server
Lg
Gs
LSAF
LCF
LSOF
LSPF
LSBF
LSCF
SGSN
Lg
LSAF
LSPF
PPR
Lpp
LSTF
PMD
Lid
LCCF
LCAF
LSOF
LSBF
LCCTF
LSAF
LSPF
LSCTF
LCZTF
LIMS-IWF
GMLC
Le
* See Note 1
RAN
LCF
LSCF
LSOF
PRCF
PCF
PRRM
PSMF
LCF
PCF
PSMF
LSOF
UE
Um/Uu
A/Iu
External
LCS Client

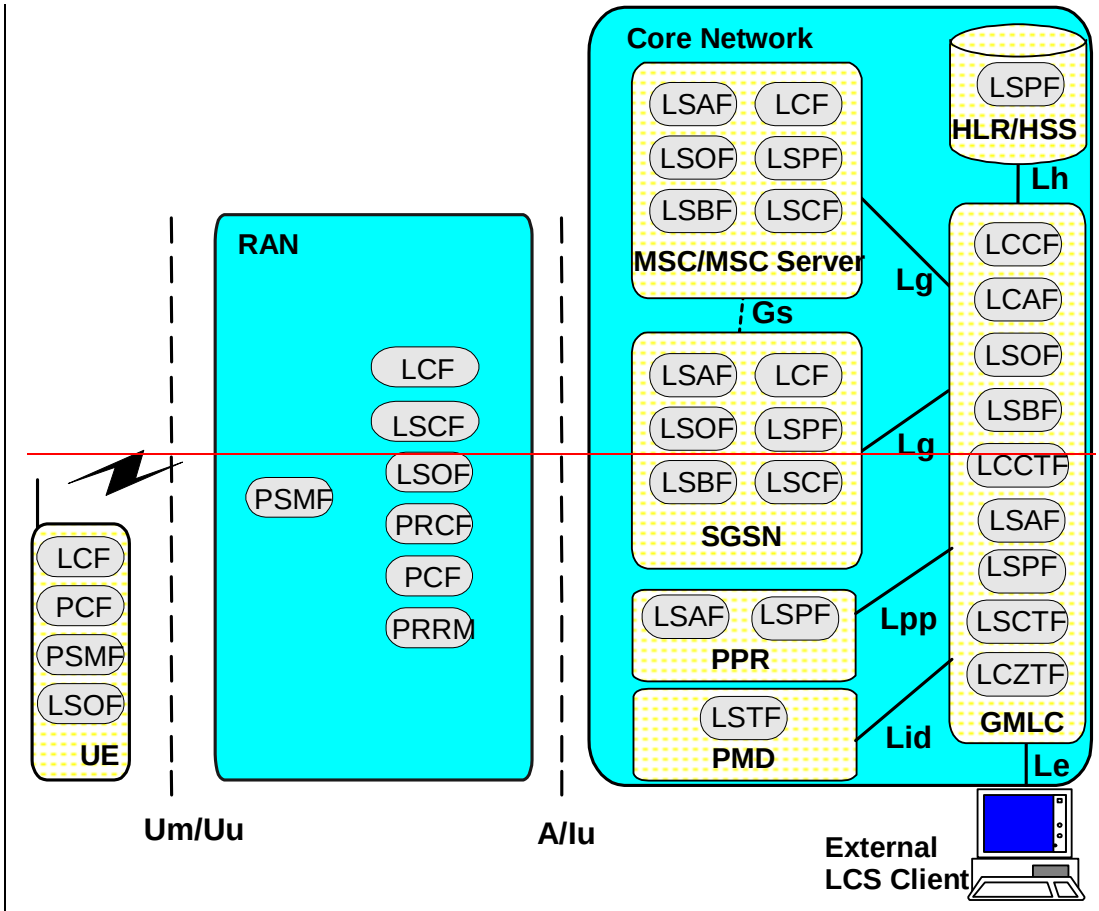


Figure 6.2: Generic LCS Logical Architecture

Note 1: The LIMS-IWF may optionally be located within the GMLC. If it is not located within the GMLC, it shall use the Le or Lr reference point to interface to the GMLC.

****** NEXT MODIFICATION ********

6.4.1 Verinyms for the target UE

It shall be possible to address and indicate the target UE using MSISDN and SIP-URI. It may be possible in certain cases to address the target UE using IP address when a static or dynamic IP address (IPv4 or IPv6) has been allocated for the UE.

In the mobile terminated location request procedures in the PS domain (as well as in the CS domain), the target UE is identified using either MSISDN or IMSI.

NOTE: It is recognized that IP-addressing of the target UE is only possible when there is an active PDP context established between the target UE and the external LCS client. Using the established PDP context, the LCS client can request the target UE, as identified with the IP address it currently uses, to initiate a Mobile originated location request. The actual signaling exchange between the LCS Client/server and the target UE or the user of the target UE is outside the scope of this specification. The resulting MO-LR is performed as specified in this document.

****** NEXT MODIFICATION ********

7.5.2 LCS Identity Response

The PMD sends the LCS Identity Response to the H-GMLC as a result of the LCS Identity Request by the H-GMLC.

The following attribute is identified for the LCS Identity Response information flow:

- Target UE identity, (one or both of MSISDN and IMSI);

7.6 IMS related Interfaces

7.6.1 Dh Interface

Dh is the interface between LIMS-IWF and SLF. The purpose of this interface is to retrieve the address of the correct HSS serving the user. Dh is an optional interface.

7.6.2 Sh Interface

Sh is the interface between LIMS-IWF and HSS. The purpose of this interface is to retrieve the user's MSISDN.

****** NEXT MODIFICATION ********

9.7.2 Location request for a mobile in dedicated-mode

When a request for location information is received at the VMSC, if the UE is already busy on CM level, the LCS-layer shall attempt to establish a parallel transaction to the existing one. If successful, the LCS-layer shall invoke the location preparation procedure.

9.8 Interworking with the IMS

9.8.1 Standard Location Request using a SIP-URI

An external LCS Client shall use the same interface to the LCS Server regardless of the target UE's identity.

If a location request from an external LCS client uses a SIP-URI as the target UE's identity, the requesting GMLC shall invoke a LIMS-IWF (Location IMS Interworking Function) to route the request to the user's home network. This routing mechanism may use standard technologies like pre-configuration of destination addresses or DNS lookups to determine the address of a LIMS-IWF in the home network of the user. The interface between two LIMS-IWF in different networks shall be Lr.

If the LIMS-IWF in the home network is not co-located with the home GMLC, it shall use the same interface towards the home GMLC as the requesting GMLC, i.e. the Lr interface. The LIMS-IWF in the home network has to determine the HSS serving the user. This may be done e.g. by a Dh SLF query or the HSS address is known to the LIMS-IWF through configuration.~~,~~ The LIMS-IWF retrieves the MSISDN from the HSS through Sh Pull and use MAP Send Routing Info for LCS to get the home GMLC IP address from the HLR. Afterwards the LIMS-IWF in the home network can forward the LCS service request (including the target UE's MSISDN) on the Lr interface to the home GMLC.

The following figure shows the principle call flow when a GMLC receives a location request where the target UE's identity is an IMS Public User Identity (SIP-URI).

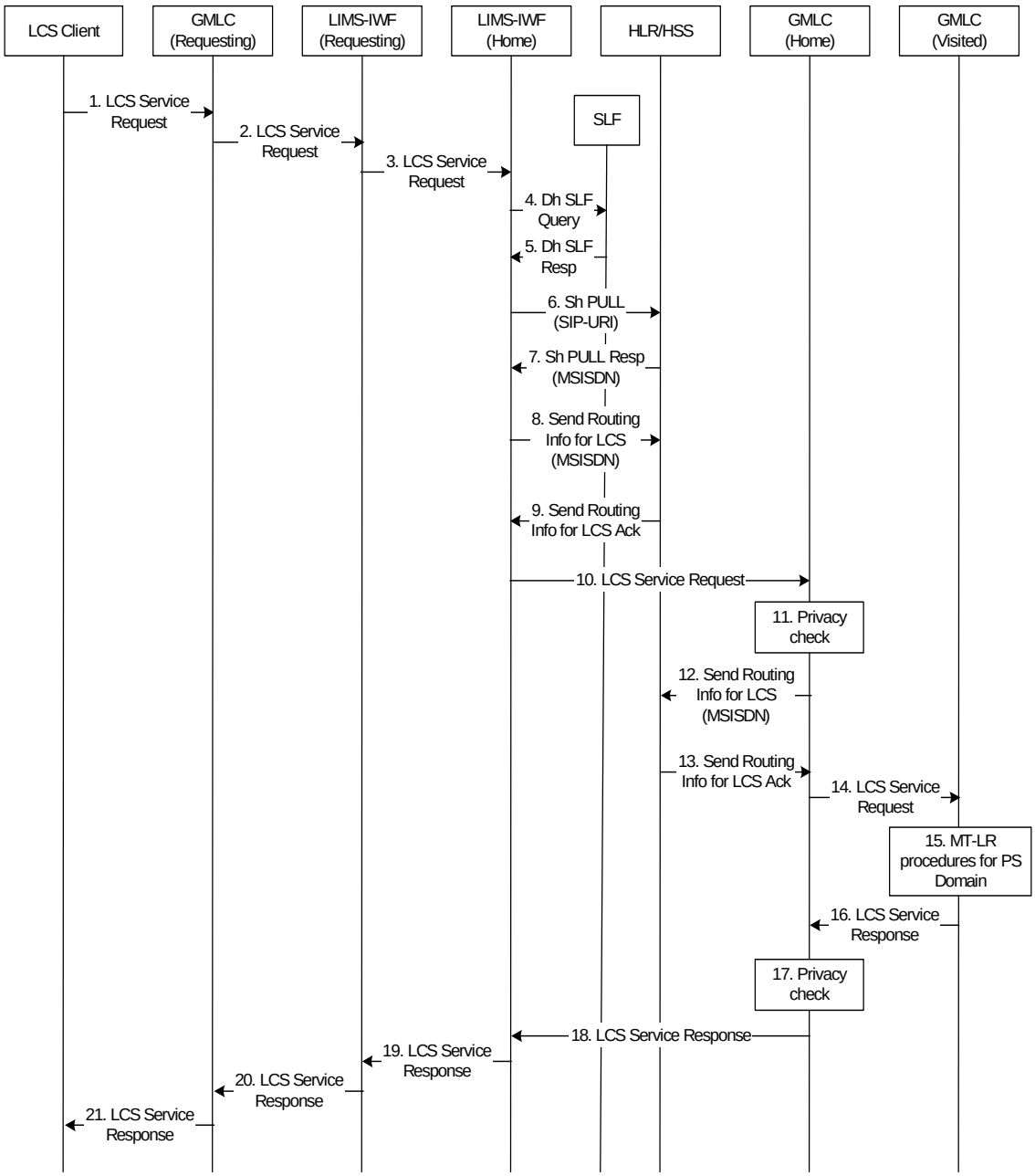


Figure X: MT-LR procedure for IMS Public User Identities

1. An external LCS Client requests the current location of a target UE from a R-GMLC using the Public User Identity (SIP-URI) associated with the target UE.

2. The R-GMLC selects a LIMS-IWF in the requesting network. The LIMS-IWF address may be pre-configured or DNS is used for this purpose. The R-GMLC forwards the LCS service request to the requested LIMS-IWF via Lr interface.

3. The LIMS-IWF in the requesting network determines the LISM-IWF address in the home network. This may be done by using a pre-configured address or by DNS. The requesting LIMS-IWF forwards the LCS service request to the home LIMS-IWF via Lr interface.

4. The home LIMS-IWF queries the SLF via Dh interface to get the HSS address (using the Dh interface to retrieve the HSS address is an option).

5. The home LIMS-IWF retrieves the HSS address from the SLF via Dh SLF Response.

6. The home LIMS-IWF queries the HSS via Sh PULL (including the SIP-URI) to get the user's MSISDN.

7. The home LIMS-IWF retrieves the user's MSISDN from the HSS via Sh PULL Response.

8. The LIMS-IWF uses MAP Send Routing Info for LCS to get the H-GMLC address from the HLR.

9. The LIMS-IWF retrieves the H-GMLC address from the HLR.

10. The LCS service request is forwarded to the H-GMLC through Lr interface.

11. The H-GMLC performs the privacy check.

12. The H-GMLC queries the HLR using MAP Send Routing Info for LCS to get the V-GMLC address.

13. The H-GMLC retrieves the V-GMLC address from the HLR.

14. The H-GMLC forwards the LCS service request to the V-GMLC.

15. The standard MT-LR procedure is performed.

16. The LCS service response is send from the V-GMLC to the H-GMLC.

17. The H-GMLC performs the privacy check.

18. The LCS service response is send from the H-GMLC to home LIMS-IWF.

19. The LCS service response is send from the home LIMS-IWF to the requesting LIMS-IWF.

20. The LCS service response is send from the requesting LIMS-IWF to the R-GMLC.

21. The LCS service response is send from the R-GMLC to the external LCS Client.

9.8.2 Standard Location Request using a TEL-URL

IF a location request from an external LCS client uses a TEL-URL as the target UE's identity, the requesting GMLC shall convert the TEL-URL into a MSISDN, use this MSISDN in the location request as the target UE's address and continue with the MT-LR procedure for the PS domain.

9.8.3 Mobile Originated Location Requests in the IMS

Mobile Originated Location Requests will not specifically require IMS interworking and therefore are not covered within this specification.

****** NEXT MODIFICATION ********

10.5.4 Interworking between pre Rel-6 network nodes and Rel-6 or later HLR/HSS

In addition to the procedures in this section, if the HLR/HSS is notified that the serving node does not support the LCS capability set 2 and/or set 3, the procedures described in 10.5.3 shall be also taken into consideration.

10.5.4.1 Rel-6 or later HLR/HSS with pre Rel-6 serving node

The Rel-6 or later HLR/HSS notifies the H-GMLC about the all LCS capability set supported by the serving node.

In accordance with the notified LCS capability of the serving node and the privacy profile of the target UE, the H-GMLC decides whether the location estimation process can be continued or not.

In order to request the privacy related action (i.e. checking the on-going call/session and/or notification/verification procedures) to the pre Rel-6 serving node, H-GMLC may send the Provide Subscriber Location request message to the serving node with the pseudo-external identity. The detail of the pseudo-external identity is described in Annex C.

10.6 LIMS-IWF

As the LIMS-IWF is a simple interworking function that provides routing of LCS service requests and responses based on the target UE's SIP-URI and mapping of SIP-URI to MSISDN it must not store user or LCS Client specific data during or after a location request procedure.

CR-Form-v7

CHANGE REQUEST

⌘ 23.271 CR 252 ⌘rev 1 ⌘ Current version: 6.6.0 ⌘

*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:	⌘	Introduction of LCS QoS Class and Enhencement of MO-LR
Source:	⌘	SA2 (Huawei, China Mobile, Nokia, TCS)
Work item code:	⌘	LCS2
Date:	⌘	20/02/2004
Category:	⌘	B
Release:	⌘	REL-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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

Reason for change: ⌘[H14]

This CR is a combine CR from CR#239r5(S2-040665) and CR#186R7 (S2-040457) which are agreed by SA2 as resolution for issues identified during the SA#37-38 meeting. However, there are overlaped changes in the different CR, so it is descided by the SA2 plenary to combine them as one CR to submit to the SA Plenary.

Reasons for change from CR#239R5 and CR#186R7:

1.when the UE requests its own location to be sent to an external LCS client, the corresponding GMLC address may be specified by the UE, or assigned by the VMSC/MSC Server. However, in case the address of the GMLC is specified by the UE, the VMSC/MSC server maybe cannot access that GMLC. Furthermore, in case the GMLC address is assigned by the VMSC/MSC server, the assigned GMLC maybe cannot access the specified external LCS Client.

2.In addtion, In the current MO-LR procedure, when the UE only request its own location, or location assistance data or broadcast assistance data message ciphering keys from the network, the request information can not be transferred to the V-GMLC, the MSC/SGSN should be the entity to record the charging information. However, as a value-added service, the most LCS service related information should be stored in the service gateway, i.e. GMLC, rather than the MSC/SGSN, in this case, the GMLC should be the more suitable entity to collect charging information and generate the CDR. In addition, the MSC/SGSN may do not store some service related information so may can not fill all fields of the CDR. Furthermore, comparison with other LCS procedures, GMLC and MSC/SGSN always both be the charging entity. So the V-GMLC should be added as a charging entity in case the location information does not be transferred to the LCS Client, then this charging module should be more extensible to a new MO-LR service.

3.Moreover, in case the UE's location information is transfered to the LCS Client, a pseudonym should be considered to conceal the UE's MSIDSN/IMSI.

The above 3 problems can also occur in the current PS-MO-LR procedure.

	4. (CR#186R7) According to TS 22.071, there is a requirement for the concept of LCS QoS Class. Currently any location estimate that does not satisfy the QoS requested in an original location request may be discarded by GMLC. It is often the case that some kind of location estimate regardless of how accurate it is or how long it took to obtain it, is better than having no location estimate. However, this can only be determined by the requestor/LCS Client. It may also be used to act as an upper bound to determine what the requestor is prepared to pay for.
Summary of change: ⌘	This CR is a combination of CR#239r5(S2-040665) and CR#186r7 (S2-040457), notice that only section 9.2.1and 9.2.2 have overlapes with some change to same stentances, but no conflicts. Following changes are applied to the TS: 1.The address of the V-GMLC, and a GMLC that can access the LCS Client are added to the MO-LR signalling procedure figures. When the address of the GMLC is speicified by the UE and the VMSC/MSC server cannot access it, the VMSC/MSC server shall assign a GMLC, i.e. V-MSC server send the MAP Subscriber Location Report to that V-GMLC. The V-GMLC then contact the H-GMLC to tranfer the MO-LR Location Information to the correct GMLC. When the H-GMLC cannot access the specified LCS Client, the H-GMLC shall determine a GMLC that can access the LCS Client and send the MO-LR Location Information to that GMLC. 2. In any case MAP Subscriber Location Report shall be send to the V-GMLC, carrying at least the MSISDN/IMSI of the UE, the event causing the location estimate (CS-MO-LR/PS-MO-LR) and the location estimate and its age. V-GMLC shall record the charging information for the UE and return the MAP Subscriber Location Report Acknowledgement to the VMSC/MSC server/SGSN. 3.The UE can set a “Pseudonym indicator” to indicate a pseudonym should be assigned by the network and transferred to the LCS Client as the UE’s identity. According to the UE’s verinym, the GMLC may perform the assignment, or request the H-GMLC/PMD of the UE to assign a pseudonym to the UE. 4.(CR#186R7) Introduces a new concept of QoS Classes to LCS – Best Effort (i.e. allow location estimate of lower accuracy or longer response time) and Assured (do not allow location estimate of lower accuracy or longer response time). According to a proposal yet to be decided in RAN WG3, UTRAN in its location response should include an indication whether the achieved accuracy fulfills the requested accuracy or not and the core network forwards this indication to GMLC. Only V-GMLC handles the LCS QoS class verification. The UE may also indicate requested QoS class in its mobile originated location request.
Consequences if not approved: ⌘	The current MO-LR procedures do not describe any mechanisms how to handle the case when the VMSC/MSC server cannot access the GMLC speicifed by the UE and the case when the V-GMLC assigned by the VMSC/MSC server cannot access the specified LCS Client. And charging of the MO-LR prodedure shall be handled differently with other LCS procedures. In addtion, In case the location information of the UE should be provided to the LCS Client, the UE’s MSISDN/IMSI can not be concealled to the LCS Client.the pseudonym functionality can not be fulfilled completely. GMLC would not be able to send low accuracy location information it has received to the LCS client, even though the LCS client might have found the available location information satisfactory.

Clauses affected: ⌘	3.1, 5.5.1, 5.5.2, 5.6.1, 5.6.2, Additional Section 6.5, 9.1.1, 9.1.2, 9.1.5, 9.1.6, 9.1.7, 9.2.1, 9.2.2, 10.3.1, 11.1

		Y	N			
Other specs	⌘	X		Other core specifications	⌘	32.271, 32.250, 32.251, 24.080, 29.002, 25.413, 49.031
Affected:			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘	This modification may affect the RLP. Update to OMA MLP and RLP may be required.				

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Pseudonym mediation device: functionality that verifies pseudonyms to verinyms

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

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

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

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

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

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

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

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

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

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

Target UE: UE being positioned

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

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

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

******* NEXT MODIFIED SECTION ******

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 or last known location applicable to LIR only (current location is only available for LDR);
- Priority, if needed;
- Service coverage (i.e. country codes), if needed;
- Requested maximum age of location, if needed;
- Local coordinate reference system, if needed;
- Target area, i.e. geographical area expressed as one of the following format, if needed.
    a) a shape defined in TS 23.032
    b) local coordinate system
    c) country code
    d) PLMN identity

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

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

******* NEXT MODIFIED SECTION ******

5.5.2 Location Service Response

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

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

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

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

******* NEXT MODIFIED SECTION ******

5.6.1 Location Service Request

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

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

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

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

- Target area, i.e. geographical area expressed as one of the following format, if needed.

  a) a shape defined in TS 23.032

  b) country code

  c) PLMN identity

- LDR reference number, if needed.

******* NEXT MODIFIED SECTION ******

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;
- 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.

****** ADDITIONAL SECTION********

6.5 Quality of Service Information

LCS Quality of Service information is characterised by 3 key attributes:

- LCS QoS Class
- Accuracy
- Response Time

The use of quality of service to characterise location requests is optional and if not requested the default shall be either network operator determined or client negotiated.

6.5.1 LCS QoS Class

The LCS QoS Class defines the degree of adherence by the Location Service to another quality of service parameter (Accuracy), if requested. The LCS Server shall attempt to satisfy the other quality of service parameter regardless of the use of QoS Class.

6.5.1.1 Best Effort Class

This class defines the least stringent requirement on the QoS achieved for a location request. If a location estimate obtained does not fulfil the other QoS requirements, it should still be returned but with an appropriate indication that the requested QoS was not met. If no location estimate is obtained, an appropriate error cause is sent.

6.5.1.2 Assured Class

This class defines the most stringent requirement on the accuracy achieved for a location request. If a location estimate obtained does not fulfil the other QoS requirements, then it shall be discarded and an appropriate error cause sent.

*******NEXT MODIFIED SECTION********

9.1.1 Common MT-LR procedure in PS and CS domain

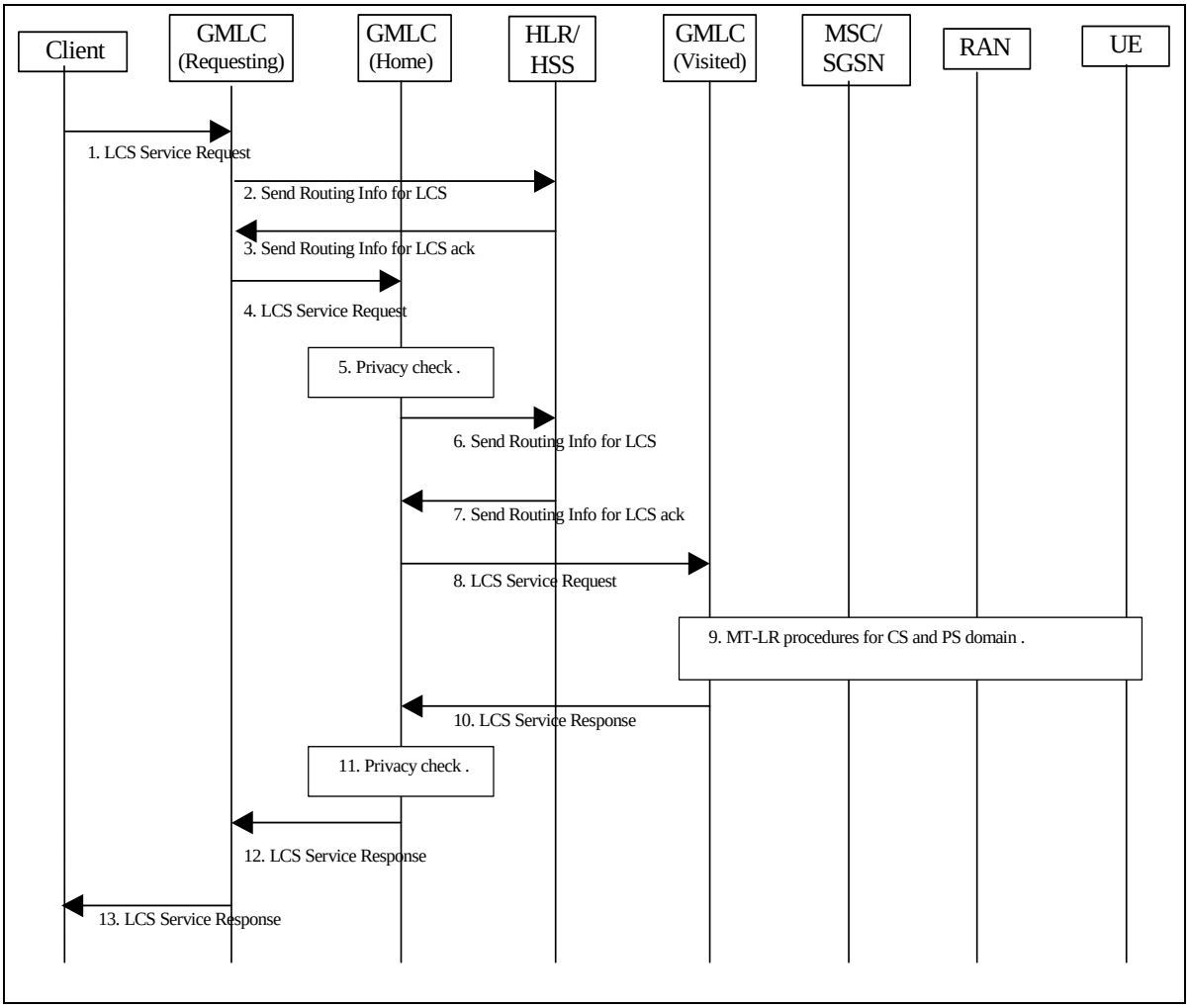


Figure 9.1: General Network Positioning for a MT-LR

1) An external LCS client requests the current location of a target UE from a GMLC. The LCS Client may also request a deferred location request, i.e. based on event. The R-GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI or pseudonym of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. For a call related location request, the LCS client includes the LCS client's called party number, as dialled by the target mobile user, in the LCS service request. For a session related location request, the LCS client includes the APN-NI of the LCS client, as used by the target UE, in the LCS service request. For a call/session related request the R-GMLC may verify that the called party number or APN-NI is correct for the LCS client in question. The LCS client's dialled number or APN-NI are checked in step 9 for the call/session related class.
The LCS request may carry also the Service Identity and the Codeword and the service coverage information. The R-GMLC may verify that the Service Identity received in the LCS request matches one of the service identities allowed for the LCS client. If the service identity does not match one of the service identities for the LCS client, the R-GMLC shall reject the LCS request. Otherwise, the R-GMLC can map the received service identity in a corresponding service type.
If the location request is originated by a Requestor, the Requestor Identity may be added to the LCS service request. The LCS client should authenticate the Requestor Identity but this is outside the scope of this specification. The LCS service request may also contain the type of the Requestor identity if the requestor identity was included.
If the H-GMLC address is not contained in the pseudonym or cannot deduced from the pseudonym, the R-GMLC shall determine the verinym for the pseudonym. In this case the R-GMLC may access to its associated PMD as described in 9.1.1.3.
The R-GMLC verifies whether it stores the privacy profile of the target UE. If the R-GMLC stores the UE's privacy profile, (this means the R-GMLC is the H-GMLC of the target UE), then step 2, 3, 4 and 12 are skipped.

If location is required for more than one UE, or if periodic location is requested, the steps following below may be repeated. In case the location is requested for more than one UE, the R-GMLC should verify whether the number of Target UEs in the LCS request is equal or less than the Maximum Target UE Number of the LCS client. If the Maximum Target UE Number is exceeded, the R-GMLC should respond to the client with proper error cause.

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

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

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

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

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

5) The H-GMLC verifies whether the R-GMLC is authorized to request UE location information. If the R-GMLC is not authorized, an error response is returned.
If the LCS service request contains the pseudonym of the target UE and the H-GMLC cannot resolve the PMD address from the pseudonym, the H-GMLC itself determines the verinym (MSISDN or IMSI) of the target UE. If the H-GMLC can resolve the address of PMD from the pseudonym, the H-GMLC requests the verinym from its associated PMD, see clause 9.1.1.3. In case H-GMLC knows that the PMD functionality is integrated in PPR, it can include the information from the LCS Identity Request in the LCS authorisation request to the PPR, see clause 9.1.1.1. In this case, if H-GMLC is not able to obtain the verinym of the target UE, the H-GMLC shall cancel the location request.
The H-GMLC performs privacy check on the basis of the UE user's privacy profile stored in the H-GMLC and the capabilities of the serving nodes (MSC/VLR and/or SGSN), if available. If the privacy profile of the target UE is stored in a PPR and the H-GMLC received the network address of the PPR from R-GMLC or is able to determine the PPR address (e.g. from a previous location request or an internal lookup table), the H-GMLC shall ask the PPR to perform the privacy check as described in the 9.1.1.1. If the privacy profile is stored in a PPR but the network address of the PPR is not available, the H-GMLC shall send SRI for LCS message to HLR/HSS in step 6 in order to get the PPR address and the privacy check in this step shall be performed after step 7. Also if the key of the UE user's privacy profile (i.e. MSISDN or IMSI) is not available, the privacy check in this step shall be performed after step 7. The H-GMLC/PPR verifies LCS barring restrictions in the UE user's privacy profile in the H-GMLC/PPR. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If the location service request is to be barred, GMLC shall terminate the request towards the R-GMLC or the LCS client with the appropriate error code. As a result of the privacy check, the H-GMLC/PPR selects one or two indicators of the privacy check related action and/or a pseudo-external identity. (The details of the indicator of the privacy check related action and the pseudo-external identity are described in chapter 9.5.4 and Annex C). If the requested type of location is

"current or last known location" and the requested maximum age of location information is available, the H-GMLC verifies whether it stores the previously obtained location estimate of the target UE. If the H-GMLC stores the location estimate and the location estimate satisfies the requested accuracy and the requested maximum age of location, the H-GMLC checks the result of the privacy check. In case the result of the privacy check for call/session unrelated class is "Location allowed without notification" then steps 6, 7, 8, 9 and 10 may be skipped.

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

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

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

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

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

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

10) The V-GMLC sends the location service response to the H-GMLC 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 MODIFIED SECTION********

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

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

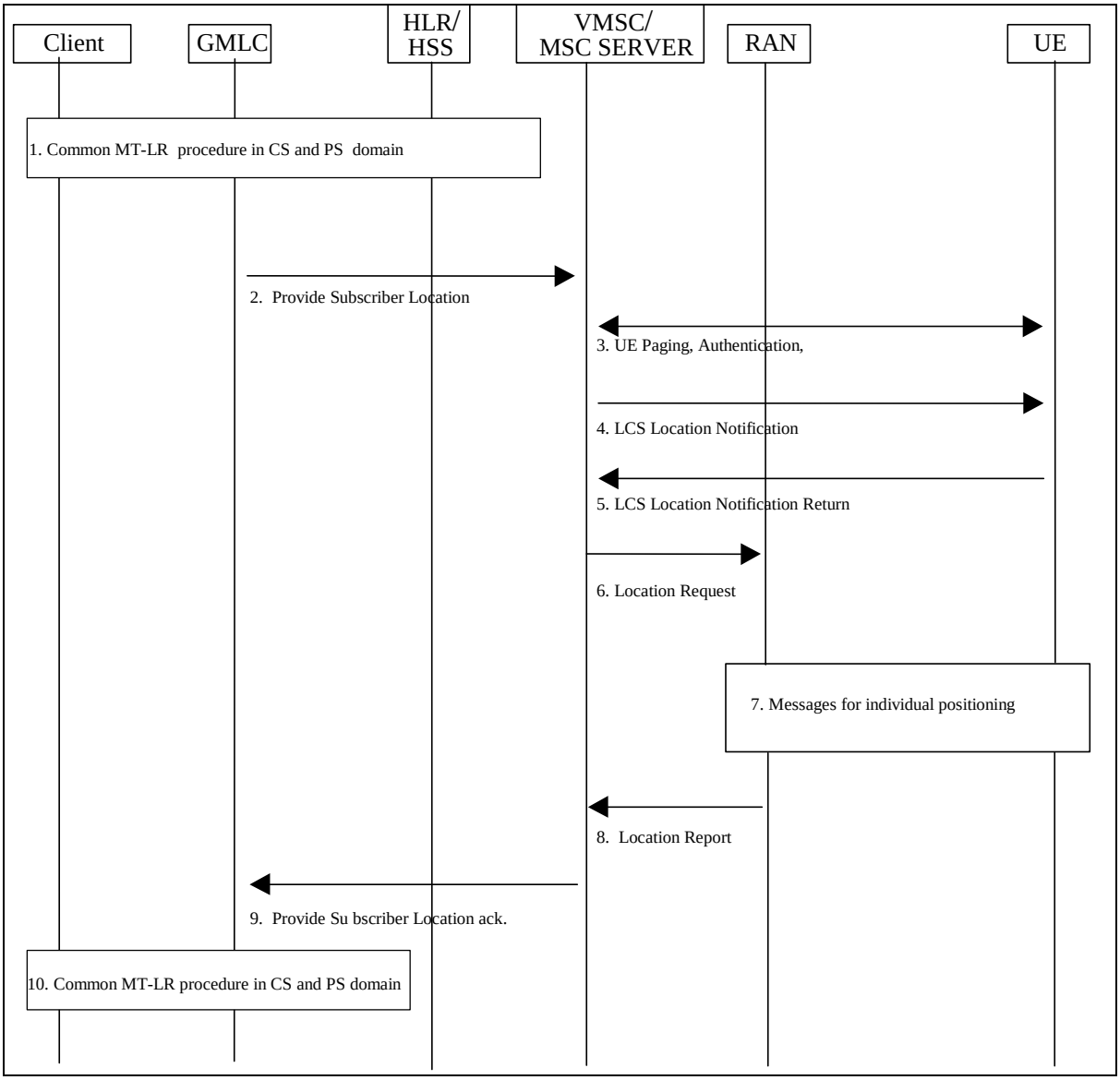


Figure 9.2: Network Positioning for a CS-MT-LR

9.1.2.1 Location Preparation Procedure

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

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

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

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

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

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

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

5) The target UE notifies the UE user of the location request. If privacy verification was requested, the target UE indicates to the UE user whether the location request will be allowed or not allowed in the absence of a response and waits for the user to grant or withhold permission. The UE then returns an LCS Location Notification Return Result to the VMSC/MSC server indicating, if privacy verification was requested, whether permission is granted

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

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

9.1.2.2 Positioning Measurement Establishment Procedure

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

9.1.2.3 Location Calculation and Release Procedure

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

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

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

*******NEXT MODIFIED SECTION********

9.1.5 Network Induced Location Request (NI-LR)

Figure 9.4 illustrates positioning for an emergency service call.

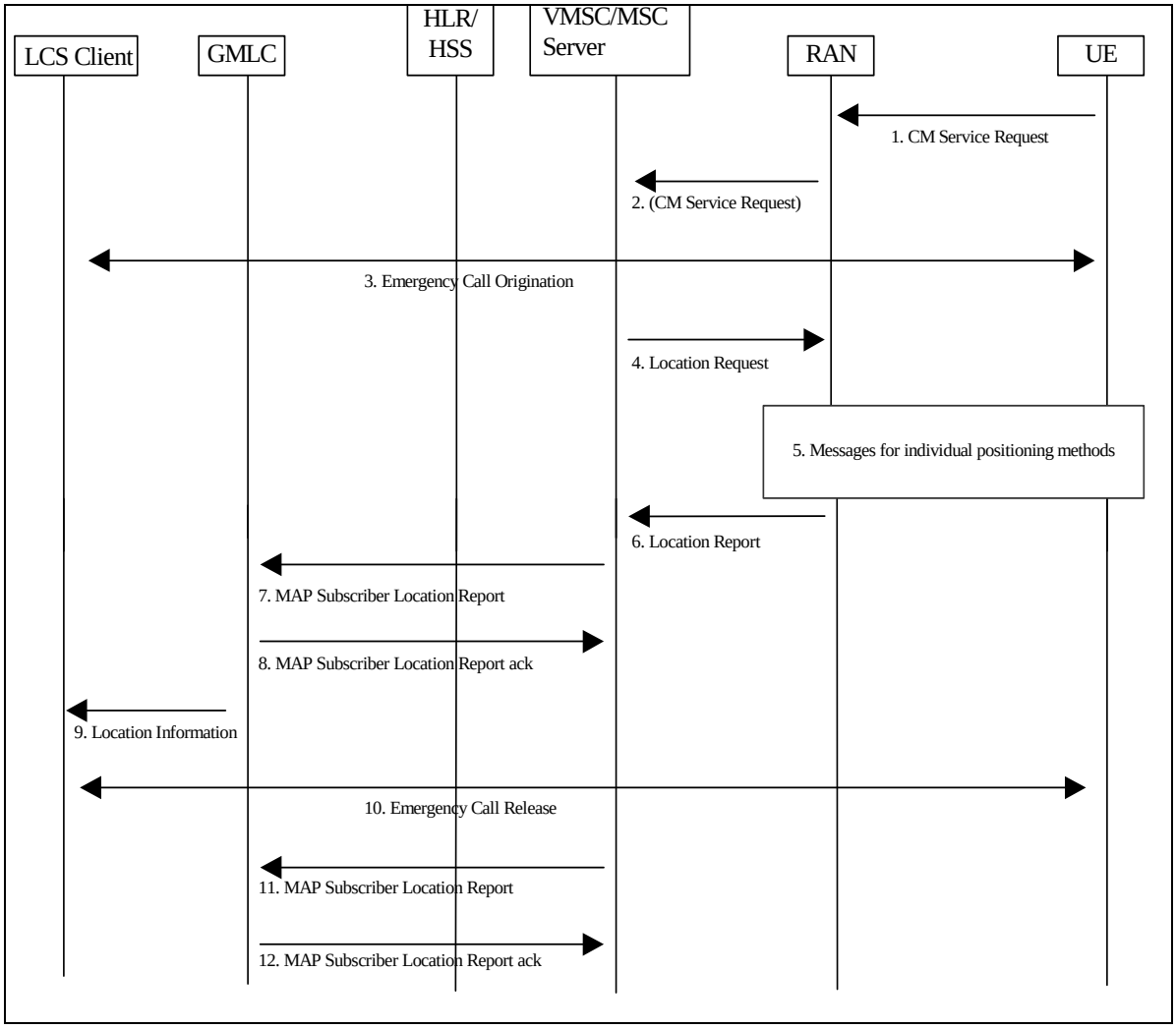


Figure 9.4: Positioning for a NI-LR Emergency Service Call

9.1.5.1 Location Preparation Procedure

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

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

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

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

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

9.1.5.2 Positioning Measurement Establishment Procedure

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

9.1.5.3 Location Calculation and Release Procedure

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

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

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

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

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

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

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

*******NEXT MODIFIED SECTION********

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

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

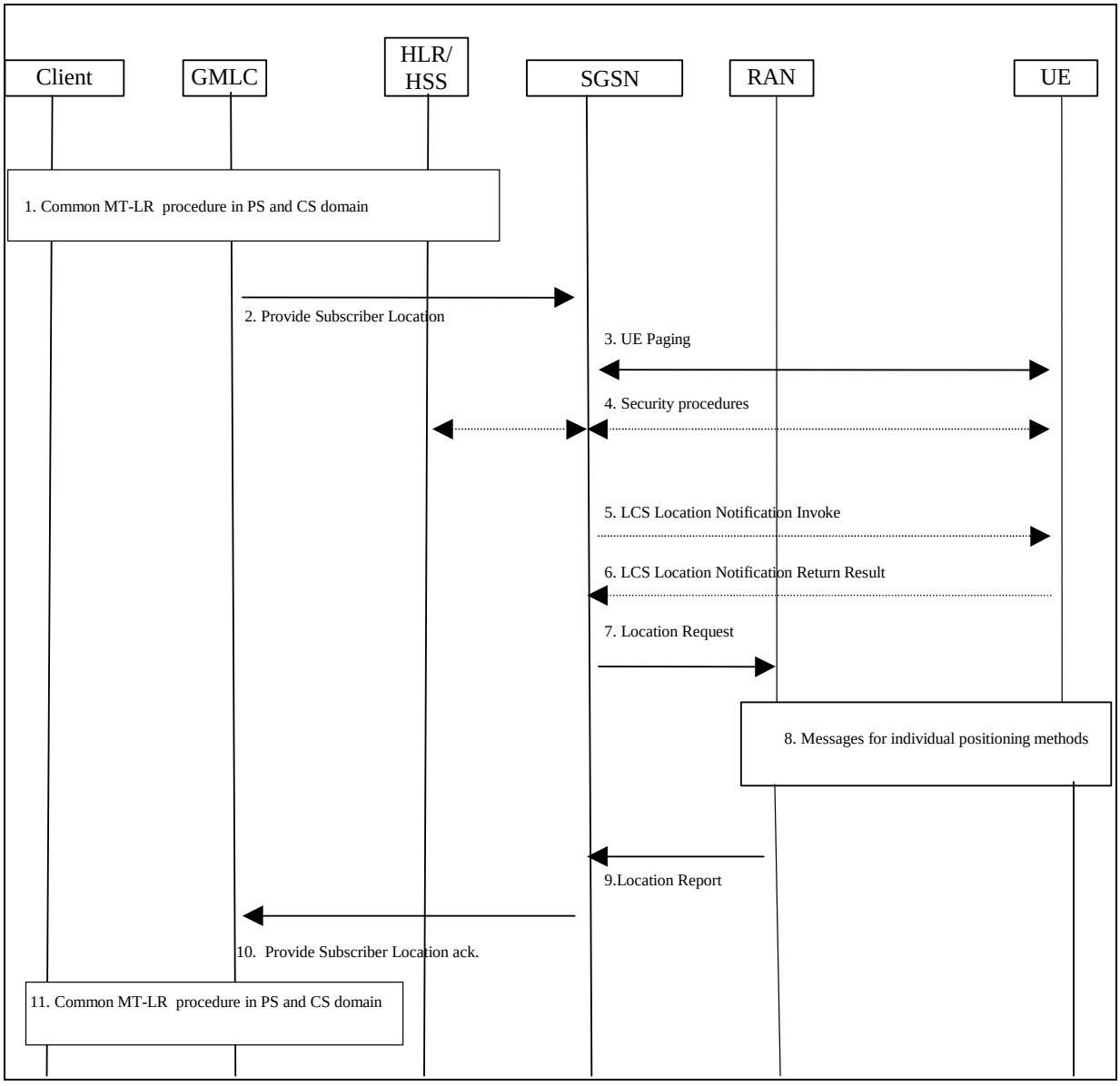


Figure 9.5: General Network Positioning for Packet Switched MT-LR

9.1.6.1 Location Preparation Procedure

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

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

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

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

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

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

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

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

9.1.6.2 Positioning Measurement Establishment Procedure

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

9.1.6.3 Location Calculation and Release Procedure

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

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

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

*******NEXT MODIFIED SECTION********

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

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

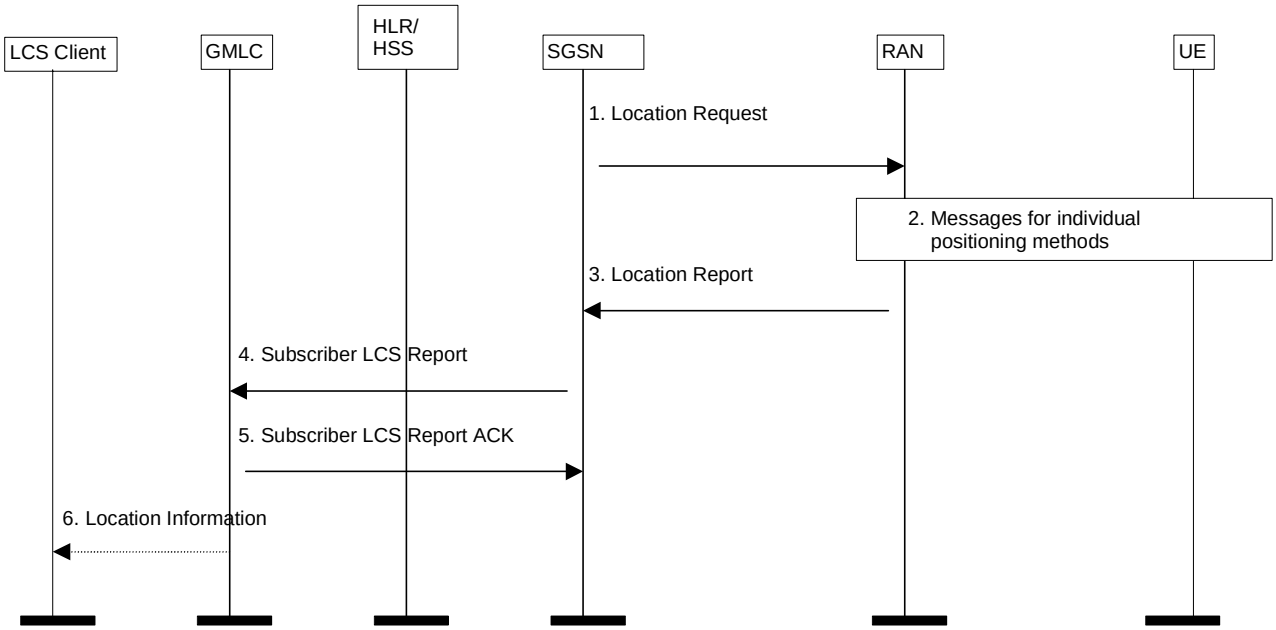


Figure 9.6: Network Induced Location Request

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

9.1.7.1 Positioning Measurement Establishment Procedure

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

9.1.7.2 Location Calculation and Release Procedure

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

4) The SGSN shall send a MAP Subscriber Location Report to the GMLC obtained in step 1 carrying the MSISDN of the UE, the identity of the LCS client, the event causing the location estimate (NI-LR-PS), ~~and~~ the location estimate and its age and the indication received from RAN whether the obtained location estimate satisfies the requested accuracy or not. The serving cell identity or SAI of the UE may be sent with the location information. The SGSN may record charging information.

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

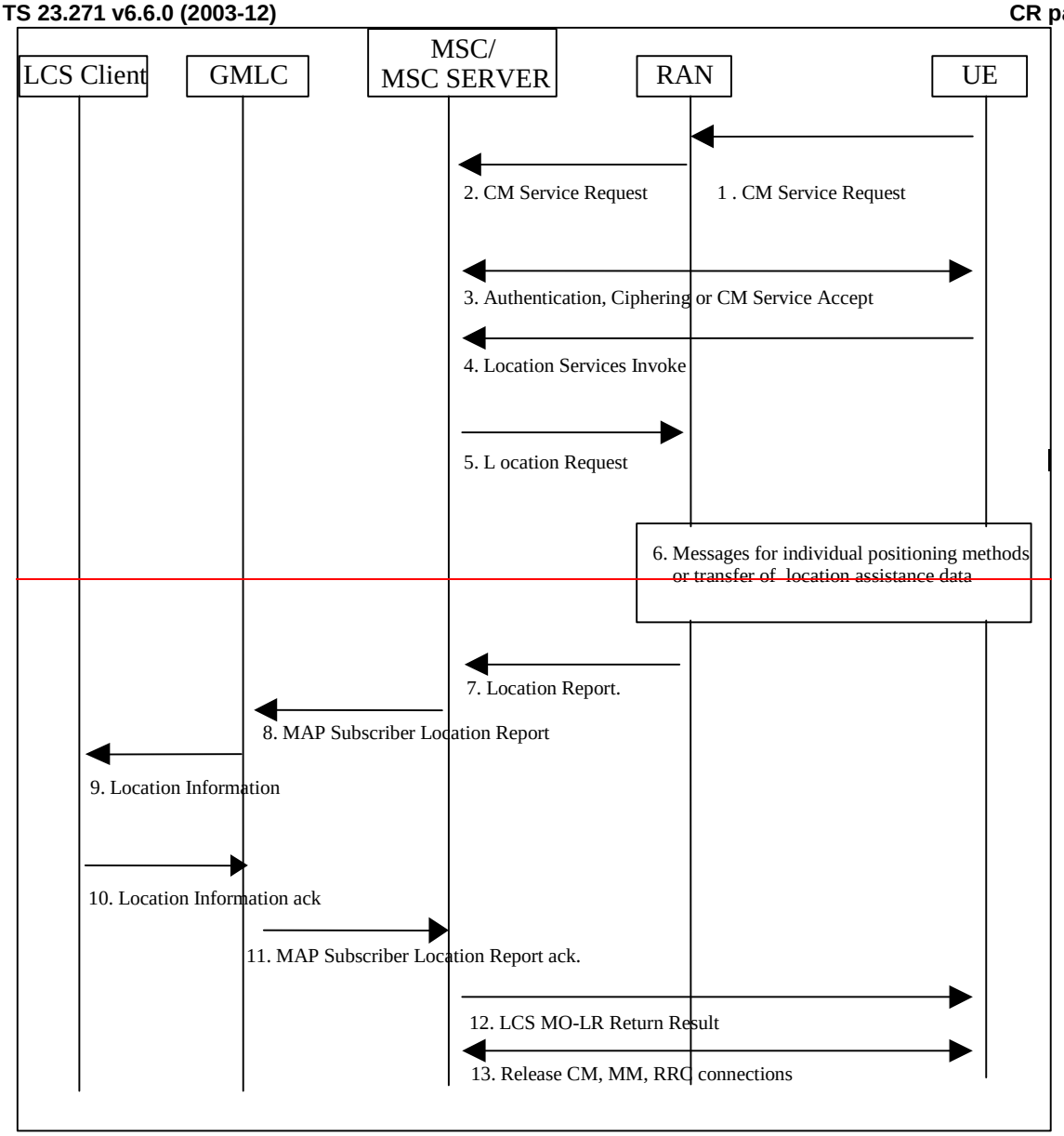
6) The GMLC may transfer the location information to the LCS client either immediately or upon request from the client. The GMLC may record charging information.

*******NEXT MODIFIED SECTION********

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, 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.


LCS Client
GMLC
MSC/
MSC SERVER
RAN
UE
2. CM Service Request
1 . CM Service Request
3. Authentication, Ciphering or CM Service Accept
4. Location Services Invoke
5. L ocation Request
6. Messages for individual positioning methods
or transfer of location assistance data
7. Location Report.
8. MAP Subscriber Location Report
9. Location Information
10. Location Information ack
11. MAP Subscriber Location Report ack.
12. LCS MO-LR Return Result
13. Release CM, MM, RRC connections

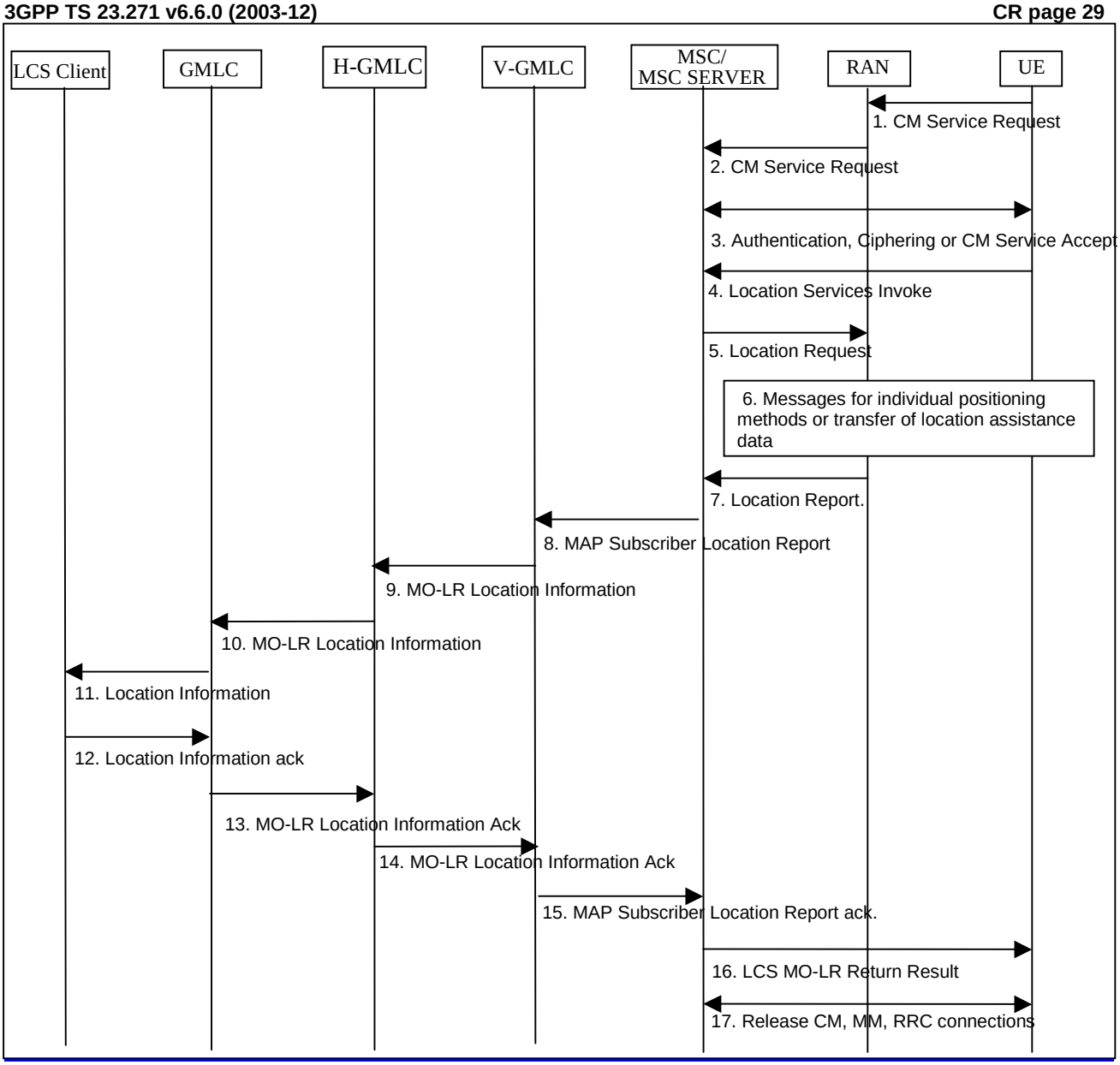


Figure 9.7: General Network Positioning for CS-MO-LR

9.2.1.1 Location Preparation Procedure

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

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

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

4) The UE sends a LCS CS-MO-LR Location Services invoke to the VMSC/MSC server. Different types of location services can be requested: location of the UE, location of the UE to be sent to an external LCS client, location assistance data or broadcast assistance data message ciphering keys. If the UE is requesting its own location or that its own location be sent to an external LCS client, this message carries LCS requested QoS information (e.g. accuracy, response time, 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, the message 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 a GMLC address is not included, the VMSC/MSC server may assign a GMLC address stored in the VMSC/MSC server. If a GMLC address is not available for this case, the VMSC/MSC server shall reject the location request.~~ If the UE is instead requesting location assistance data or ciphering keys, the message specifies the type of assistance data or deciphering keys and the positioning method for which the assistance data or ciphering applies. 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 shall 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 ~~UE requested transfer of its location to an external LCS client and a~~ location estimate was successfully obtained, the VMSC/MSC server shall send a MAP Subscriber Location Report to the V-GMLC assigned in the step 4, ~~obtained in step 4~~ carrying the MSISDN/IMSI of the UE, ~~the identity of the LCS client,~~ the event causing the location estimate (CS-MO-LR) and the location estimate, ~~and~~ its age, 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 and the GMLC address specified by the UE, if available. ~~Otherwise, this step and steps 9-11 are skipped.~~

9) Upon receipt of the MAP Subscriber Location Report, the V-GMLC shall determine whether the UE requests transfer of its location 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.

~~9~~11) If the identified LCS Client is not accessible, this step and step ~~10~~ 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), 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~~12) If the LCS Client doesn't support MO-LR (for temporary or permanent reasons) or can't handle the location estimate of the UE, e.g. LCS Client doesn't have the corresponding data of the UE, the LCS Client shall return the Location Information ack message to the GMLC 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 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~~13) If the identified LCS Client is not accessible, the GMLC sends MO-LR Location Information Acknowledgement ~~MAP Subscriber Location Report ack~~ to the H-GMLC ~~MSC/MSC server~~ with an appropriate error cause. Otherwise, the GMLC shall send MO-LR Location Information Acknowledgement ~~MAP Subscriber Location Report ack~~ to the H-GMLC~~MSC/MSC SERVER~~. The message shall specify whether the location estimate of the UE has been handled successfully by the identified LCS Client, and if not, the corresponding error cause obtained in step ~~10~~12. The 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.

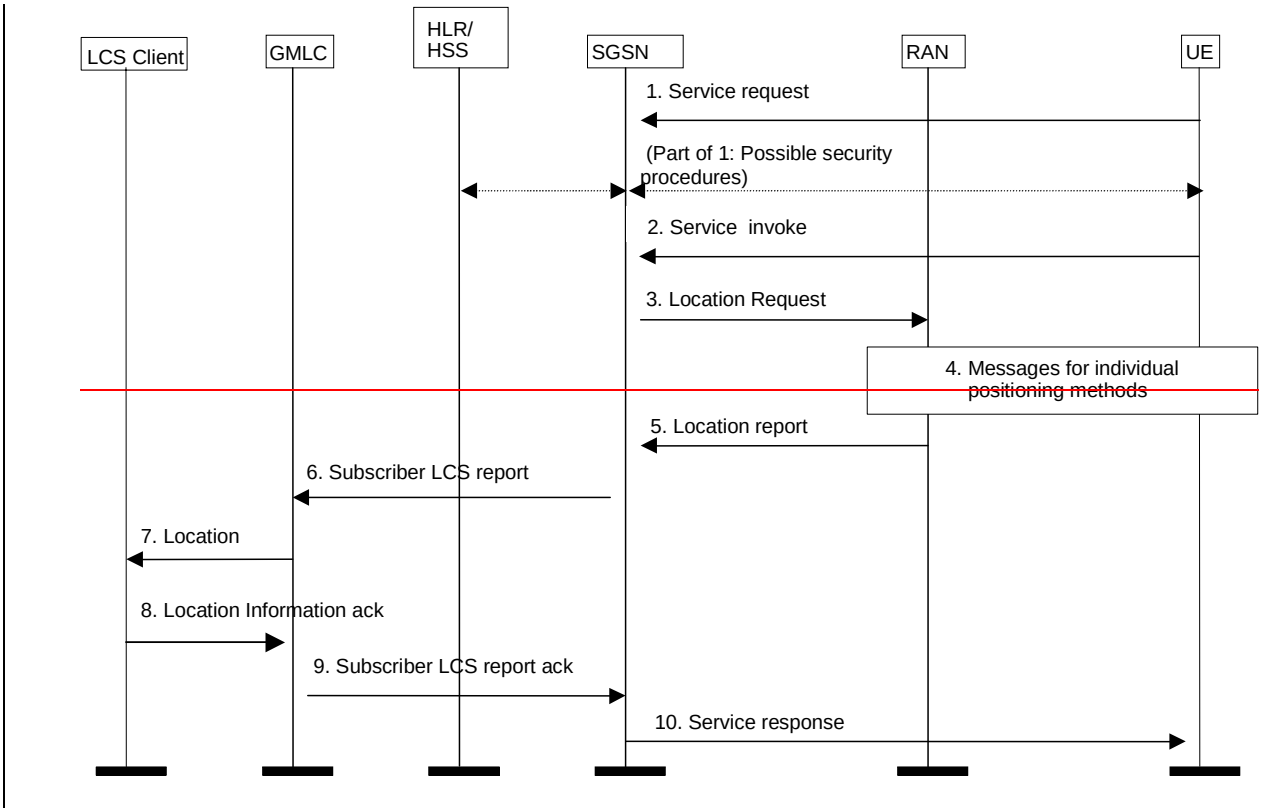
~~12~~16) The VMSC/MSC server returns a CS-MO-LR Return Result to the UE carrying any location estimate requested by the UE including the indication received from RAN whether the obtained location estimate satisfies the requested accuracy or not, ciphering keys or an indicator whether a location estimate 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 ~~11~~15.

~~13~~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.

*******NEXT MODIFIED SECTION********

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

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



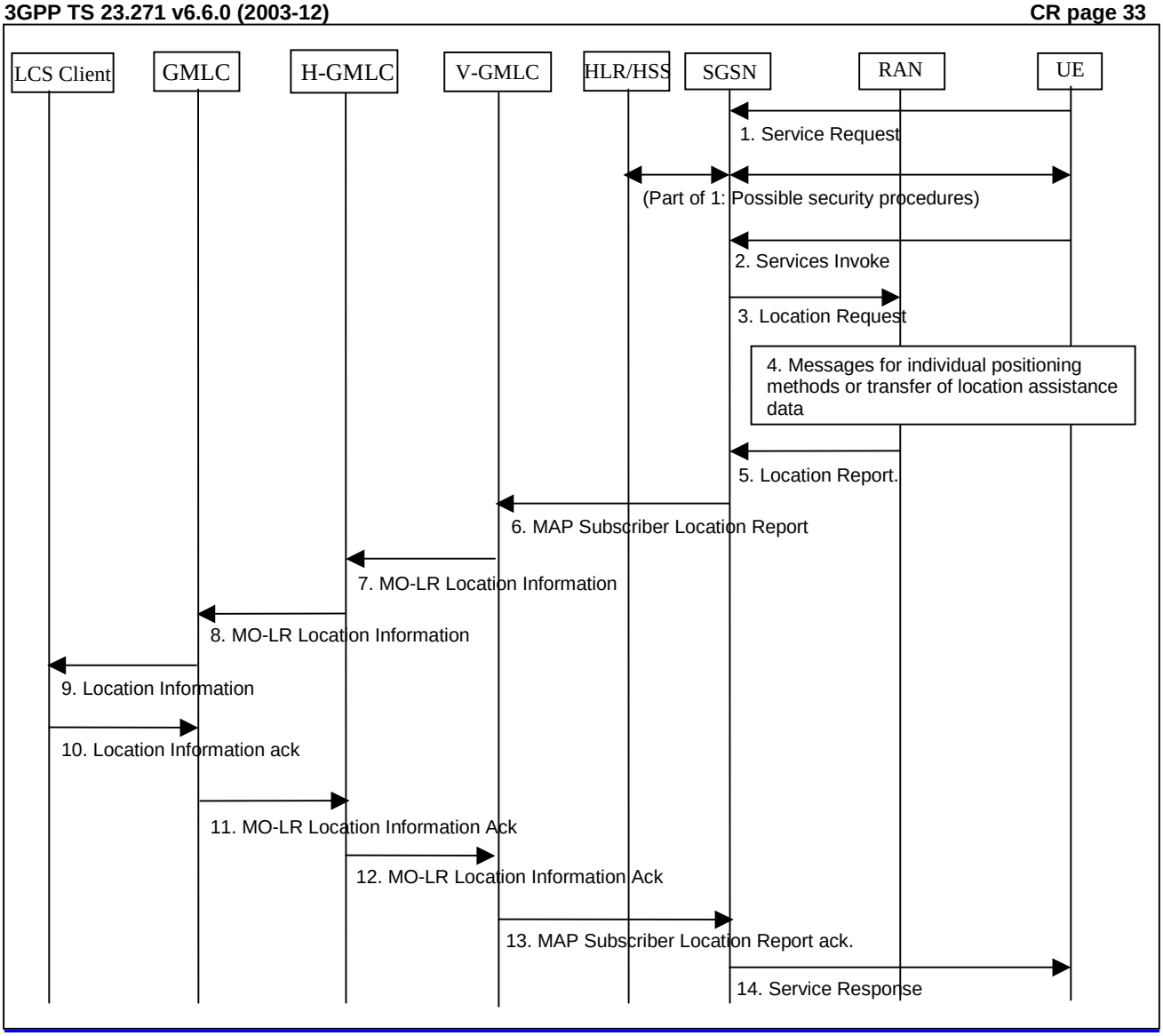


Figure 9.8: General Network Positioning for packet switched MO-LR

9.2.2.1 Location Preparation Procedure

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

2) The UE sends a LCS PS-MO-LR Location Services invoke message to the SGSN. Different types of location services can be requested: location of the UE, location of the UE to be sent to an external LCS client, location assistance data or broadcast assistance data message ciphering keys. If the UE is requesting its own location or that its own location be sent to an external LCS client, this message carries LCS requested QoS information (e.g. accuracy, response time, 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, the message 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 a GMLC address is not included, the SGSN may assign a GMLC address stored in the SGSN. If a GMLC address is not available for this case, the SGSN shall reject the location request.~~ If the UE is instead requesting location assistance data or ciphering keys, the message specifies the type of assistance data or deciphering keys and the positioning method for which the assistance data or ciphering applies. 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 shall 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 ~~UE requested transfer of its location to an external LCS client and a~~ location estimate was successfully obtained, the SGSN shall send a MAP Subscriber Location Report to the V-GMLC assigned in the step 2, ~~obtained in step 2~~ carrying the MSISDN/IMSI of the UE, ~~the identity of the LCS client,~~ the event causing the location estimate (PS-MO-LR~~-PS~~) and the location estimate, ~~and~~ 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 and the GMLC address specified by the UE, if available.~~Otherwise, this step and steps 7-9 are skipped.~~

7) Upon receipt of the MAP Subscriber Location Report, the V-GMLC shall determine whether the UE requests transfer of its location 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.

~~7~~9)If the identified LCS Client is not accessible, this step and step ~~8~~ 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), 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..

~~8~~10) If the LCS Client doesn’t support MO-LR (for temporary or permanent reasons) or can’t handle the location estimate of the UE, e.g. LCS Client doesn't have the corresponding data of the UE, the LCS Client shall return the Location Information ack message to the GMLC 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 sends the GMLC or

the H-GMLC the Location Information ack message signalling that the location estimate of the UE has been handled successfully.

~~9~~11) If the identified LCS Client is not accessible, the GMLC sends MO-LR Location Information Acknowledgement ~~MAP Subscriber Location Report ack~~ to the H-GMLC~~SGSN~~ with an appropriate error cause. Otherwise, the GMLC shall send MO-LR Location Information Acknowledgement ~~MAP Subscriber Location Report ack~~ to the H-GMLC~~SGSN~~. The message shall specify whether the location estimate of the UE has been handled successfully by the identified LCS Client, and if not, the corresponding error cause obtained in step ~~8~~10. The 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.

~~10~~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 ~~CS-MO-LR Return Result~~ 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 ~~9~~13. The SGSN may record charging information.

*******NEXT MODIFIED SECTION********

10.3.1 LCS Data in the GMLC for a LCS Client

The GMLC holds data for a set of external LCS clients that may make call related or non-call related CS-MT-LR/PS-MT-LR requests to this GMLC. The permanent data administered for each LCS client is as follows.

Table10.7: GMLC Permanent Data for a LCS Client

LCS Client data in GMLC	Status	Description
LCS Client Type	M	Identifies the type LCS client from among the following: - Emergency Services - Value Added Services - PLMN Operator Services - Lawful Intercept Services
External identity	O	A list of one or more identifiers used to identify an external LCS client. The identity may be used when making an MT-LR and/or MO-LR. The format of the identity is international E.164 addresses. Each external identity shall be associated with a logical client name.
Authentication data	M	Data employed to authenticate the identity of an LCS client – details are outside the scope of the present document
Call/session related identity	O	A list of one or more international E.164 addresses, which are used to make calls by mobile subscribers, or APN-NIs (see NOTE) to identify the client for a call related MT-LR In case the LCS client was reached via IN or abbreviated number routing (e.g. toll free number or emergency call routing), the E.164 number(s) stored in the GMLC shall be the number(s) that the UE has to dial to reach the LCS Client. In these cases the E.164 number is not to be in international format. The country in which the national specific number(s) is (are) applicable is (are) also stored (or implied) in this case. Each call related identity may be associated with a specific external identity. Each call/session-related identity shall be associated with a logical client name.
Internal identity	O	Identifies the type PLMN operator services and the following classes are distinguished: - LCS client broadcasting location related information - O&M LCS client in the HPLMN - O&M LCS client in the VPLMN - LCS client recording anonymous location information - LCS Client supporting a bearer service, teleservice or supplementary service to the target UE This identity is applicable only to PLMN Operator Services.
Client name	O	An address string which is associated with LCS client's external identity (i.e., E.164 address). See note 2.
Client name type	O	Indication what is the type of the LCS client name. The type of the LCS client name can be one of the following: - Logical name - MSISDN - E-mail address[33] - URL[33] - SIP URL[34] - IMS public identity[35]
Override capability	O	Indication of whether the LCS client possesses the override capability (not applicable to a value added and PLMN operator service)
Authorized UE List	O	A list of MSISDNs or groups of MSISDN for which the LCS client may issue a non-call related MT-LR. Separate lists of MSISDNs and groups of MSISDN may be associated with each distinct external or non-call related client identity.
Priority	M	The priority of the LCS client – to be treated as either the default priority when priority is not negotiated between the LCS server and client or the highest allowed priority when priority is negotiated

QoS parameters	M	The default QoS requirements for the LCS client, comprising: - Accuracy - Response time - LCS QoS Class Separate default QoS parameters may be maintained for each distinct LCS client identity (external, non-call related, call related)
Service Coverage	O	A list of country codes where the LCS client offers its location services.
Allowed LCS Request Types	M	Indicates which of the following are allowed: - Non-call related CS-MT-LR/PS-MT-LR - Call/session related CS-MT-LR/PS-MT-LR - Specification or negotiation of priority - Specification or negotiation of QoS parameters - Specification or negotiation of Service Coverage parameter - Request of current location - Request of current or last known location
Local Co-ordinate System	O	Definition of the co-ordinate system(s) in which a location estimate shall be provided – details are outside the scope of the present document
Access Barring List(s)	O	List(s) of MSISDNs or groups of MSISDN for which a location request is barred
Service Identities	O	List of service identities allowed for the LCS client.
Maximum Target UE Number	O	The maximum number of the Target UEs in one LCS request. For a specific LCS Client, this parameter may have different values for different service identities.

NOTE 1: The LCS Client is identified with E.164 number or APN-NI. APN-NI is specified in TS 23.003.

NOTE 2: The LCS Client name should not contain two equal signs, because those characters are used to separate LCS client name from Requestor ID when GLMC includes them into the same field.

*******NEXT MODIFIED SECTION********

11 Operational Aspects

11.1 Charging

Charging Information collected by the PLMN serving the LCS Client.

The following charging information shall be collected by the PLMN serving the LCS Client:

- type and identity of the LCS Client;
- identity of the target UE;
- results (e.g. success/failure, method used if known, response time, accuracy) - to be repeated for each instance of positioning for a deferred location request;
- identity of the visited PLMN;
- LCS request type (i.e. LDR or LIR);
- requested Quality of Service information;
- state;
- type of event (applicable to LDR requests only);
- time stamp;
- type of co-ordinate system used.

11.2 Charging Information Collected by the Visited PLMN

The following charging information shall be collected by the visited PLMN:

- date and time;
- type and identity of the LCS Client (if known);
- identity of the target UE;
- location of the target UE (e.g., MSC, MSC Server, SGSN, location area ID, cell ID, location co-ordinates);
- which location services were requested;
- requested Quality of Service information;
- results (e.g. success/failure, positioning method used, response time, accuracy) - to be repeated for each instance of positioning for a batch location request;
- identity of the GMLC or PLMN serving the LCS Client;
- state;
- type of event (applicable to LDR requests only).

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