

Technical Specification Group Services and System Aspects **TSGS#16(02)0405**

Meeting #16, Marco Island, USA, 10-13 June 2002

Source: TSG SA WG2
Title: CRs creating 23.271 Rel-6 (LCS Stage 2)
Agenda Item: 7.2.3

The CRs creating 23.271 originally presented in SP-020377 were written on the wrong version of the TS and so were rejected. Two of them have been updated and are now against the correct version of TS 23.271, i.e. v.5.2.0. They are presented for approval.

On 23.271 Rel-6:

S2 Tdoc #	Spec	CR #	rev	Rel	Title	cat	V in	V out	WI
S2-021155r1	23.271	79	1	Rel-6	Introduction of the GMLC-GMLC Lr (roaming) interface: Clauses: 3, 4 & 5 changes	B	5.2.0	6.0.0	LCS2-GMLC
S2-021156r1	23.271	80	1	Rel-6	Introduction of the GMLC-GMLC Lr (roaming) interface: Clauses: 6 & 8	B	5.2.0	6.0.0	LCS2-GMLC

CHANGE REQUEST

⌘ **23.271 CR 79** ⌘ rev **1** ⌘ Current version: **5.2.0** ⌘

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Proposed change affects: ⌘ (U)SIM ME/UE Radio Access Network Core Network

Title:	⌘	Introduction of the GMLC - GMLC Lr (roaming) interface: – Clauses: 3, 4 & 5: Abbreviations, Main Concepts and General LCS Architecture	
Source:	⌘	SA2	
Work item code:	⌘	LCS2-GMLC	Date: ⌘
Category:	⌘	B	Release: ⌘ REL-6
		Use <u>one</u> 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 <u>one</u> 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)

Reason for change:	⌘	The introduction of the GMLC – GMLC Lr interface [proposed title], in accordance with LCS Work Item.
Summary of change:	⌘	Clause 3: Abbreviations for Home (H-GMLR), Requesting (R-GMLR) and Visited GMLR (V-GMLR) added Clauses 4, 5: New diagrams and explanatory text added for the GMLC – GMLC Lr (roaming) interface.
Consequences if not approved:	⌘	Stage 2 description of GMLC – GMLC interface will be incomplete

Clauses affected:	⌘	
Other specs affected:	⌘	<input type="checkbox"/> Other core specifications ⌘ <input type="checkbox"/> Test specifications ⌘ <input type="checkbox"/> O&M Specifications ⌘
Other comments:	⌘	

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

3GPP TS23.271 v5.2.0

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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
<u>H-GMLC</u>	<u>Home-GMLC</u>
HSS	Home Subscriber Server
HLR	Home Location Register
HPLMN	Home Public Land Mobile Network
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPDL	Idle Period Downlink
LA	Location Application
LAF	Location Application Function
LBS	Location Based Services
LCAF	Location Client Authorization Function
LCCF	Location Client Control Function
LCCTF	Location Client Co-ordinate Transformation Function
LCF	Location Client Function
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
R-GMLC	Requesting-GMLC
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
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].

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4 Main concepts

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

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

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

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

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

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

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5 General LCS architecture

5.1 ~~LCS access interfaces and reference points~~

One or more LCS Clients may access a Location Server via its Le interface. Location Servers, resident in the same or different PLMNs, may communicate with each other, indirectly, via the Lg interface to their associated MSC/SGSNs. Optionally, the Lr interface, as specified for direct GMLC to GMLC messaging, may be used for this purpose. A fuller description of the LCS architecture, together with a diagram showing other LCS related interfaces, can be found in clause 6.

~~There is one reference point between the LCS server and LCS client called Le, see figure 5.1. The general aspects of the Le reference point are described in TS 22.071 [4]. Protocol specifies that may be implemented for the Le interface have been specified by LIF (Location Inter-operability Forum) [31]. There may be more than a single LCS network interface to several different LCS clients or other networks. These networks may both differ in ownership as well as in communications protocol. The network operator should define and negotiate interconnect with each external LCS client or other network.~~

An interface differs from a reference point in that an interface is defined where specific LCS information is exchanged and needs to be fully recognized.

There is an interface called Lg that connects two independent LCS networks (different PLMNs) for message exchange.

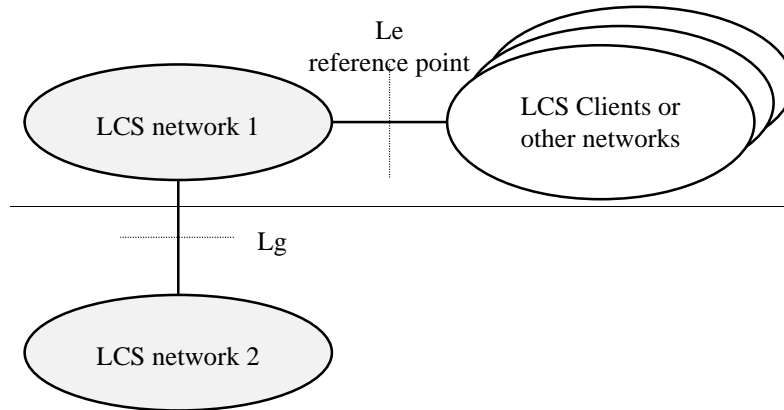


Figure 5.1: LCS Access Interfaces and Reference Points

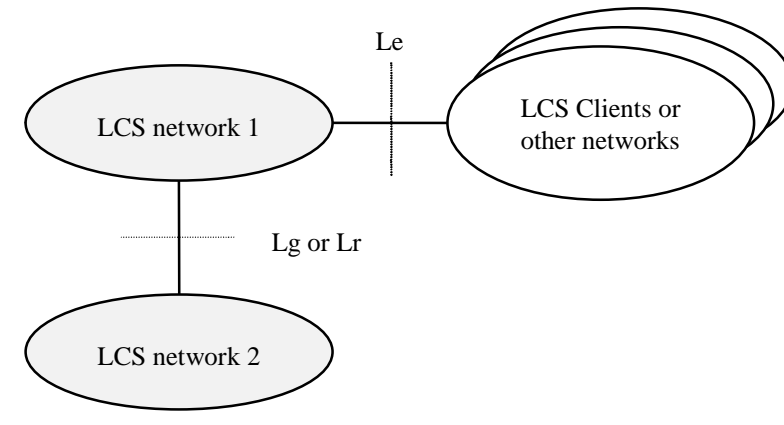


Figure 5.1: LCS Access Interfaces and Reference Points

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CHANGE REQUEST

⌘ **23.271 CR 80** ⌘ rev **1** ⌘ Current version: **5.2.0** ⌘

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Proposed change affects: ⌘ (U)SIM ME/UE Radio Access Network Core Network X

Title:	⌘ Introduction of the GMLC - GMLC Lr (roaming) interface: – Clauses: 6 & 8: LCS Architecture and General Network Procedures		
Source:	⌘ SA2		
Work item code:	⌘ LCS2-GMLC	Date:	⌘
Category:	⌘ B Use <u>one</u> 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 .	Release:	⌘ REL-6 Use <u>one</u> 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)

Reason for change:	⌘ Stage 2 description of the GMLC – GMLC Lr (roaming) interface, LCS architecture and general procedures, in accordance with LCS Work Item.		
Summary of change:	⌘ Clauses 6 & 8: New diagrams and explanatory text added to include optional use of GMLC – GMLC Lr interface.		
Consequences if not approved:	⌘ Stage 2 description of GMLC – GMLC interface will be incomplete		

Clauses affected:	⌘		
Other specs affected:	⌘ <input type="checkbox"/> Other core specifications	⌘	
	<input type="checkbox"/> Test specifications		
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Other comments:	⌘		

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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.

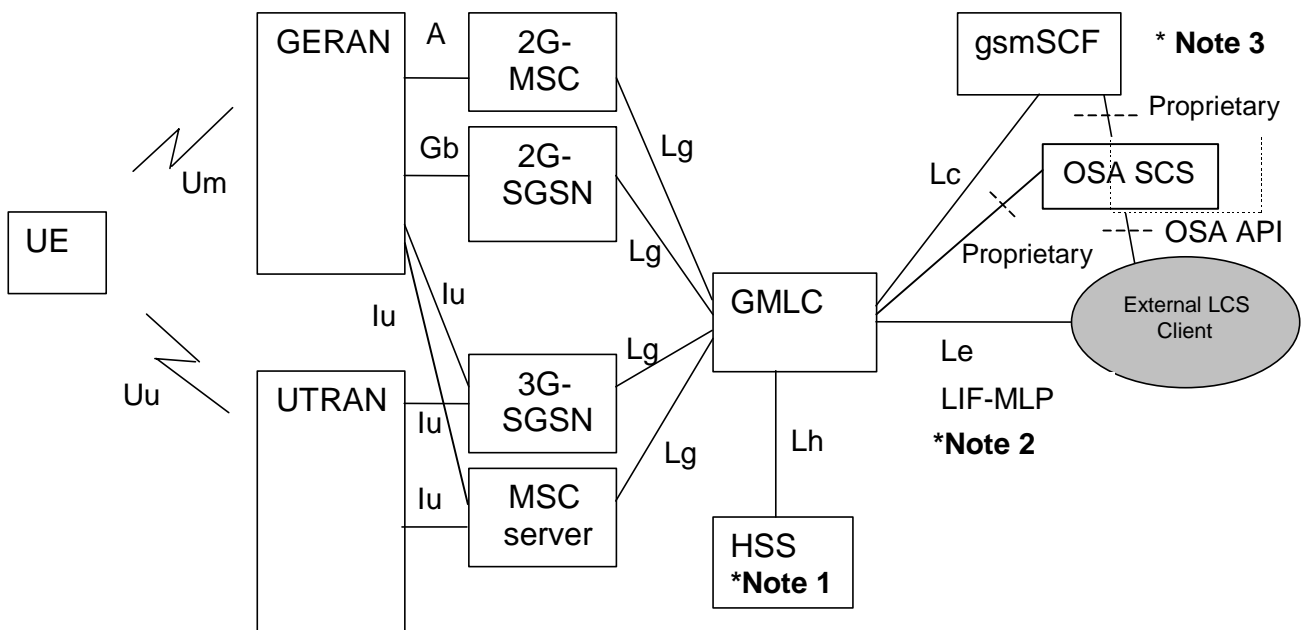


Figure 6.1-1: General arrangement of LCS

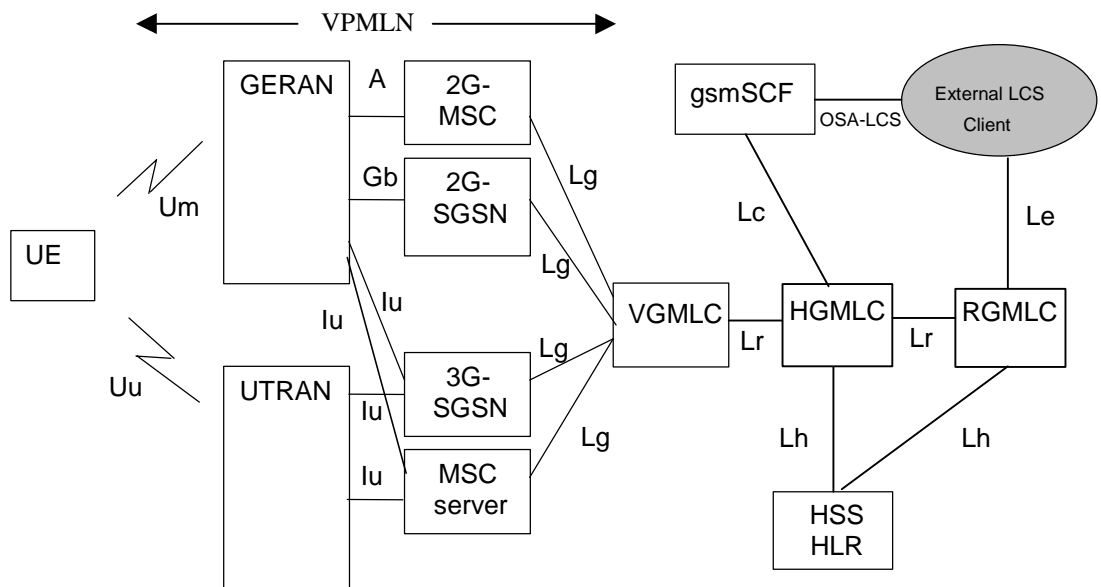


Figure 6.1-2: General arrangement of LCS with inter-GMLC [Lr] interface

6.1 Schematic functional description of LCS operations

The allocation of LCS functional blocks to the Client, LCS server, Core Network, Access Network and UE is based on the schematic functional description below. The detailed functions and interactions are specified later in the present document and in TS 25.305 [1] for UTRAN, in TS 43.059 [16] for GERAN and in corresponding Stage 3 specifications.

The operation begins with a LCS Client requesting location information for a UE from the LCS server. The LCS server will pass the request to the LCS functional entities in the core network. The LCS functional entities in the core network shall then:

- verify that the LCS Client is authorised to request the location of the UE or subscriber;
- verify that LCS is supported by the UE;
- establish whether it is allowed to locate the UE or subscriber, for privacy or other reasons;
- establish which network element in the Access Network should receive the Location request;
- request the Access Network (via the A, Gb or Iu interface) to provide location information for an identified UE, with indicated QoS;
- receive information about the location of the UE from the Access Network and forward it to the Client;
- send appropriate accounting information to an accounting function.

The Access Network LCS functional entities shall determine the position of the target UE according to TS 25.305 [1] for UTRAN and TS 43.059 [16] for GERAN.

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6.3.3 Gateway Mobile Location Center, GMLC

The Gateway Mobile Location Center (GMLC) contains functionality required to support LCS. In one PLMN, there may be more than one GMLC.

The GMLC is the first node an external LCS client accesses in a GSM PLMN (i.e. the Le reference point is supported by the GMLC). The GMLC may request routing information from the HLR or HSS via the Lh interface. After performing registration authorization, it sends positioning requests to either the VMSC, SGSN or MSC Server and receives final location estimates from the corresponding entity via Lg interface. Optionally, location information may be communicated between GMLCs, located in the same or different PLMNs, via the Lr GMLC to GMLC interface.

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8 General network location procedures

8.1 State description for GMLC

8.1.1 GMLC states

8.1.1.1 NULL State

In the NULL state, a particular location request from some LCS client either has not been received yet or has already been completed. After a location request is received from a LCS client, the GMLC remains in the NULL state while the identity of the client and nature of its location request are verified. While the NULL state exists conceptually, it need not be represented explicitly in the GMLC.

8.1.1.2 INTERROGATION State

In this state, the GMLC has sent an interrogation to the home HLR/HSS of the UE to be located and is awaiting a response giving one or several of the following addresses: the VMSC, MSC Server, SGSN address and IMSI for this UE.

8.1.1.3 LOCATION State

In this state, the GMLC has sent a location request to the VMSC, MSC Server or, SGSN or serving the UE to be located and is awaiting a response containing a location estimate. Optionally, location information may also be communicated between GMLCs, located in the same or a different PLMN, via the GMLC to GMLC Lr interface

8.1.2 State functionality

8.1.2.1 State Transitions

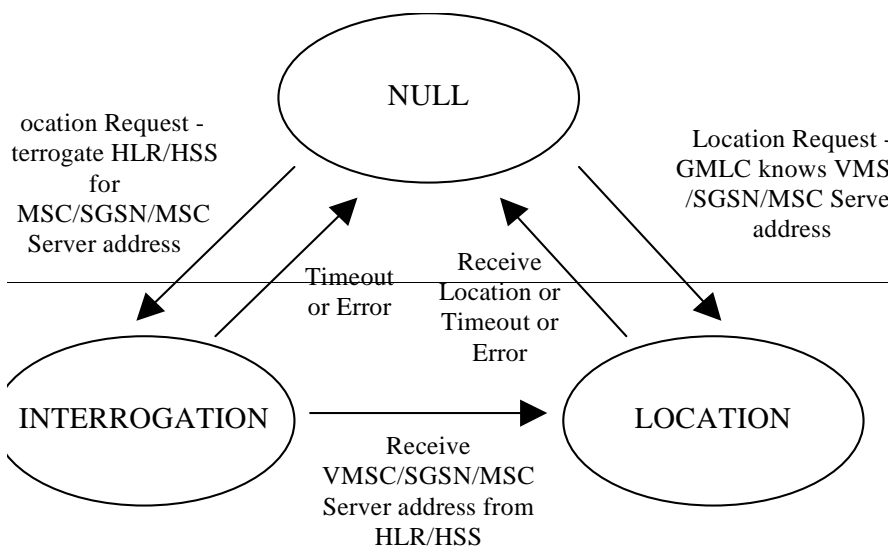
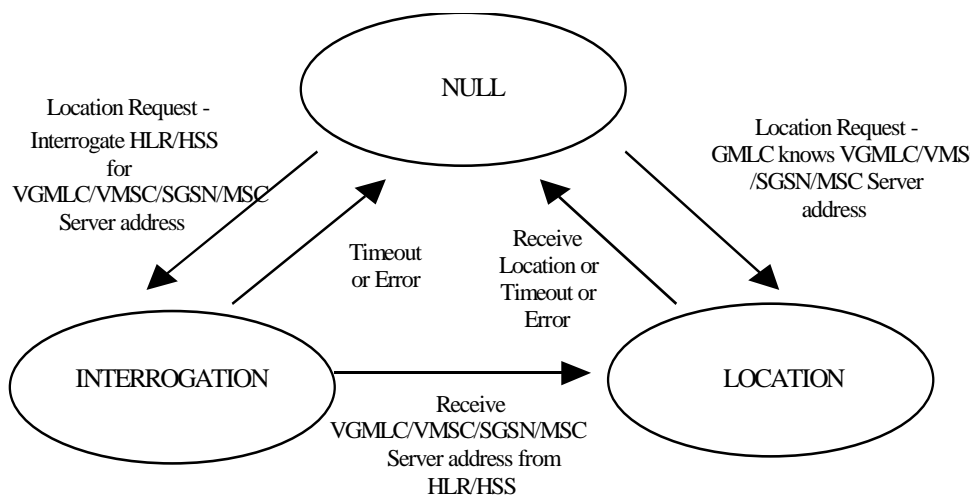


Figure 8.1: State Transitions in the GMLC

Moving from NULL to INTERROGATION state:

If the GMLC does not know any of the following addresses: VMSC, MSC Server, SGSN, V-GMLC address or IMSI when it receives a location service request from some LCS client, it moves from the NULL state to the INTERROGATION state and sends a request to the UE's home HLR/HSS for the VMSC/ MSC Server/ SGSN/V-GMLC address and IMSI.

Moving from NULL to LOCATION state:

If the GMLC already knows one of the following addresses: VMSC, MSC Server, SGSN or UE IMSI, when it receives a location service request from some LCS client (e.g. from information retained for an earlier location request for the same UE), it moves from the NULL state to the LOCATION state and sends a location request to either the VMSC, MSC Server or SGSN. Optionally, it may send the location request to another GMLC via the Lr interface.

NOTE: It is for further study how GMLC selects if it shall send the location request to VMSC, MSC server and/or SGSN in different cases. This should be specified in the signaling procedures.

Moving from INTERROGATION to LOCATION state:

After the GMLC, in the INTERROGATION state, receives one or several of the addresses VMSC, MSC Server, SGSN, V-GMLC and IMSI from the home HLR/HSS, it enters the LOCATION state and sends a location request to either the VMSC, MSC Server, ~~or~~ SGSN or V-GMLC of the UE being located.

Moving from LOCATION to NULL state:

After the GMLC receives a location estimate response from the VMSC, MSC Server, ~~or~~ SGSN or V_GMLC, it forwards the location estimate to the requesting LCS client and re-enters the NULL state.

<<<End of changes>>>