Technical Specification Group Services and System Aspects **TSGS#11(01)0120**

Meeting #11, Palm Springs, USA, 19-22 March 2001

Source: TSG SA WG2
Title: CRs on 03.71 v.7.4.0, v.8.0.0, 23.171 v.3.2.0 and 23.271 v.4.0.0
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 #11.

Note: the source of all these CRs is now S2, even if the name of the originating company(ies) is still reflected on the cover page of all the attached CRs.

CRs applicable to 03.71 (R98 and R99)

SA2 meeting	S2 Tdoc #	Spec	CR #	rev	Rel	Title	cat	Input	output	WI
S2-17	S2-010773	03.71	A018	1	R98	Applicability of LCS services in CS domain to GPRS mobile stations	F	7.4.0	7.5.0	
S2-17	S2-010774	03.71	A019	1	R99	Applicability of LCS services in CS domain to GPRS mobile stations	F	8.0.0	8.1.0	
S2-16	S2-010152	03.71	A011		R98	Correction; BSSMAP Location Information Report replaced by BSSMAP Connection Oriented Information	F	7.4.0	7.5.0	
S2-16	S2-010153	03.71	A012		R99	Correction; BSSMAP Location Information Report replaced by BSSMAP Connection Oriented Information	F	8.0.0	8.1.0	
S2-17	S2-010590	03.71	A016	1	R98	Corrections of A-GPS Broadcast Descriptions	F	7.4.0	7.5.0	
S2-17	S2-010591	03.71	A017	1	R99	Corrections of A-GPS Broadcast Descriptions	F	8.0.0	8.1.0	
S2-17	S2-010814	03.71	A020		R98	Geographical shape restriction in LCS	F	7.4.0	7.5.0	
S2-17	S2-010815	03.71	A021		R99	Geographical shape restriction in LCS	A	8.0.0	8.1.0	
S2-16	S2-010056	03.71	A013	1	R98	LCS error handling (Inter-BSC Handover)	F	7.4.0	7.5.0	
S2-16	S2-010057	03.71	A014	1	R99	LCS error handling (Inter-BSC Handover)	F	8.0.0	8.1.0	
S2-16	S2-010058	03.71	A022		R98	Segmentation/Pre-emption for LCS	F	7.4.0	7.5.0	
S2-16	S2-010059	03.71	A010	1	R99	Segmentation/Pre-emption for LCS	F	8.0.0	8.1.0	

CRs applicable to TS 23.171 (R99) and TS 23.271 (Rel-4)

S2-17	S2-010775	23.171	016	3	R99	Stop reporting procedure for UMTS, TS 23.171 (Rel 99)	A	3.2.0	3.3.0	
S2-17	S2-010776	23.271	015	3	Rel-4	Stop reporting procedure for UMTS, TS 23.271 (Rel 4)	A	4.0.0	4.1.0	LCS1

CRs applicable to TS 03.71 (R98), 23.171 (R99) and TS 23.271 (Rel-4)

S2-17	S2-010779	03.71	A015	3	R98	Privacy check procedures for call related MT-LR, GSM 03.71	D	7.4.0	7.5.0	
S2-17	S2-010780	23.171	017	3	R99	Privacy check procedures for call related MT-LR, TS 23.171 (Rel 99)	A	3.2.0	3.3.0	
S2-17	S2-010781	23.271	016	3	Rel-4	Privacy check procedures for call related MT-LR, TS 23.271 (Rel 4)	A	4.0.0	4.1.0	LCS1

CRs applicable to R99 (TS 23.171)

SA2 meeting	S2 Tdoc #	Spec	CR #	rev	Rel	Title	cat	Input	output	WI
S2-17	S2-010516	23.171	015		R99	Service Area definition in LCS stage 2	F	3.2.0	3.3.0	

CRs applicable to Rel-4 (TS 23.271)

SA2 meeting	S2 Tdoc #	Spec	CR #	rev	Rel	Title	cat	Input	output	WI
S2-16	S2-010064	23.271	001	1	Rel-4	Exception Procedures in SGSN	B	4.0.0	4.1.0	LCS1
S2-16	S2-010169	23.271	002		Rel-4	Correct Inconsistencies in LCS Stage 2 for the CN	F	4.0.0	4.1.0	LCS1
S2-16	S2-010063	23.271	003	1	Rel-4	IP addressing in LCS	B	4.0.0	4.1.0	LCS1
S2-16	S2-010374	23.271	006	2	Rel-4	Clarification of the use of the LCS client ID	F	4.0.0	4.1.0	LCS1
S2-16	S2-010265	23.271	007	1	Rel-4	MT-LR PS and CS procedures	F	4.0.0	4.1.0	LCS1
S2-16	S2-010266	23.271	008	1	Rel-4	POI not applicable to PLMN operator service	F	4.0.0	4.1.0	LCS1
S2-16	S2-010108	23.271	009		Rel-4	Clarification of the privacy class selection	F	4.0.0	4.1.0	LCS1
S2-16	S2-010109	23.271	010		Rel-4	Call related/unrelated is applicable only to value added service	F	4.0.0	4.1.0	LCS1
S2-17	S2-010785	23.271	011	3	Rel-4	Interworking with pre-Rel'4 LCS	B	4.0.0	4.1.0	LCS1
S2-16	S2-010054	23.271	012	1	Rel-4	Clarification on the use of APN as LCS Client ID	F	4.0.0	4.1.0	LCS1
S2-16	S2-010051	23.271	013	1	Rel-4	Presence condition of External LCS Client list for Call/session Related Class	F	4.0.0	4.1.0	LCS1
S2-16	S2-010055	23.271	014	1	Rel-4	MS presence notification procedure for LCS As informative annex to 23.271	B	4.0.0	4.1.0	LCS1
S2-17	S2-010787	23.271	017	1	Rel-4	Restructuring chapter 9.5.3 MS Privacy options, CR to 23.271 Rel4	D	4.0.0	4.1.0	LCS1
S2-17	S2-010788	23.271	018	1	Rel-4	Correction on the privacy check for session related class	F	4.0.0	4.1.0	LCS1
S2-17	S2-010786	23.271	019	1	Rel-4	Editorial to change MS to UE	D	4.0.0	4.1.0	LCS1
S2-17	S2-010816	23.271	020	1	Rel-4	Clarification of CN and RAN classmarks for LCS purposes	D	4.0.0	4.1.0	LCS1
S2-17	S2-010789	23.271	021	1	Rel-4	Paging Procedure in PS-MT-LR	C	4.0.0	4.1.0	LCS1

CR-Form-v3

CHANGE REQUEST

⌘ **03.71 CR A028** ⌘ rev ⌘ Current version: **7.4.0** ⌘

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

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

Title: ⌘	Segmentation/Pre-emption for LCS		
Source: ⌘	Ericsson		
Work item code: ⌘	LCS	***Date:*** ⌘	2001-01-15
Category: ⌘	F	***Release:*** ⌘	R98

Use one of the following categories:	Use one of the following releases:
F (essential correction)	2 (GSM Phase 2)
A (corresponds to a correction in an earlier release)	R96 (Release 1996)
B (Addition of feature),	R97 (Release 1997)
C (Functional modification of feature)	R98 (Release 1998)
D (Editorial modification)	R99 (Release 1999)
Detailed explanations of the above categories can	REL-4 (Release 4)
be found in 3GPP TR 21.900.	REL-5 (Release 5)

Reason for change: ⌘	The current segmentation/pre-emption mechanism leads to problems with large messages, this CR creates a new alternative mechanism.
Summary of change: ⌘	As an alternative to RR and BSSAP-LE level segmentation, long messages are sent in several shorter messages, each one still fulfilling the existing protocol specification.
Consequences if not approved: ⌘	Emergency calls and other CM and MM level activities may be delayed by up to 35 seconds. LCS may not work in certain environments.

Clauses affected: ⌘	10.2, 10.3, 10.4, 10.5		
Other specs affected: ⌘	**X** Other core specifications	⌘	04.06, 04.31
	☐ Test specifications		
	☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

10.2   Positioning for BSS based SMLC

This signaling flow is generic for all MS based or assisted location methods (MS Based E-OTD, MS Assisted E-OTD, GPS and Assisted GPS). If the SMLC desires to avoid lower layer (e.g. BSSAP-LE) segmentation and transfer the LCS assistance data more reliably, this procedure may be preceded by an "Assistance Data Delivery from BSS based SMLC" procedure. Note that part of the entire set of assistance data may be included in the RRLP Measure Position Request even when the message is preceded by an "Assistance Data Delivery from BSS based SMLC" procedure.
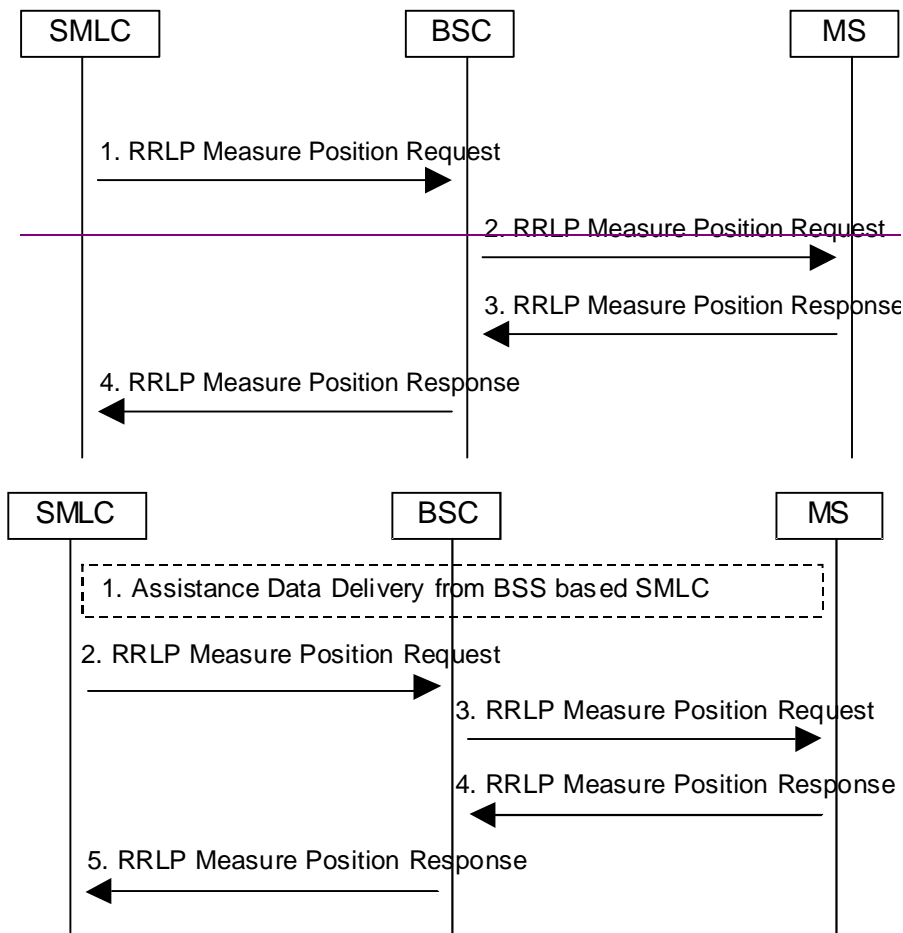

Figure 54: E-OTD/GPS Positioning Flow

1.   The SMLC may precede the RRLP MEASURE POSITION REQUEST with an optional Assistance Data Delivery from BSS based SMLC procedure (see 10.4).

2. The SMLC determines possible assistance data and sends RRLP MEASURE POSITION REQUEST to the BSC.

3. The BSC forwards the positioning request including the QoS and any assistance data to the MS in a RRLP MEASURE POSITION REQUEST.

4. The MS performs the requested E-OTD or GPS measurements, if needed assistance data is available in the MS. If the MS is able to calculate its own location and this is required and needed assistance data is available in MS, the MS computes a location estimate based on E-OTD or GPS measurements. In case of E-OTD, any data necessary to perform these operations will either be provided in the RRLP MEASURE POSITION request or available from broadcast sources. In case of Assisted GPS and first positioning attempt, Acquisition Assistance data and optionally Differential GPS data will be provided in the RRLP MEASURE POSITION REQUEST. In case of MS based GPS and further positioning attempt (failure in first attempt due to missing assistance data), complete GPS assistance data excluding Acquisition Assistance data will be provided in the RRLP MEASURE POSITION REQUEST and possibly preceding RRLP ASSISTANCE DATA messages. The resulting E-OTD or GPS measurements or E-OTD or GPS location estimate are returned to the BSC in a RRLP MEASURE POSITION RESPONSE. If the MS was unable to perform the necessary measurements, or compute a location, a failure indication identifying the reason for failure (e.g. missing assistance data) is returned instead.

<u>5</u>4. BSC forwards the RRLP MEASURE POSITION response to SMLC.

10.3   Positioning for NSS based SMLC

This signaling flow is generic for all MS based or assisted location methods (MS Based E-OTD, MS Assisted E-OTD, GPS and Assisted GPS). If the SMLC desires to avoid lower layer (e.g. BSSAP-LE) segmentation and transfer the LCS assistance data more reliably, this procedure may be preceded by an "Assistance Data Delivery from NSS based SMLC" procedure. Note that part of the entire set of assistance data may be included in the RRLP Measure Position Request even when the message is preceded by an "Assistance Data Delivery from NSS based SMLC" procedure.
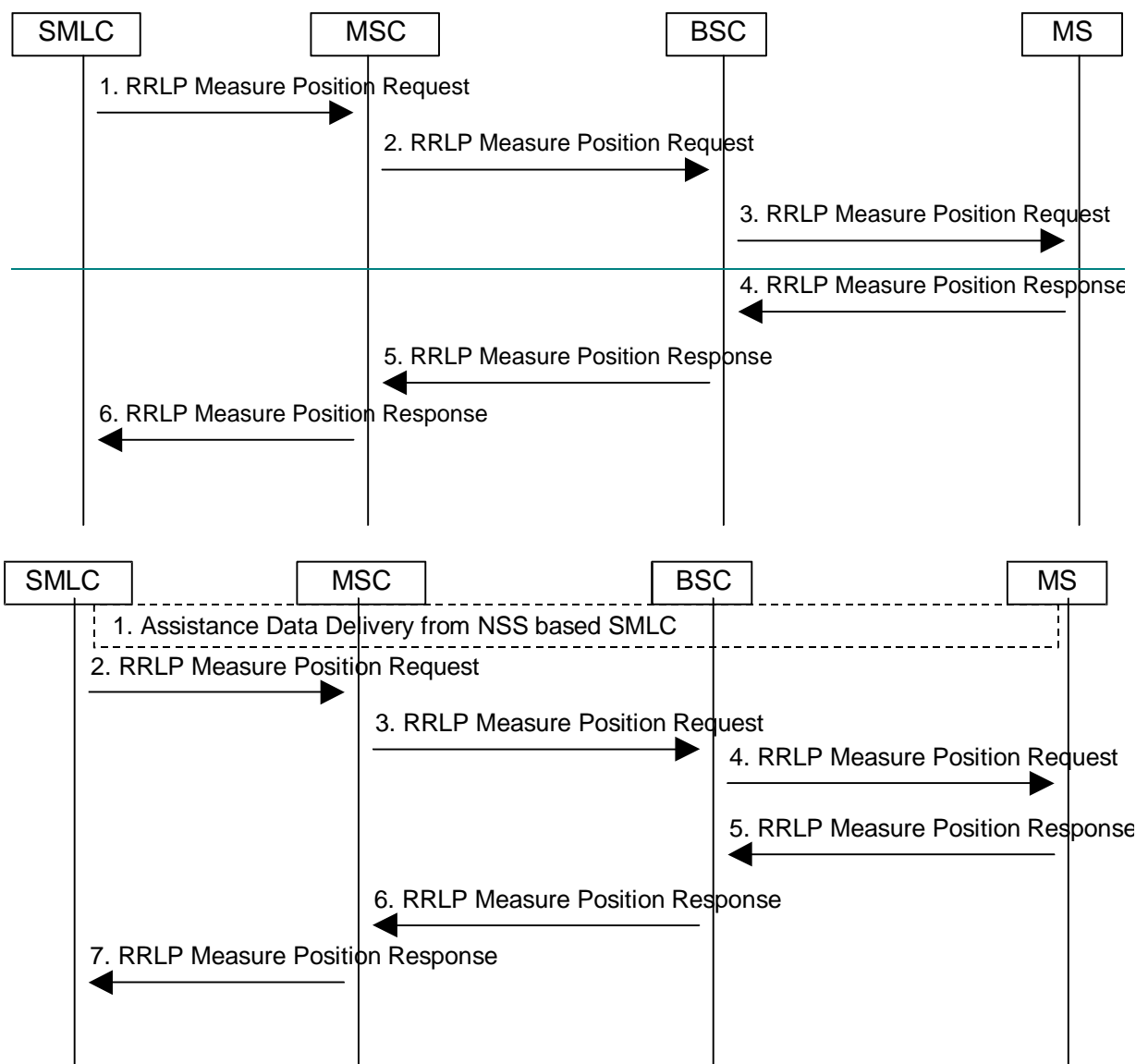

Figure 55: E-OTD/GPS Positioning Flow

1. The SMLC may precede the RRLP MEASURE POSITION REQUEST with an optional Assistance Data Delivery from NSS based SMLC procedure (see 10.5).

<u>2</u>1. The SMLC determines possible assistance data and sends RRLP MEASURE POSITION REQUEST to MSC.

<u>3</u>2. The MSC forwards the RRLP MEASURE POSITION REQUEST to the BSC.

<u>4</u>3. The BSC sends the positioning request including the QoS and any assistance data to the MS in a RRLP MEASURE POSITION REQUEST.

54. The MS performs the requested E-OTD or GPS measurements, if needed assistance data is available in MS. If the MS is able to calculate its own location and this is required and needed assistance data is available in MS, the MS computes an E-OTD or GPS location estimate. In case of E-OTD, any data necessary to perform these operations will be either provided in the RRLP MEASURE POSITOIN request or available from broadcast sources. In case of Assisted GPS and first positioning attempt, Acquisition Assistance data and optionally Differential GPS data will be provided in the RRLP MEASURE POSITION REQUEST. In case of MS based GPS and further positioning attempt (failure in first attempt due to missing assistance data), complete GPS assistance data excluding Acquisition Assistance data will be provided in the RRLP MEASURE POSITION REQUEST and possibly preceding RRLP ASSISTANCE DATA messages. The resulting E-OTD or GPS measurements or E-OTD or GPS location estimate are returned to the BSC in a RRLP MEASURE POSITION RESPONSE. If the MS was unable to perform the necessary measurements, or compute a location, a failure indication identifying the reason for failure (e.g. missing assistance data) is returned instead.

65. BSC sends measurement results in the MEASURE POSITION RESPONSE within BSSMAP Location Information Report message to MSC.

76. MSC forwards the measurement results in the MEASURE POSITION RESPONSE within LCS Information Report message to SMLC.

10.4 Assistance Data Delivery from BSS based SMLC

This signaling flow is generic for all MS based location methods (MS Based and Assisted E-OTD and Network Based and Assisted GPS). If the SMLC desires to avoid lower layer (e.g. BSSAP-LE) segmentation and transfer the LCS assistance data more reliably, the sequence 1-4 may be repeated one or several times to deliver more assistance data than can be sent by one RRLP Assistance Data Delivery message. In this case, each individual message is independent such that the data received in one message is stored in the MS independently of the other RRLP Assistance Data messages (i.e. an error of delivery of one message does not require a retransmission of all the RRLP Assistance Data messages). The SMLC shall indicate in the RRLP ASSISTANCE DATA message if more RRLP ASSISTANCE DATA messages will be used after the current one in order to deliver the entire set of assistance data. Data that is specific to the current cell should be sent in the last message.
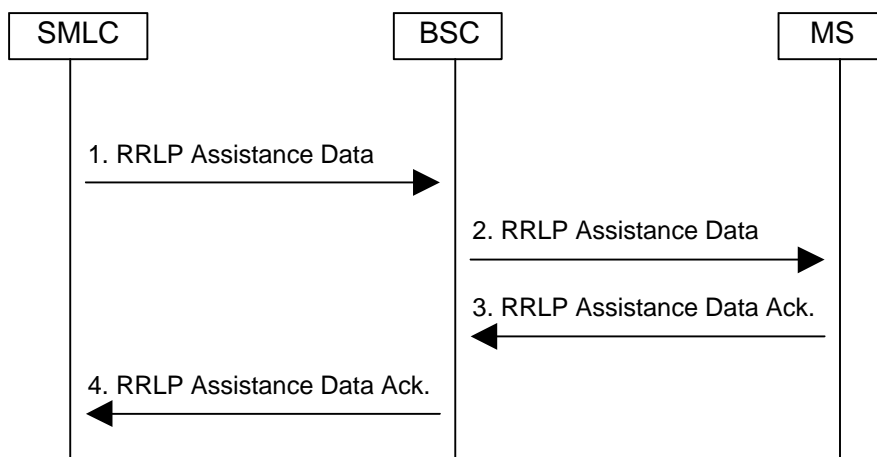

Figure 56: E-OTD or GPS Assistance Data Delivery Flow with BSS based SMLC

1) The SMLC determines assistance data and sends it in the RRLP ASSISTANCE DATA message to the BSC.

2) The BSC forwards the assistance data to the MS in a RRLP ASSISTANCE DATA message.

3) The MS acknowledges the reception of complete assistance data to the BSC with a RRLP ASSISTANCE DATA Ack.

4) The BSC forwards the RRLP ASSISTANCE DATA Ack message to the SMLC.

10.5 Assistance Data Delivery from NSS based SMLC

This signaling flow is generic for all MS based location methods (MS Based and Assisted E-OTD and Network Based and Assisted GPS). If the SMLC desires to avoid lower layer (e.g. BSSAP-LE) segmentation and transfer the LCS assistance data more reliably, the sequence 1-6 may be repeated one or several times to deliver more assistance data than can be sent by one RRLP Assistance Data Delivery message. In this case, each individual message is independent such that the data received in one message is stored in the MS independently of the other RRLP Assistance Data messages (i.e. an error of delivery of one message does not require a retransmission of all the RRLP Assistance Data messages). The SMLC shall indicate in the RRLP ASSISTANCE DATA message if more RRLP ASSISTANCE DATA messages will be used after the current one in order to deliver the entire set of assistance data. Data that is specific to the current cell should be sent in the last message.
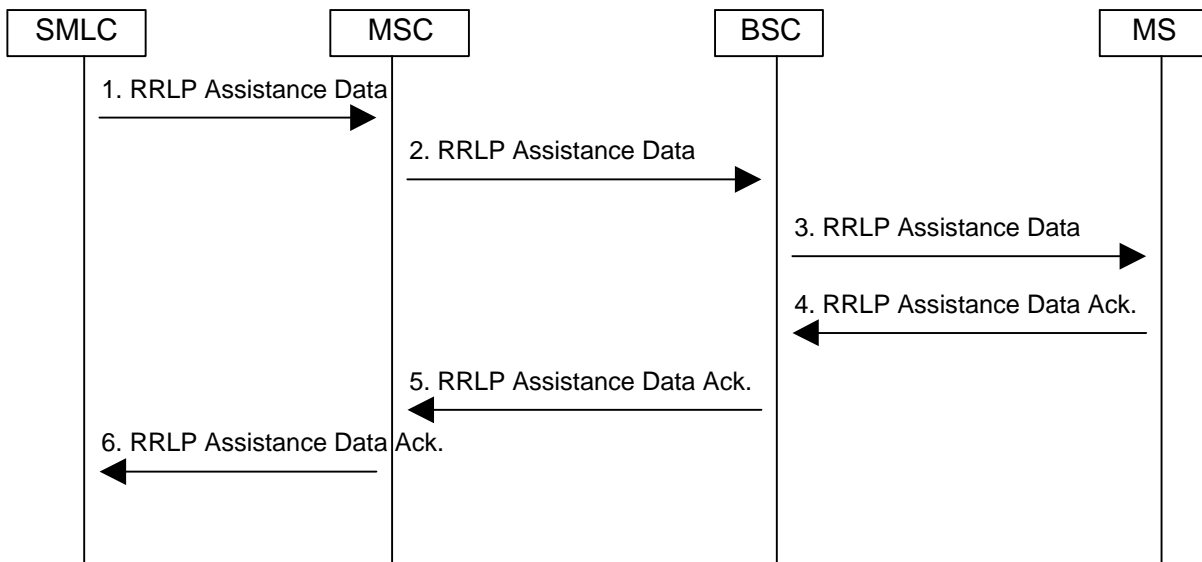

Figure 57: E-OTD or GPS Assistance Data Delivery Flow with NSS based SMLC

1) The SMLC determines assistance data and sends the RRLP ASSISTANCE DATA message to the MSC.

2) The MSC forwards the RRLP ASSISTANCE DATA message to the BSC.

3) The BSC sends the assistance data to the MS in a RRLP ASSISTANCE DATA message.

4) The MS acknowledges the reception of complete assistance data to the BSC in a RRLP ASSISTANCE DATA Ack.

5) The BSC sends the RRLP ASSISTANCE DATA Ack to the MSC.

6) The MSC forwards the RRLP ASSISTANCE DATA Ack to the SMLC.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.271** CR **013** | ⌘ rev **R1** | ⌘ | Current version: **4.0.0** | ⌘ |

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

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

Title: ⌘	Presence condition of External LCS Client list for Call/session Related Class	
Source: ⌘	Fujitsu Limited	
Work item code: ⌘	LCS1	***Date:*** ⌘ 22/01/01
Category: ⌘	**F**	***Release:*** ⌘ REL-4

Use one of the following categories:
F (essential 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)

Reason for change: ⌘	In Rel-4 LCS, the External LCS client list was introduced into the subscriber data for Call/session Related Class service just like Call/session Unrelated Class service. However the presence conditions of the list and each field in it remain unsettled. The handling of the External LCS client list for Call/session Related Class service is the same as for Call/session Unrelated Class service. That is, the same presence conditions for the External LCS client list and each field in it can be applied to both Call/session Related Class and Call/session Unrelated Class. This should be clarified.
Summary of change: ⌘	The presence conditions of the External LCS client list for Call/session Unrelated Class are also applied to Call/session Related Class in Table 10.2 of section 10.1.1.
Consequences if not approved: ⌘	

Clauses affected: ⌘	10.1.1
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

10.1.1   LCS Data in the HLR/HSS for an UE Subscriber

The IMSI is the primary key for LCS UE subscription data in the HLR/HSS. This subscription data may be stored in a Multiple Subscriber Profile (MSP), with the HLR/HSS able to hold a number of MSPs per IMSI.

LCS UE subscription data includes a privacy exception list containing the privacy classes for which location of the target UE is permitted. Each privacy class is treated as a distinct supplementary service with its own supplementary service code. The following logical states are applicable to each privacy class (refer to GSM 23.011 for an explanation of the notation):

Table10.1: Logical States for each LCS Privacy Class

Provisioning State	Registration State	Activation State	HLR Induction State
(Not Provisioned,	Not Applicable,	Not Active,	Not Induced)
(Provisioned,	Not Applicable,	Active and Operative,	Not Induced)

For each LCS privacy class, the HLR/HSS shall store the logical state of the class on a per-subscriber (or per subscriber MSP) basis. In addition, the permanent data indicated below shall be stored on a per subscriber (or per subscriber MSP) basis when the logical provisioning state of the associated LCS privacy class is "provisioned". For the meaning of each LCS privacy class, refer to clause 9 and to TS 22.071.

Table 10.2: LCS data stored in the HLR privacy exception list for an UE Subscriber (or UE Subscriber MSP)

LCS Privacy Class	Status	Additional HLR Data when Class is provisioned
Universal Class	-	No additional data
Call/session Related Class	M	Indication of one of the following mutually exclusive options for any LCS client not in the external LCS client list: • Location not allowed • Location allowed without notification (default case) • 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
	O[tbd] C[tbd] O[tbd] C[tbd]	External LCS client list: a list of zero or more LCS clients, with the following data stored for each LCS client in the list: • International E.164 address identifying a single LCS client or a single group of LCS clients that are permitted to locate this target MS • Restriction on the GMLC. Possible values are: - Identified GMLCs only - Any GMLC in the home country • Indication of one of the following mutually exclusive options: - Location allowed without notification (default case) - 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
Call/session Unrelated Class	M	Indication of one of the following mutually exclusive options for any LCS client not in the external LCS client list: • Location not allowed (default case) • 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
	O C O OC C	External LCS client list: a list of zero or more LCS clients, with the following data stored for each LCS client in the list: • International E.164 address identifying a single LCS client or a single group of LCS clients that are permitted to locate this target MS • Restriction on the GMLC. Possible values are: - Identified GMLCs only - Any GMLC in the home country • Indication of one of the following mutually exclusive options: - Location allowed without notification (default case) - 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
PLMN Operator Class	O	LCS client list: a list of one or more generic classes of LCS client that are allowed to locate the particular MS. 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 MS

3GPP

LCS UE subscription data may include a mobile originating list containing the LCS mobile originating classes that an UE is permitted to request. Each LCS mobile originating class is treated as a distinct supplementary service with its own supplementary service code. The following logical states are applicable to each mobile originating class (refer to TS 23.011 for an explanation of the notation):

Table 10.3: Logical States for each Mobile Originating LCS Class

Provisioning State	Registration State	Activation State	HLR Induction State
(Not Provisioned,	Not Applicable,	Not Active,	Not Induced)
(Provisioned,	Not Applicable,	Active and Operative,	Not Induced)

For each LCS Mobile Originating class, the HLR/HSS shall store the logical state of the class on a per-subscriber (or per subscriber MSP) basis. In this version of LCS, there is no additional permanent data in the HLR. The table below shows the defined mobile originating classes. For the meaning of each LCS mobile originating class, refer to clause 8 and to GSM 22.071.

Table 10.4: Data stored in the HLR for the LCS Mobile Originating List for an UE (or UE Subscriber MSP)

LCS Mobile Originating Class	Status	Additional HLR Data when Class is provisioned
Basic Self Location	-	No additional data
Autonomous Self Location	-	No additional data
Transfer to Third Party	-	No additional data

In addition to the privacy exception list, the following other data itemsmay be stored in the UE subscription profile in the HLR to support LCS:

Table 10.5: Temporary LCS data in the HLR

Other Data in the HLR	Status	Description
GMLC List	O	List of one or more E.164 addresses of the GMLCs from which a location request for an MT-LR is allowed, The addresses are only relevant to an LCS client that is restricted (in the UE privacy exception list) to making call/session related or call/session unrelated location requests.

CR-Form-v3

CHANGE REQUEST

	⌘	**23.271**	CR	**012**	⌘	rev	**R2**	⌘	Current version:	**4.0.0**	⌘

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

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

Title:	⌘	Clarification on the use of APN as LCS Client ID
Source:	⌘	Fujitsu Limited
Work item code: ⌘	LCS1	***Date:*** ⌘ 22/01/01
Category: ⌘	**F**	***Release:*** ⌘ REL-4

Use one of the following categories:
***F** (essential 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)

Reason for change: ⌘	(1)	In the last S2 meeting, it was agreed to use the APN only to associate a session-related MT_LR with an established PS session and not to use the APN as External Client Identity. This CR proposes some modifications to reflect this.
	(2)	According to TS 23.060, when the user subscribes to the wild card APN, the APN used to establish a session is the one notified by user or default APN in the VPLMN. The APN selection rule including the case of wild card APN is specified in the normative annex of TS 23.060. The APN selected by the SGSN based on the selection rule should be compared with the APN received from the GMLC.
	(3)	The PS session can be established toward the GGSN in the VPLMN or the HPLMN based on the selection rule in the annex of TS 23.060. To show whether a session-related MT_LR is associated with a session towards the VPLMN or HPLMN, the APN carried from the GMLC by the Provide Subscriber Location message shall include Operator Identifier as mandatory.

Summary of change: ⌘	-	How to use the APN for privacy checking was clarified in section 9.5.3.
	-	To show whether a session-related MT_LR is associated with a session towards the VPLMN or HPLMN, it was clarified that the APN carried from GMLC shall include Operator Identifier (i.e. it is globally unique identifier) as mandatory in section 10.3.
	-	The APN as session-unrelated identity was removed from Table 10.6 in section 10.3.

Consequences if not approved:	⌘	

Clauses affected:	⌘	9.5.3, 10,3

Other specs affected:	⌘	☐ Other core specifications ⌘
		☐ Test specifications

☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

2)

9.5.3   MS Privacy Options

The UE privacy options in the SLPP apply to an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR and either indicate that no CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR is allowed for the UE (except as may be overridden by the POI or local regulatory requirements) or define the particular classes of LCS client for which an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR for location are allowed, with the following classes being possible:

[Editor's note: The text in this chapter became rather complex when combining several input documents, so the chapter should be edited for clarity. An e-mail comment pointed out that there are different cases still to be covered in the description of the classes: 1. the LCS Client identity is included in SLPP or 2. the LCS Client identity is NOT included in SLPP. Also some GMLC restriction conditions need to be mentioned.]

a) Universal Class – allow positioning by all LCS clients

b) Call/Session related Class – allow positioning by specific identified LCS client or groups of LCS Client to which the UE originated a call in CS domain or an LCS client with which the UE has a session via an active PDP context in PS domain indicated by a specific APN. For all clients in the call related class, OR For each identified LCS client or group of LCS Clients, one of the following subscription options shall apply:

[NOTE: usage of APN is FFS in PS domain, e.g. using wild card APN as a global LCS client identity should be considered.]

Location request allowed only from GMLCs identified in the SLPP

      Location request allowed only from a GMLC in the home country

      Location request allowed from any GMLC (default case)

     For each identified value added LCS client or group of LCS Clients in the privacy exception list, one of the following subscription options shall apply:

      positioning allowed without notifying the UE user (default case)

      positioning allowed with notification to the UE user

      positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

      positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

       For all value added LCS clients sending a call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

      positioning not allowed

      positioning allowed without notifying the UE user (default case)

      positioning allowed with notification to the UE user

      positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

      positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

     NOTE: The usage of Call/Session related Class in the IM subsystem is FFS.

c) Call/Session-unrelated Class – allow positioning by specific identified LCS Clients or groups of LCS Client with the following restrictions allowed for each identified LCS Client or group of LCS Clients

      Location request allowed only from GMLCs identified in the SLPP

      Location request allowed only from a GMLC in the home country

      Location request allowed from any GMLC (default case)

For each identified value added LCS client in the privacy exception list, one of the following subscription options shall apply:

positioning allowed without notifying the UE user (default case)

positioning allowed with notification to the UE user

positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a non-call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

positioning not allowed (default case)

positioning allowed with notification to the UE user

positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

d) PLMN operator Class – 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

All UE privacy options of above four classes are commonly used for both CS and PS domain.

Note: If a privacy option setting in a domain is updated, same modification will be applied to the other domain.

If the UE subscribes to the universal class, any CS-MT-LR or NI-LR shall be allowed by the VMSC/MSC Server and any PS-MT-LR or PS-NI-LR shall be allowed by the SGSN. If local regulatory requirements mandate it, any MT-LR for an emergency services LCS client and any NI-LR for an emergency services call origination shall be allowed by the VMSC/MSC Server.

If the UE subscribes to the call/session-related class, an CS-MT-LR may be allowed if both of following conditions are met:

- The UE previously originated a call in CS domain that is still established and the called party number either dialled by the UE or used by the VMSC/MSC Server for routing matches the called party number received from the GMLC.

- The identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's/UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met

If these conditions are satisfied, the CS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the CS-MT-LR shall be restricted.

If the UE subscribes to the call/session-related class, a PS-MT-LR may be allowed if both of the following conditions are met:

- The UE previously originated a PDP-context towards the network where the external client is located and that this context is still established

- The APN that is used to set up the PDP context~~negotiated between the UE and SGSN~~ matches the APN received from the GMLC.

If these conditions are satisfied, the PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the PS-MT-LR shall be restricted.

If the UE subscribes to the call/session related class, a CS-MT-LR or PS-MT-LR from an LCS client that is NOT contained in the SLPP of the target UE shall be allowed or restricted according to the following conditions:

- For any non-matched LCS client, the CS-MT-LR or PS-MT-LR shall be allowed, if the UE user subscribes to either location without notification or location with notification.

- If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR or PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR or PS-MT-LR shall be restricted.

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR may be allowed by the MSC/MSC server or SGSN if the identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met.

If the LCS client is correctly matched in this way and any GMLC restrictions are satisfied, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR from an LCS client that is not contained in the MS's SLPP shall be allowed or restricted according to the following conditions. For any non-matched LCS client, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

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 MS's SLPP or is otherwise authorized by local regulatory requirements to locate the MS.

In evaluating privacy where any address "A" associated with the LCS client (e.g. LCS client ID, ~~APN~~ or GMLC address) needs to be compared with a corresponding address "B" in the target MS's SLPP, a match shall be determined if a match is found for each of the following components of each address:

   a) Numbering Plan

   b) Nature of Address Indicator

   c) Corresponding address digits for all digits in "B" (the digits or initial digits in "A" must match all the digits in "B", but "A" may contain additional digits beyond those in "B")

All addresses shall be transferred to the MSC/VLR, MSC server or SGSN in international format.

In evaluating privacy where an APN associated with the LCS client notified by the GMLC needs to be compared with a corresponding APN that is used to set up the associated PDP context, a match shall be determined if a match is found for each of following components of each address:

     a)   Operator Identifier (the Operator Identifier received from the GMLC is compared with the corresponding information used to set up the associated PDP Context in the SGSN when the associated PS session was established)

     b)   Network Identifier

*** *Next Change* ***

10.3   GMLC

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.

Table10.6: 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	M	A list of one or more identifiers used to identify an external LCS client when making an MT-LR – the nature and content of the identifier(s) is outside the scope of the present document
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 or APNs (see NOTE) to identify the client for a call related MT-LR Each call related identity may be associated with a specific external identity. Each session-related identity shall be associated with a logical client name.
Call/session-unrelated identity	O	A list of one ore more international E.164 addresses or APNs to identify the client for a non-call related CS-MT-LR/PS-MT-LR. NOTE: A list of IP addresses or other appropriate PS specific identities may be added here. Each non-call related identity may be associated with a specific external identity. Each session-related identity shall be associated with a logical client name.
Client name	O	An address string which is a logical name associated with LCS client's E.164 address.
Override capability	O	Indication of whether the LCS client possesses the override capability (not applicable to a value added client)
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 Separate default QoS parameters may be maintained for each distinct LCS client identity (external, non-call related, call related)
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 • 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

NOTE: The LCS Client is identified with E.164 number or APN. APN is specified in TS 23.003 **Error! Reference source not found.**.

The APN identity of the LCS Client shall include Operator Identifier as mandatory (i.e. it is globally unique) to show whether the session-related MT_LR is associated with a session towards the VPLMN or HPLMN.should be further defined, e.g. if it is global or GMLC related.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.271** CR **014** | ⌘ rev **1** ⌘ | Current version: | **4.0.0** | ⌘ |

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

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

Title: ⌘	MS presence notification procedure for LCS	
Source: ⌘	Fujitsu	
Work item code: ⌘	LCS1	***Date:*** ⌘ 24/Jan/2001
Category: ⌘ **B** Critical correction		***Release:*** ⌘ REL-4

Use one of the following categories: **F** *(essential 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)*

Reason for change: ⌘	MS presence notification procedure, which enables the network to alert the LCS client when the mobile station becomes reachable after the failure of the MT-LR, is agreed to introduce to LCS.
Summary of change: ⌘	Descriptions about LCS routing procedure, LCS alerting procedure and LCS status reporting procedure are added.
Consequences if not approved: ⌘	

Clauses affected: ⌘	ANNEX C
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments: ⌘	This CR proposes to include the text in the informative ANNEX of 23.271 to show SA2's provisional approval. When the liaison statement from SA1 is received, this description may be moved to the main body or may be deleted from the specification.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

Annex C (Informative - under study): MS Presence Notification

The context in this annex has been reviewed and currently under study by SA2. This text may be moved to the main body or deleted according to the feedback from SA1 on the underlying requirement.

Note: The section number in this annex is not consistent since it was originally intended to be included in the main body.

9.8 MS Presence Notification

9.8.1 MT-LR routing procedure
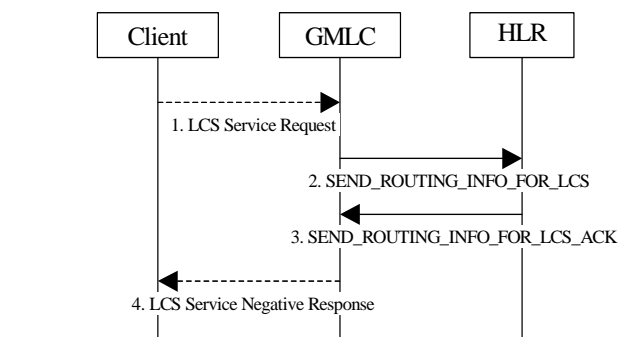
9.x: MT-LR routing procedure

9.8.1.1 HLR

When the HLR receives the SEND_ROUTING_INFO_FOR_LCS message from the GMLC, it checks if the routing information (i.e., MSC number and/or SGSN number) is stored for the mobile subscriber and the mobile subscriber is reachable either via CS domain or PS domain based on the status of the "MSC Area Restricted Flag" and the "MS purged for non GPRS" for CS domain, and "SGSN Area Restricted Flag" and "MS purged for GPRS" for PS domain.

If no routing information is stored for the mobile subscriber or the mobile subscriber is not reachable based on the flags listed above, the mobile station not reachable flags for the appropriate domain (i.e., MNRF and/or MNRG) are set and the "Absent Subscriber" error is returned with the appropriate absent subscriber diagnostic indication, i.e., "Deregistered in HLR for non GPRS", "Deregistered in HLR for GPRS", "Roaming Restricted", "Roaming Restricted for GPRS", "MS-Purged for non GPRS" or "MS-Purged for GPRS". The LCS client ID and the GMLC number are included in the MWD if the GMLC support the MS presence notification procedure. The HLR knows that the GMLC supports the MS presence notification procedure receiving the LCS Client ID in the SEND_ROUTING_INFO_FOR_LCS message.

The HLR returns the routing information (i.e., MSC number and/or SGSN number) if available irrelevant to the status of the mobile station not reachable flags.

i) Routing information is available in either domain

   The available routing information is set to the SEND_ROUTING_INFO_FOR_LCS_ACK and returned to the GMLC.

ii) Routing information is NOT available in both domains

   The "Absent Subscriber" error is returned to the GMLC with the appropriate absent subscriber diagnostic indication which is derived from the mobile not reachable reason (MNRR), and the mobile station not reachable flag(s) for the appropriate domain is set.

If the MS presence notification procedure is supported by the GMLC, following procedure shall be applied:

The HLR includes the LCS MWD Status, which shows the status of the MNRF, the MNRG and the contents of MNRR, in the every SEND_ROUTING_INFO_FOR_LCS_ACK message to indicate the status of the MWD in the HLR, and its support of the MS presence notification procedure to the GMLC.

The HLR also set the indication to the SEND_ROUTING_INFO_FOR_LCS_ACK message whether or not the LCS Client ID is already included in the MWD.

9.8.1.2   GMLC

Receiving the SEND_ROUTING_INFO_FOR_LCS_ACK message from the HLR, the GMLC proceeds with the MT-LR based on the received routing information and LCS MWD status (if available).

The detail logics of the GMLC regarding how the routing to be proceeded with are left to the implementation, however possible points to be considered are, for example,

- which domain is selected first considering the LCS MWD status,

- if the GMLC proceeds with the MT-LR to a domain whose not reachable flag is set and the MNRR indicating "No Paging Response",

- if the LCS priority is taken into account for the decision of above, and

- if the GMLC retries in the other domain or abort of the MT-LR when first trail has failed.

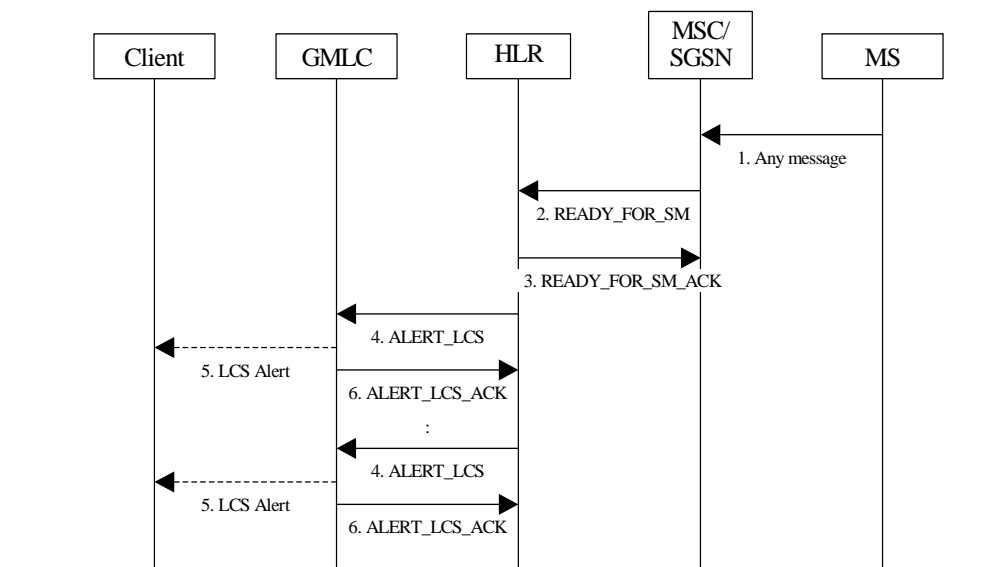## 9.8.2   LCS client alerting procedure

Figure 9.y: LCS Client Alerting procedure

9.8.2.1   MSC/SGSN

When detecting that the mobile subscriber becomes reachable while the MNRF or the MNRG is set, the MSC or the SGSN will send the READY_FOR_SM message towards the HLR. The Alert Reason is set to indicate that the mobile subscriber is present.

When receiving the answer, the MSC or the SGSN will act as follows:

- MNRF or MNRG is cleared if the procedure is successful

- MNRF or MNRG is NOT cleared if the procedure is not successful

9.8.2.2   HLR

Depending on the received message (e.g., READY_FOR_SM, UPDATE_LOCATION, UPDATE_GPRS_LOCATION), the HLR updates the status of the appropriate mobile station not reachable flag, and initiates the LCS client alerting procedure if necessary. This logic to initiate the alerting procedure is

almost same as what is defined in the SMS except that the LCS is not relevant to the alerting reason about memory becoming available in the mobile equipment. For detail, refer to TS 23.040 [x] and TS 29.002 [y].

If the HLR determines to initiate the LCS client alerting procedure, all the GMLCs that are set to the MWD are sent the ALERT_LCS messages to inform the mobile subscriber become reachable. The ALERT_LCS message includes the list of the LCS Client IDs that are associated with the GMLC.

When receiving the answer to the ALERT_LCS message, the HLR will clear the GMLC number and the associated LCS Client IDs in the MWD.

9.8.2.3   GMLC

When the ALERT_LCS message is correctly received by the GMLC, the GMLC will forward the alerting to the given LCS clients specified in the received message.
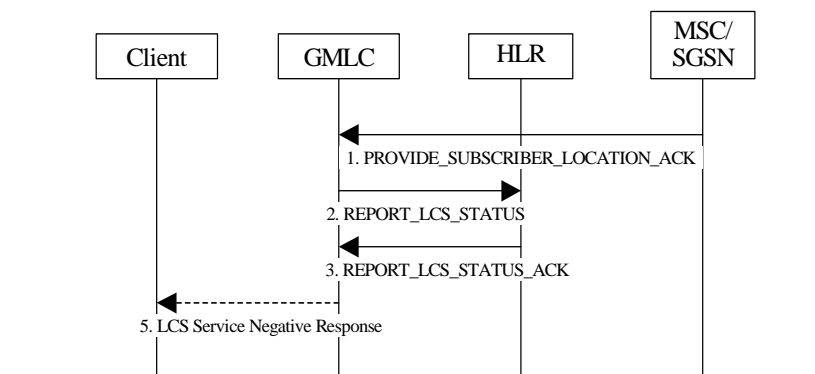
9.9.3   LCS status reporting procedure

Figure 9.z: MS Presence Notification procedure

9.8.3.1   MSC/SGSN

Receiving the PROVIDE_SUBSCRIBER_LOCATION message, the MSC or the SGSN initiates an appropriate procedure for the MT-LR.

If the MT-LR fails because the mobile subscriber is not reachable, the MSC or the SGSN shall set the mobile station not reachable flag. The "Absent Subscriber" error is returned to the GMLC with the appropriate absent subscriber diagnostic indication.

Note: The support of the MS presence notification procedure for LCS in the MSC and the SGSN is mandatory.

9.8.3.2   GMLC

The GMLC recognized that the HLR supports the MS presence notification procedure receiving the LCS MWD Status in the SEND_ROUTING _INFO_FOR_LCS_ACK message. If the HLR does not support the MS presence notification procedure, the GMLC does not initiate the LCS status reporting procedure to the HLR.

If the GMLC does not have the LCS MWD Status since it did not execute the send routing information for LCS procedure and the GMLC is not sure that the HLR does not support the MS presence notification procedure for LCS, the GMLC shall always initiate the LCS status reporting procedure.

The conditions that the GMLC needs to initiate the LCS status reporting procedure when the HLR supports the MS presence notification procedure and the send routing information for LCS procedure has been executed are left for implementation. The GMLC can initiate the procedure always, or if only necessary. The minimum conditions to initiate the procedure are as follows:

a)   Either of the MNRF or the MNRG is not set in the HLR, and the MT-LR fails for the domain because of the mobile subscriber not reachable.

b)   The MT-LR has succeeded for a domain while the not reachable flag for the domain is set in the HLR.

c)   The reason set in the MNRR for a domain is not same as one newly received from the domain.

d)   The LCS client is not set in the MWD when the MT-LR fails for the domain because of the mobile subscriber not reachable.

Note: The failure of the MT-LR in above includes two cases. One is the case that PROVIDE_SUBSCRIBER_LOCATION message has been sent and negative response is received, and another case is that the MT-LR is aborted before sending the message because of the status of the MNRF or MNRG.

If the GMLC determines that it is necessary to update the MWD in the HLR, it sends the REPORT_LCS_STATUS message to the HLR that includes the new status of the either or both of the MNRF and the MNRG with the network node number (i.e., the MSC number or the SGSN number) that returned the error response. If the GMLC has received the diagnostic information with "Absent Subscriber" error, it is forwarded to the HLR as well.

If the LCS client ID cannot be inserted to the MWD in the HLR by any reason, the GMLC may inform the LCS client that it cannot expect the report when the mobile subscriber becomes reachable.

9.8.3.3   HLR

The HLR receives the REPORT_LCS_STATUS message from the GMLC.

If the corresponded MSC is earlier than LCS phase 2, the MNRF shall not be newly set in the HLR. In this case, the LCS Client ID cannot be inserted to the MWD unless either the MNRF or the MNRG has been already set. Otherwise if the inclusion of the GMLC number and/or LCS Client ID in the MWD is not possible, "Feature not supported by the serving node" error is returned.

If the MT-LR Outcome reports unsuccessful execution, the network node number received in the REPORT_LCS_STATUS message is same as the current serving node number stored in the HLR for the corresponding domain, and the message waiting list is not full, the given LCS Client ID is inserted and an acknowledgement is sent to the GMLC. Otherwise if the inclusion of the GMLC number and/or LCS Client ID in the MWD is not possible, a message waiting list full error is returned to the GMLC, or if the serving node numbers are not same, a "Serving Node Number Mismatch" error is returned to the GMLC.

If the MT-LR Outcome is absent subscriber for non GPRS, the HLR sets the mobile station not reachable flag in the subscriber data. If a reason for absence is provided by the GMLC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.

If the MT-LR Outcome is absent subscriber for GPRS, the HLR sets the mobile station not reachable for GPRS flag in the subscriber data. If a reason for absence is provided by the GMLC then this is stored in the mobile station not reachable reason (MNRR) in the subscriber data.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** CR | **A013** | ⌘ rev | **A** | ⌘ Current version: | **7.4.0** | ⌘ |

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

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

Title: ⌘	LCS error handling (Inter-BSC Handover)	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	**Date:** ⌘ 2001-01-22
Category: ⌘	**F**	**Release:** ⌘ R98

Use <u>one</u> of the following categories:
 F *(essential 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 LCS Stage Two is inconsistent with the BSSAP-LE (GSM 09.31) specification. This CR corrects this problem.
Summary of change: ⌘	The BSC is now allowed to abort with BSSLAP or BSSAP-LE depending on whether there is an active BSSLAP transaction or not.
Consequences if not approved: ⌘	Stage Two inconsistency with detailed stage three specification may lead to interoperability problems.

Clauses affected: ⌘	7.11.4
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

ETSI TS 101 724 V7.4.0 (2000-07)

Technical Specification

Digital cellular telecommunications system (Phase 2+);
Location Services (LCS);
(Functional description) - Stage 2
(GSM 03.71 version 7.4.0 Release 1998)

GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

ETSI

7.11 Exception Procedures

The procedures in this section apply to all variants of an MT-LR, NI-LR and MO-LR where a BSSMAP-LE Perform Location Request has been sent to an SMLC by a BSC or MSC requesting some location service (e.g. provision of a location estimate for a target MS or transfer of assistance data to a target MS).

7.11.1 Procedures in the SMLC

When a request for a location estimate fails due to failure of a position method itself (e.g. due to inaccurate or insufficient position measurements and related data) and the SMLC is unable to instigate another positioning attempt (e.g. due to a requirement on response time), the SMLC may return a BSSMAP-LE Perform Location response containing a less accurate location estimate (e.g. based on serving cell and timing advance). If a less accurate estimate is not available or will not meet the accuracy requirement, the SMLC shall instead return a BSSMAP-LE Perform Location response message containing no location estimate and indicating the cause of failure.

When a request for any other location service (e.g. transfer of assistance data to a target MS) fails for any reason and the SMLC is unable to reattempt the service, the SMLC shall return a BSSMAP-LE Perform Location response message indicating the cause of failure.

When a location service request is interrupted by some other unrecoverable error event inside the SMLC, the SMLC shall immediately terminate the location service attempt and return a BSSMAP Perform Location Response message containing the reason for the location service cancellation. In that case, any dialogue previously opened with an LMU or BSC for the purpose of instigating position measurements for any MS being located may also be aborted by the SMLC.

If the SMLC receives a BSSMAP-LE Perform Location Abort indication for a previous location service request from the VMSC (NSS based SMLC) or BSC (BSS based SMLC), it shall immediately terminate the location service attempt and may abort any dialogues used for the location service attempt that may still exist with any LMUs. Although the SMLC cannot abort any location procedure instigated in the serving BSC (e.g. for TOA), the circumstances of the abort may still ensure cancellation of any such procedure (see section on BSC).

If the SMLC has instigated any location related procedure in the Target MS or its serving BSC and receives a BSSLAP Reject, BSSLAP Abort or BSSLAP Reset indication from the BSC, it shall cancel the location service attempt and may abort any dialogues for this that currently exist with any LMUs. For a BSSLAP Abort, the SMLC shall then either return any location estimate already derived, if this was requested and is sufficient for the requested QoS, or return a BSSMAP-LE Perform Location response indicating failure of the location service and the cause of the failure in the BSSLAP Abort. For a BSSLAP Reject and BSSLAP Reset, the SMLC has the additional option of restarting the location service attempt and using the same or a different position method where a location estimate was requested. A decision to restart the location service shall take into account the cause of the location service failure as conveyed in the BSSLAP Reject or BSSLAP Reset and whether, in the case of successful intra-BSC handover, the new cell for the target MS is still associated with the SMLC. If the SMLC receives a BSSLAP Reject or BSSLAP Reset with a cause indicating intra-BSC handover and with a new cell identity for the target MS that is not associated with the SMLC, the SMLC shall return a BSSMAP-LE Perform Location response containing either a location estimate, if requested, available and sufficient for the requested QoS, or a failure cause indicating "intra-BSC" handover.

> NOTE: This procedure may only be needed for an NSS-based SMLC.

The SMLC may indicate an inability to support location due to overload by rejecting with a cause indicating congestion a BSSMAP-LE Perform Location request received from either an MSC or BSC.

7.11.2 Procedures in the VMSC

After the VMSC has requested a location service for a particular MS from the SMLC or BSC, certain events may occur that may temporarily or permanently interfere with the location service. For each such event notified to the VMSC, the VMSC shall employ one of the following error recovery actions.

Restart the Location Service

This action shall be employed for any event that temporarily impedes a location service attempt and cannot be delayed until the location service attempt is complete. When such an event is notified to the VMSC, it shall immediately cancel the location service attempt and the associated BSSMAP-LE or BSSMAP dialogue with the SMLC (NSS based SMLC)

or BSC (BSS based SMLC), respectively, if this still exists by sending a BSSMAP-LE or BSSMAP Perform Location Abort message to the SMLC or BSC, respectively. The Abort message shall contain the reason for the location procedure cancellation.

After aborting the location request dialogue with the SMLC or BSC, the VMSC may queue the location service request until the event causing the restart has terminated (if not already terminated). The VMSC may optionally wait for an additional time period (e.g. if the queuing delay is minimal) to ensure that any resources allocated in and by the SMLC have time to be released. The VMSC may then send another location service request to the SMLC or BSC associated with the current serving cell of the target MS.

Abort the Location Service

This action shall be employed for any event that permanently impedes a location service attempt, such as loss of the DCCH to the target MS. When such an event is notified to the VMSC, it shall cancel the current location service attempt and the associated BSSMAP-LE or BSSMAP dialogue with the SMLC (NSS based SMLC) or BSC (BSS based SMLC), respectively, if still existing, by sending a BSSMAP-LE or BSSMAP Perform Location Abort message to the SMLC or BSC, respectively. The Abort message shall contain the reason for the location procedure cancellation. The VMSC shall then return an error response to the client or network entity from which the location request was originally received. The VMSC shall also release all resources (e.g. DCCH) specifically allocated for the location attempt.

The following table indicates the appropriate error recovery procedure for certain events. For events not listed in the table, the VMSC need take no action.

Table 2: LCS Error Recovery Procedures in the VMSC for certain Events

Event	VMSC Error Recovery
Release of radio channel to the MS	Abort
Any error response from the SMLC or BSC except for intra-BSC, inter-BSC or inter-MSC handover	Abort
An error response from the SMLC indicating intra-BSC handover	Restart with no additional delay required
Inter-BSC Handover	Restart after handover completed
Inter-MSC Handover	Restart after handover completed

If a location service request is aborted due to an error response from the SMLC or BSC indicating congestion, the MSC may reduce the frequency of location service requests to this SMLC or BSC according to the rules in GSM 09.31, which give precedence to location service requests with a higher priority.

7.11.3   Procedures in an LMU

An LMU shall return an error indication to its controlling SMLC when location measurements previously ordered by the SMLC cannot be provided due to any error condition.

7.11.4   Procedures in the BSC

7.11.4.1   General Procedures

The BSC serving a target MS shall supervise any network or MS location service procedure, including transfer of positioning assistance data to an MS, and shall only allow one such procedure to be active at any time. If a new procedure is instigated by the SMLC for any target MS, the BSC shall cancel any previous procedure without notifying the SMLC or target MS. The new procedure shall then be treated according to the prevailing conditions – e.g. may be rejected if a previous TOA handover attempt was not yet completed. If a location information transfer to an MS initiated by an SMLC is not active, the BSC shall discard any RRLP message or message segment received from the MS. This precludes the initiation of any location service procedure from an MS.

Depending on the location procedure and its current state of execution, a serving BSC may chose to defer certain radio related events (e.g. handover) to avoid interference with location – refer to the later sections for each position method. A serving BSC shall abort all existing location related procedures for a particular target MS without notifying an NSS based SMLC or target MS if the DCCH to the target MS or the SCCP connection to the VMSC or a BSS based SMLC is released. In the event of an abort with a BSS based SMLC, the BSC shall attempt to notify the SMLC using a BSSMAP-LE Perform Location Abort.

7.11.4.2 Rejection of an SMLC Positioning Request

The BSC may reject any request from an SMLC for positioning or transfer of assistance data for a target MS if the request cannot be performed for reasons other than interaction with handover or other RR management. If the request is rejected, the BSC shall return a BSSLAP Reject to the SMLC containing the cause of rejection.

7.11.4.3 Interaction with Inter-BSC or Inter-MSC Handover

The BSC shall reject any request from an SMLC for positioning or transfer of assistance data while an inter-BSC or inter-MSC handover procedure is ongoing and shall return a BSSLAP Abort to the SMLC.

The BSC shall terminate any network or MS positioning procedure or any transfer of RRLP assistance data already in progress if inter-BSC or inter-MSC handover is needed and is not precluded by the particular location procedure and its current state. When a location procedure is terminated and there is an active BSSLAP transaction, the BSC shall return a BSSLAP Abort message to the SMLC after the BSSMAP Handover Required has been sent to the serving MSC. The BSSLAP Abort shall contain the cause of the location procedure failure. When a location procedure is terminated and there is no active BSSLAP transaction, the BSC shall send a BSSAP-LE Perform Location Abort message to the SMLC after the BSSMAP Handover Required has been sent to the serving MSC.

7.11.4.4 Interaction with Intra-BSC Handover and other RR Management Procedures

The BSC shall reject any request from an SMLC for positioning or transfer of assistance data while an intra-BSC handover or other intra-BSC RR management procedure involving the target MS is ongoing and shall return a BSSLAP Reset to the SMLC when the handover or other RR management procedure is complete or has timed out in the BSC.

The BSC shall terminate any network or MS positioning procedure or any transfer of RRLP assistance data already in progress if an intra-BSC handover or other intra-BSC RR management procedure is needed and is not precluded by the particular location procedure and its current state. When location procedure is terminated, the BSC shall return a BSSLAP Reset message to the SMLC after the intra-BSC handover or other RR management procedure is complete or has timed out in the BSC. The BSSLAP Reset shall contain a cause indication, the current serving cell identity and may contain measurement information for the target MS (e.g. TA value).

7.11.4.5 Priority of Handover and Other RR Management Procedures

If the transfer of RRLP messages between an SMLC and target MS is interrupted by intra-BSC handover, inter-BSC handover or any other intra-BSC RR management procedure, the BSC shall avoid delay to the handover or RR management procedure by employing the preemption capability defined in GSM 04.06 and 04.08. This allows an RR Handover Command or other RR management command sent to the target MS to be assigned a "high" priority at the data link level enabling preemption of "low" priority RR Application Information messages (carrying RRLP messages) which may have been sent earlier. This procedure ensures that any RRLP data still untransmitted to the MS will be preempted (and discarded) by the data link layer in the BTS prior to transmission of the Handover Command or other RR Management command.

7.11.4.6 Interaction with Segmentation

When requested to transfer a segmented RRLP message between an SMLC and target MS, the BSC shall discard all received RRLP segments if the transfer procedure in the BSC cannot be supported or is aborted. The BSC need not wait until all RRLP segments are received before notifying the SMLC of the failure of the RRLP procedure with a BSSLAP Abort, Reject or Reset message.

If a location service procedure for a target MS is not currently underway or previously failed, the BSC shall discard all BSSLAP segments received from an SMLC for this MS until it receives the first or only segment of a new BSSLAP message. Once a location service procedure has been started involving RRLP message transfer to a target MS, the BSC shall discard all RRLP segments received from the MS until it receives the first or only segment of a new RRLP message. The new RRLP message shall then be treated according to the state of the RRLP message transfer as described in section 7.7.

Further details regarding transfer and segmentation of RRLP messages between a BSC and MS can be found in GSM 04.08.

7.11.4.7 Overload

The BSC may indicate an inability to support location due to overload by rejecting with a cause indicating congestion a BSSMAP Perform Location request received from the MSC. If a BSS based SMLC has rejected a request from the BSC to perform location with a cause indicating congestion, the BSC shall convey the rejection and cause to the MSC if the request was MSC initiated. If the request was initiated by the BSC, the BSC may reduce the frequency of its location requests to the SMLC according to the rules in GSM 09.31, which give precedence to location service requests with a higher priority.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** CR | **A014** | ⌘ rev | **A** | ⌘ Current version: | **8.0.0** | ⌘ |

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

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

Title: ⌘	LCS error handling (Inter-BSC Handover)	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 2001-01-22
Category: ⌘	**A**	***Release:*** ⌘ R99

Use <u>one</u> of the following categories:
  F *(essential 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 LCS Stage Two is inconsistent with the BSSAP-LE (GSM 09.31) specification. This CR corrects this problem.
Summary of change: ⌘	The BSC is now allowed to abort with BSSLAP or BSSAP-LE depending on whether there is an active BSSLAP transaction or not.
Consequences if not approved: ⌘	Stage Two inconsistency with detailed stage three specification may lead to interoperability problems.

Clauses affected: ⌘	7.11.4
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

ETSI TS 101 724 V7.4.0 (2000-07)

Technical Specification

Digital cellular telecommunications system (Phase 2+);
Location Services (LCS);
(Functional description) - Stage 2
(GSM 03.71 version 7.4.0 Release 1998)

GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

ETSI

7.11 Exception Procedures

The procedures in this section apply to all variants of an MT-LR, NI-LR and MO-LR where a BSSMAP-LE Perform Location Request has been sent to an SMLC by a BSC or MSC requesting some location service (e.g. provision of a location estimate for a target MS or transfer of assistance data to a target MS).

7.11.1 Procedures in the SMLC

When a request for a location estimate fails due to failure of a position method itself (e.g. due to inaccurate or insufficient position measurements and related data) and the SMLC is unable to instigate another positioning attempt (e.g. due to a requirement on response time), the SMLC may return a BSSMAP-LE Perform Location response containing a less accurate location estimate (e.g. based on serving cell and timing advance). If a less accurate estimate is not available or will not meet the accuracy requirement, the SMLC shall instead return a BSSMAP-LE Perform Location response message containing no location estimate and indicating the cause of failure.

When a request for any other location service (e.g. transfer of assistance data to a target MS) fails for any reason and the SMLC is unable to reattempt the service, the SMLC shall return a BSSMAP-LE Perform Location response message indicating the cause of failure.

When a location service request is interrupted by some other unrecoverable error event inside the SMLC, the SMLC shall immediately terminate the location service attempt and return a BSSMAP Perform Location Response message containing the reason for the location service cancellation. In that case, any dialogue previously opened with an LMU or BSC for the purpose of instigating position measurements for any MS being located may also be aborted by the SMLC.

If the SMLC receives a BSSMAP-LE Perform Location Abort indication for a previous location service request from the VMSC (NSS based SMLC) or BSC (BSS based SMLC), it shall immediately terminate the location service attempt and may abort any dialogues used for the location service attempt that may still exist with any LMUs. Although the SMLC cannot abort any location procedure instigated in the serving BSC (e.g. for TOA), the circumstances of the abort may still ensure cancellation of any such procedure (see section on BSC).

If the SMLC has instigated any location related procedure in the Target MS or its serving BSC and receives a BSSLAP Reject, BSSLAP Abort or BSSLAP Reset indication from the BSC, it shall cancel the location service attempt and may abort any dialogues for this that currently exist with any LMUs. For a BSSLAP Abort, the SMLC shall then either return any location estimate already derived, if this was requested and is sufficient for the requested QoS, or return a BSSMAP-LE Perform Location response indicating failure of the location service and the cause of the failure in the BSSLAP Abort. For a BSSLAP Reject and BSSLAP Reset, the SMLC has the additional option of restarting the location service attempt and using the same or a different position method where a location estimate was requested. A decision to restart the location service shall take into account the cause of the location service failure as conveyed in the BSSLAP Reject or BSSLAP Reset and whether, in the case of successful intra-BSC handover, the new cell for the target MS is still associated with the SMLC. If the SMLC receives a BSSLAP Reject or BSSLAP Reset with a cause indicating intra-BSC handover and with a new cell identity for the target MS that is not associated with the SMLC, the SMLC shall return a BSSMAP-LE Perform Location response containing either a location estimate, if requested, available and sufficient for the requested QoS, or a failure cause indicating "intra-BSC" handover.

> NOTE: This procedure may only be needed for an NSS-based SMLC.

The SMLC may indicate an inability to support location due to overload by rejecting with a cause indicating congestion a BSSMAP-LE Perform Location request received from either an MSC or BSC.

7.11.2 Procedures in the VMSC

After the VMSC has requested a location service for a particular MS from the SMLC or BSC, certain events may occur that may temporarily or permanently interfere with the location service. For each such event notified to the VMSC, the VMSC shall employ one of the following error recovery actions.

Restart the Location Service

This action shall be employed for any event that temporarily impedes a location service attempt and cannot be delayed until the location service attempt is complete. When such an event is notified to the VMSC, it shall immediately cancel the location service attempt and the associated BSSMAP-LE or BSSMAP dialogue with the SMLC (NSS based SMLC)

or BSC (BSS based SMLC), respectively, if this still exists by sending a BSSMAP-LE or BSSMAP Perform Location Abort message to the SMLC or BSC, respectively. The Abort message shall contain the reason for the location procedure cancellation.

After aborting the location request dialogue with the SMLC or BSC, the VMSC may queue the location service request until the event causing the restart has terminated (if not already terminated). The VMSC may optionally wait for an additional time period (e.g. if the queuing delay is minimal) to ensure that any resources allocated in and by the SMLC have time to be released. The VMSC may then send another location service request to the SMLC or BSC associated with the current serving cell of the target MS.

Abort the Location Service

This action shall be employed for any event that permanently impedes a location service attempt, such as loss of the DCCH to the target MS. When such an event is notified to the VMSC, it shall cancel the current location service attempt and the associated BSSMAP-LE or BSSMAP dialogue with the SMLC (NSS based SMLC) or BSC (BSS based SMLC), respectively, if still existing, by sending a BSSMAP-LE or BSSMAP Perform Location Abort message to the SMLC or BSC, respectively. The Abort message shall contain the reason for the location procedure cancellation. The VMSC shall then return an error response to the client or network entity from which the location request was originally received. The VMSC shall also release all resources (e.g. DCCH) specifically allocated for the location attempt.

The following table indicates the appropriate error recovery procedure for certain events. For events not listed in the table, the VMSC need take no action.

Table 2: LCS Error Recovery Procedures in the VMSC for certain Events

Event	VMSC Error Recovery
Release of radio channel to the MS	Abort
Any error response from the SMLC or BSC except for intra-BSC, inter-BSC or inter-MSC handover	Abort
An error response from the SMLC indicating intra-BSC handover	Restart with no additional delay required
Inter-BSC Handover	Restart after handover completed
Inter-MSC Handover	Restart after handover completed

If a location service request is aborted due to an error response from the SMLC or BSC indicating congestion, the MSC may reduce the frequency of location service requests to this SMLC or BSC according to the rules in GSM 09.31, which give precedence to location service requests with a higher priority.

7.11.3 Procedures in an LMU

An LMU shall return an error indication to its controlling SMLC when location measurements previously ordered by the SMLC cannot be provided due to any error condition.

7.11.4 Procedures in the BSC

7.11.4.1 General Procedures

The BSC serving a target MS shall supervise any network or MS location service procedure, including transfer of positioning assistance data to an MS, and shall only allow one such procedure to be active at any time. If a new procedure is instigated by the SMLC for any target MS, the BSC shall cancel any previous procedure without notifying the SMLC or target MS. The new procedure shall then be treated according to the prevailing conditions – e.g. may be rejected if a previous TOA handover attempt was not yet completed. If a location information transfer to an MS initiated by an SMLC is not active, the BSC shall discard any RRLP message or message segment received from the MS. This precludes the initiation of any location service procedure from an MS.

Depending on the location procedure and its current state of execution, a serving BSC may chose to defer certain radio related events (e.g. handover) to avoid interference with location – refer to the later sections for each position method. A serving BSC shall abort all existing location related procedures for a particular target MS without notifying an NSS based SMLC or target MS if the DCCH to the target MS or the SCCP connection to the VMSC or a BSS based SMLC is released. In the event of an abort with a BSS based SMLC, the BSC shall attempt to notify the SMLC using a BSSMAP-LE Perform Location Abort.

7.11.4.2 Rejection of an SMLC Positioning Request

The BSC may reject any request from an SMLC for positioning or transfer of assistance data for a target MS if the request cannot be performed for reasons other than interaction with handover or other RR management. If the request is rejected, the BSC shall return a BSSLAP Reject to the SMLC containing the cause of rejection.

7.11.4.3 Interaction with Inter-BSC or Inter-MSC Handover

The BSC shall reject any request from an SMLC for positioning or transfer of assistance data while an inter-BSC or inter-MSC handover procedure is ongoing and shall return a BSSLAP Abort to the SMLC.

The BSC shall terminate any network or MS positioning procedure or any transfer of RRLP assistance data already in progress if inter-BSC or inter-MSC handover is needed and is not precluded by the particular location procedure and its current state. When a location procedure is terminated and there is an active BSSLAP transaction, the BSC shall return a BSSLAP Abort message to the SMLC after the BSSMAP Handover Required has been sent to the serving MSC. The BSSLAP Abort shall contain the cause of the location procedure failure. When a location procedure is terminated and there is no active BSSLAP transaction, the BSC shall send a BSSAP-LE Perform Location Abort message to the SMLC after the BSSMAP Handover Required has been sent to the serving MSC.

7.11.4.4 Interaction with Intra-BSC Handover and other RR Management Procedures

The BSC shall reject any request from an SMLC for positioning or transfer of assistance data while an intra-BSC handover or other intra-BSC RR management procedure involving the target MS is ongoing and shall return a BSSLAP Reset to the SMLC when the handover or other RR management procedure is complete or has timed out in the BSC.

The BSC shall terminate any network or MS positioning procedure or any transfer of RRLP assistance data already in progress if an intra-BSC handover or other intra-BSC RR management procedure is needed and is not precluded by the particular location procedure and its current state. When location procedure is terminated, the BSC shall return a BSSLAP Reset message to the SMLC after the intra-BSC handover or other RR management procedure is complete or has timed out in the BSC. The BSSLAP Reset shall contain a cause indication, the current serving cell identity and may contain measurement information for the target MS (e.g. TA value).

7.11.4.5 Priority of Handover and Other RR Management Procedures

If the transfer of RRLP messages between an SMLC and target MS is interrupted by intra-BSC handover, inter-BSC handover or any other intra-BSC RR management procedure, the BSC shall avoid delay to the handover or RR management procedure by employing the preemption capability defined in GSM 04.06 and 04.08. This allows an RR Handover Command or other RR management command sent to the target MS to be assigned a "high" priority at the data link level enabling preemption of "low" priority RR Application Information messages (carrying RRLP messages) which may have been sent earlier. This procedure ensures that any RRLP data still untransmitted to the MS will be preempted (and discarded) by the data link layer in the BTS prior to transmission of the Handover Command or other RR Management command.

7.11.4.6 Interaction with Segmentation

When requested to transfer a segmented RRLP message between an SMLC and target MS, the BSC shall discard all received RRLP segments if the transfer procedure in the BSC cannot be supported or is aborted. The BSC need not wait until all RRLP segments are received before notifying the SMLC of the failure of the RRLP procedure with a BSSLAP Abort, Reject or Reset message.

If a location service procedure for a target MS is not currently underway or previously failed, the BSC shall discard all BSSLAP segments received from an SMLC for this MS until it receives the first or only segment of a new BSSLAP message. Once a location service procedure has been started involving RRLP message transfer to a target MS, the BSC shall discard all RRLP segments received from the MS until it receives the first or only segment of a new RRLP message. The new RRLP message shall then be treated according to the state of the RRLP message transfer as described in section 7.7.

Further details regarding transfer and segmentation of RRLP messages between a BSC and MS can be found in GSM 04.08.

7.11.4.7 Overload

The BSC may indicate an inability to support location due to overload by rejecting with a cause indicating congestion a BSSMAP Perform Location request received from the MSC. If a BSS based SMLC has rejected a request from the BSC to perform location with a cause indicating congestion, the BSC shall convey the rejection and cause to the MSC if the request was MSC initiated. If the request was initiated by the BSC, the BSC may reduce the frequency of its location requests to the SMLC according to the rules in GSM 09.31, which give precedence to location service requests with a higher priority.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** CR | **A010** | ⌘ rev | **A** | ⌘ Current version: | **8.0.0** | ⌘ |

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

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

Title: ⌘	Segmentation/Pre-emption for LCS	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 2001-01-15
Category: ⌘	**F**	***Release:*** ⌘ R99

Use one of the following categories:
F *(essential 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)*

Reason for change: ⌘	The current segmentation/pre-emption mechanism leads to problems with large messages this CR creates a new alternative mechanism.
Summary of change: ⌘	As an alternative to RR and BSSAP-LE level segmentation, long messages are sent in several shorter messages, each one still fulfilling the existing protocol specification.
Consequences if not approved: ⌘	Emergency calls and other CM and MM level activities may be delayed by up to 35 seconds. LCS may not work in certain environments.

Clauses affected: ⌘	10.2, 10.3, 10.4, 10.5

Other specs affected: ⌘	**X** Other core specifications ⌘	04.06, 04.31
	☐ Test specifications	
	☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

10.2 Positioning for BSS based SMLC

This signaling flow is generic for all MS based or assisted location methods (MS Based E-OTD, MS Assisted E-OTD, GPS and Assisted GPS). If the SMLC desires to avoid lower layer (e.g. BSSAP-LE) segmentation and transfer the LCS assistance data more reliably, this procedure may be preceded by an "Assistance Data Delivery from BSS based SMLC" procedure. Note that part of the entire set of assistance data may be included in the RRLP Measure Position Request even when the message is preceded by an "Assistance Data Delivery from BSS based SMLC" procedure.
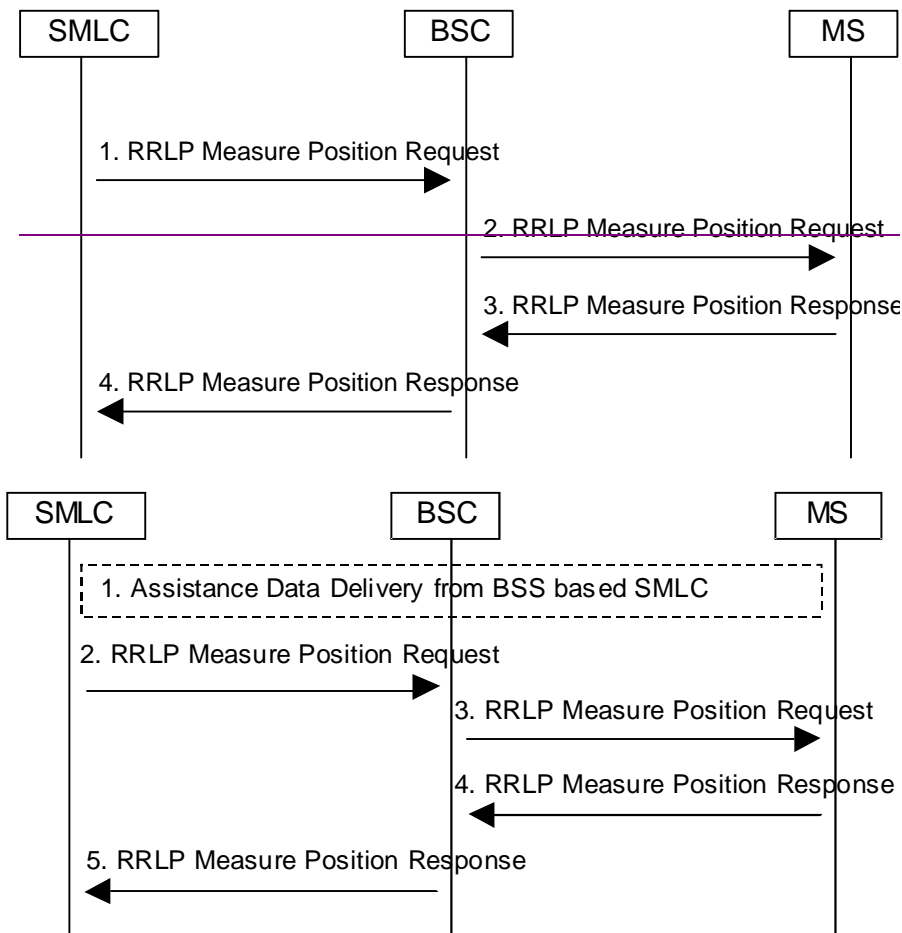

Figure 54: E-OTD/GPS Positioning Flow

1. The SMLC may precede the RRLP MEASURE POSITION REQUEST with an optional Assistance Data Delivery from BSS based SMLC procedure (see 10.4).

2~~1~~. The SMLC determines possible assistance data and sends RRLP MEASURE POSITION REQUEST to the BSC.

3~~2~~. The BSC forwards the positioning request including the QoS and any assistance data to the MS in a RRLP MEASURE POSITION REQUEST.

4~~3~~. The MS performs the requested E-OTD or GPS measurements, if needed assistance data is available in the MS. If the MS is able to calculate its own location and this is required and needed assistance data is available in MS, the MS computes a location estimate based on E-OTD or GPS measurements. In case of E-OTD, any data necessary to perform these operations will either be provided in the RRLP MEASURE POSITION request or available from broadcast sources. In case of Assisted GPS and first positioning attempt, Acquisition Assistance data and optionally Differential GPS data will be provided in the RRLP MEASURE POSITION REQUEST. In case of MS based GPS and further positioning attempt (failure in first attempt due to missing assistance data), complete GPS assistance data excluding Acquisition Assistance data will be provided in the RRLP MEASURE POSITION REQUEST and possibly preceding RRLP ASSISTANCE DATA messages. The resulting E-OTD or GPS measurements or E-OTD or GPS location estimate are returned to the BSC in a RRLP MEASURE POSITION RESPONSE. If the MS was unable to perform the necessary measurements, or compute a location, a failure indication identifying the reason for failure (e.g. missing assistance data) is returned instead.

5<u>4</u>. BSC forwards the RRLP MEASURE POSITION response to SMLC.

10.3 Positioning for NSS based SMLC

This signaling flow is generic for all MS based or assisted location methods (MS Based E-OTD, MS Assisted E-OTD, GPS and Assisted GPS). <u>If the SMLC desires to avoid lower layer (e.g. BSSAP-LE) segmentation</u> and transfer the LCS <u>assistance data more reliably, this procedure may be preceded by an "Assistance Data Delivery from NSS based</u> <u>SMLC" procedure. Note that part of the entire set of assistance data may be included in the RRLP Measure Position</u> <u>Request even when the message is preceded by an "Assistance Data Delivery from NSS based SMLC" procedure.</u>
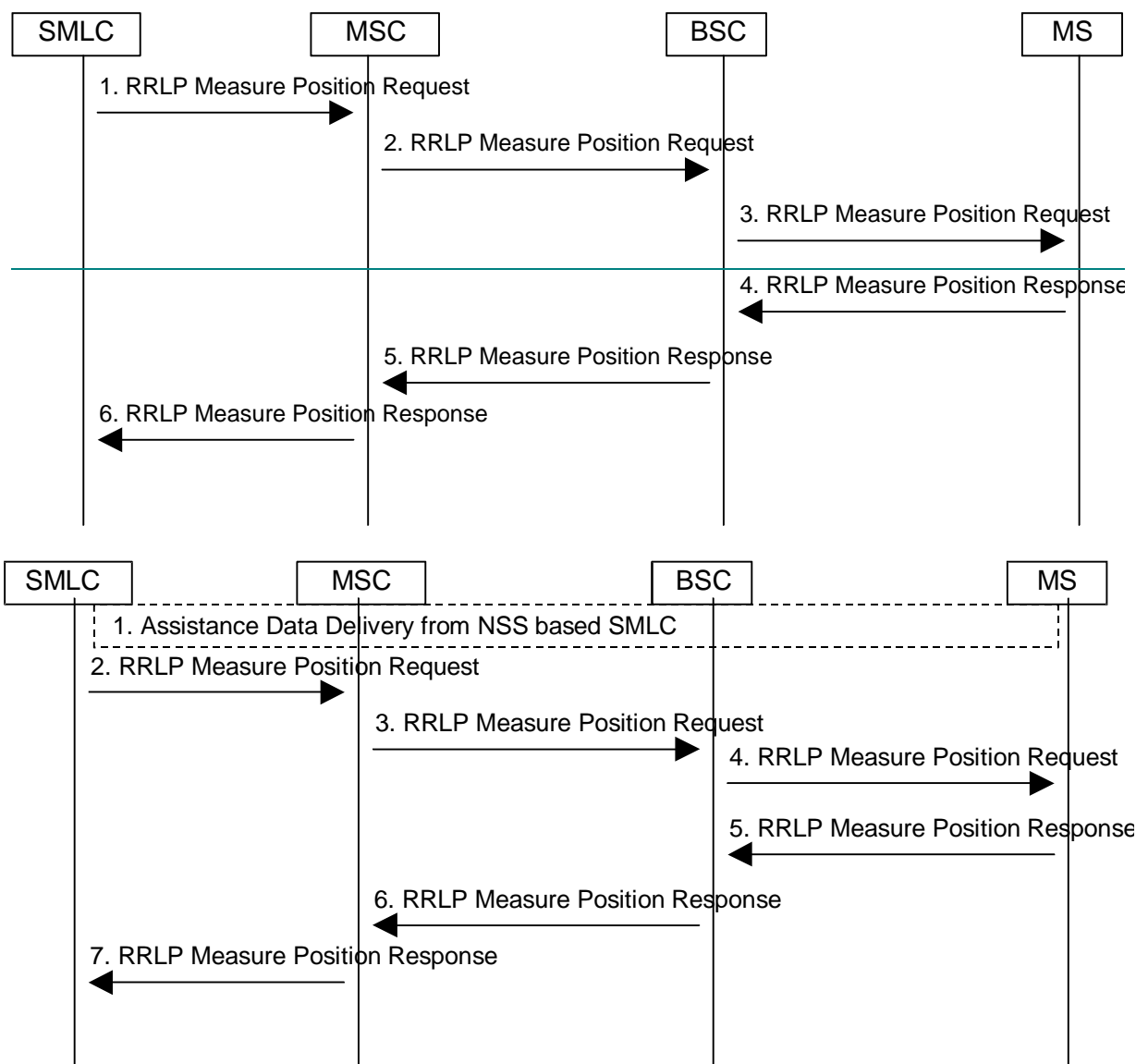
Figure 55: E-OTD/GPS Positioning Flow

1. <u>The SMLC may precede the RRLP MEASURE POSITION REQUEST with an optional Assistance Data</u> <u>Delivery from NSS based SMLC procedure (see 10.5).</u>

2<u>1</u>. The SMLC determines possible assistance data and sends RRLP MEASURE POSITION REQUEST to MSC.

3<u>2</u>. The MSC forwards the RRLP MEASURE POSITION REQUEST to the BSC.

4<u>3</u>. The BSC sends the positioning request including the QoS and any assistance data to the MS in a RRLP MEASURE POSITION REQUEST.

54. The MS performs the requested E-OTD or GPS measurements, if needed assistance data is available in MS. If the MS is able to calculate its own location and this is required and needed assistance data is available in MS, the MS computes an E-OTD or GPS location estimate. In case of E-OTD, any data necessary to perform these operations will be either provided in the RRLP MEASURE POSITOIN request or available from broadcast sources. In case of Assisted GPS and first positioning attempt, Acquisition Assistance data and optionally Differential GPS data will be provided in the RRLP MEASURE POSITION REQUEST. In case of MS based GPS and further positioning attempt (failure in first attempt due to missing assistance data), complete GPS assistance data excluding Acquisition Assistance data will be provided in the RRLP MEASURE POSITION REQUEST and possibly preceding RRLP ASSISTANCE DATA messages. The resulting E-OTD or GPS measurements or E-OTD or GPS location estimate are returned to the BSC in a RRLP MEASURE POSITION RESPONSE. If the MS was unable to perform the necessary measurements, or compute a location, a failure indication identifying the reason for failure (e.g. missing assistance data) is returned instead.

65. BSC sends measurement results in the MEASURE POSITION RESPONSE within BSSMAP Location Information Report message to MSC.

76. MSC forwards the measurement results in the MEASURE POSITION RESPONSE within LCS Information Report message to SMLC.

10.4 Assistance Data Delivery from BSS based SMLC

This signaling flow is generic for all MS based location methods (MS Based and Assisted E-OTD and Network Based and Assisted GPS). If the SMLC desires to avoid lower layer (e.g. BSSAP-LE) segmentation and transfer the LCS assistance data more reliably, the sequence 1-4 may be repeated one or several times to deliver more assistance data than can be sent by one RRLP Assistance Data Delivery message. In this case, each individual message is independent such that the data received in one message is stored in the MS independently of the other RRLP Assistance Data messages (i.e. an error of delivery of one message does not require a retransmission of all the RRLP Assistance Data messages). The SMLC shall indicate in the RRLP ASSISTANCE DATA message if more RRLP ASSISTANCE DATA messages will be used after the current one in order to deliver the entire set of assistance data. Data that is specific to the current cell should be sent in the last message.

Figure 56: E-OTD or GPS Assistance Data Delivery Flow with BSS based SMLC

1) The SMLC determines assistance data and sends it in the RRLP ASSISTANCE DATA message to the BSC.

2) The BSC forwards the assistance data to the MS in a RRLP ASSISTANCE DATA message.

3) The MS acknowledges the reception of complete assistance data to the BSC with a RRLP ASSISTANCE DATA Ack.

4) The BSC forwards the RRLP ASSISTANCE DATA Ack message to the SMLC.

10.5 Assistance Data Delivery from NSS based SMLC

This signaling flow is generic for all MS based location methods (MS Based and Assisted E-OTD and Network Based and Assisted GPS). If the SMLC desires to avoid lower layer (e.g. BSSAP-LE) segmentation and transfer the LCS assistance data more reliably, the sequence 1-6 may be repeated one or several times to deliver more assistance data than can be sent by one RRLP Assistance Data Delivery message. In this case, each individual message is independent such that the data received in one message is stored in the MS independently of the other RRLP Assistance Data messages (i.e. an error of delivery of one message does not require a retransmission of all the RRLP Assistance Data messages). The SMLC shall indicate in the RRLP ASSISTANCE DATA message if more RRLP ASSISTANCE DATA messages will be used after the current one in order to deliver the entire set of assistance data. Data that is specific to the current cell should be sent in the last message.
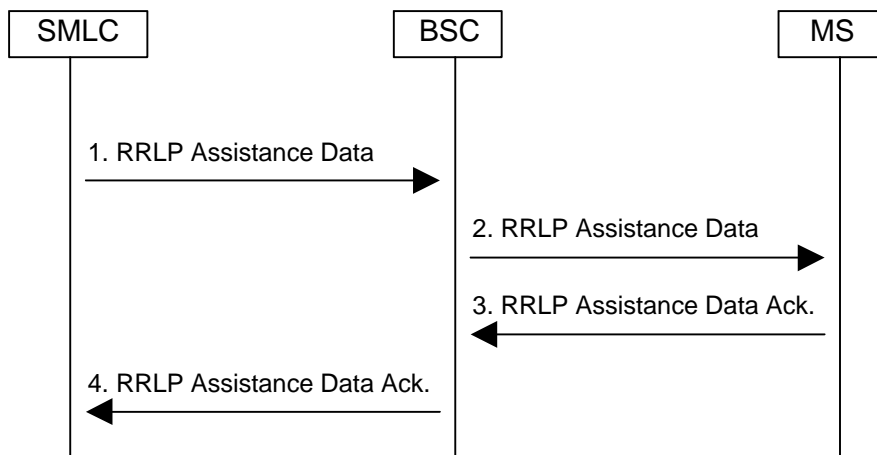

Figure 57: E-OTD or GPS Assistance Data Delivery Flow with NSS based SMLC

1) The SMLC determines assistance data and sends the RRLP ASSISTANCE DATA message to the MSC.

2) The MSC forwards the RRLP ASSISTANCE DATA message to the BSC.

3) The BSC sends the assistance data to the MS in a RRLP ASSISTANCE DATA message.

4) The MS acknowledges the reception of complete assistance data to the BSC in a RRLP ASSISTANCE DATA Ack.

5) The BSC sends the RRLP ASSISTANCE DATA Ack to the MSC.

6) The MSC forwards the RRLP ASSISTANCE DATA Ack to the SMLC.

Title: **IP –addressing in LCS**

Source: **Nokia**

Document for: **Discussion and decision**

Introduction and problem description

There is a requirement in the LCS Service description, TS 22.071 [1], stating:

- in future releases usage of IP addresses for UE identification shall be supported by the standard.

This requirement creates an issue to LCS standards. Usually UE is addressed by its MSISDN or in some cases IMSI during LCS procedures. These parameters are global to their nature. The parameters are used on several interfaces to address a specific mobile station. Using IP –address for the same purpose might be problematic because:

- the network may be configured to use dynamic IP –addresses, instead of static IP –addresses. In such a case the network is not able to identify the target UE, unless there is an active PDP context established.

- even if there is an active PDP context, the same IP-address may be allocated to another UE than the target UE in case of dynamic addressing,

- an external LCS client has no means to know whether the IP –addresses received during a PDP context are dynamic or static, hence it is useless for the LCS client to save the current address for later usage.

Proposed solutions to IP addressing in LCS PS domain

The scope of using IP addresses for LCS purposes might be limited to certain procedures in LCS release 4 standards. It is difficult to identify the functional requirements of LCS in the PS domain for the stage 2 specification 23.271[2], because no corresponding service descriptions exist in stage 1 22.071[1]. In order to identify some possible requirements the following cases could be considered:

- There is an established PDP context between UE and a server in the Internet. This server uses the IP-address received within the IP packets to address the UE. An application on the server may request the UE (or the user of UE) to initiate a Mobile Originated Location Request (MO-LR) service in order to get the location. NOTE: in this case the usage is limited to a procedure within a PDP context. Moreover, both static and dynamic IP addresses can be used.

- In Mobile Terminated –Location Request procedures addressing is based on MSISDN also in the PS domain.

- Other LCS cases in the PS domain should be identified and described.

It is proposed to limit the scope of IP-addressing in LCS to the case where an external LCS Client or server requests the UE or the user of the UE to initiate a MO-LR procedure.

There are several benefits with this approach. The first benefit is that ambigous IP addresses can be avoided in LCS. A big benefit for the user is that the user herself may choose to do a MO location request, and carry the corresponding cost as the case may be. She can also choose to forward, or not to forward, information about her location to the LCS client or server.

It is also proposed that the corresponding attached CR to TS 23.271 is checked for approval.

REFERENCES

[1]   3GPP TS 22.071, Functional Stage 1 description of Location Services

[2]   3GPP TS 23.271, Functional Stage 2 description of Location Services

CR-Form-v3

CHANGE REQUEST

⌘   **23.271 CR**   **003** ⌘ rev   ⌘ Current version: **4.0.0** ⌘

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

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

Title: ⌘	IP addressing a UE in LCS
Source: ⌘	Nokia
Work item code: ⌘	LCS. ***Date:*** ⌘ 20 Jan 2000.
Category: ⌘	B ***Release:*** ⌘ Release 4

Use <u>one</u> of the following categories:
    F *(essential 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: ⌘	Service requirement in TS 22.071: in future releases usage of IP addresses for UE identification shall be supported by the standard.
Summary of change: ⌘	Proposal how to fulfill the service requirement: limit the scope to MO-LR only
Consequences if not approved: ⌘	

Clauses affected: ⌘	Chapter 4.1, 6.4
Other specs Affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

<< Changed paragraph >>

6.4 Addressing the target UE for LCS purposes

It shall be possible to address and indicate the target UE using MSISDN. It may be possible in certain cases to address the target UE using IP address ~~e.g.~~ when a static or dynamic IP address (IPv4 or IPv6) has been allocated for the UE. ~~This is FFS.~~

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

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.

CR-Form-v3

CHANGE REQUEST

⌘ **23.271** CR **001** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

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

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

Title: ⌘	Exception Procedures in the SGSN	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 01-01-19
Category: ⌘	**B**	***Release:*** ⌘ Rel4

Use *one* of the following categories:
F *(essential 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)*

Reason for change: ⌘	The exception procedure handling for SGSN is not described in the stage 2 specification of LCS.
Summary of change: ⌘	Introduce description on how to handle the different exception procedures in the SGSN. The description is based on what is already described for the MSC, but with the addition of some SGSN specific events.
Consequences if not approved: ⌘	It will not be clear how to handle the exception procedures in SGSN.

Clauses affected: ⌘	9.4.3

Other specs Affected: ⌘	☐ Other core specifications ⌘	
	☐ Test specifications	
	☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

9.4 Exception Procedures

The procedures in this subclause apply to all variants of an MT-LR, NI-LR and MO-LR where a Location Request message has been sent to RAN requesting some location service (e.g. provision of a location estimate for a target UE or transfer of assistance data to a target UE).

9.4.1 Procedures in the VMSC

After the VMSC has requested a location service for a particular UE from RAN, certain events may occur that may temporarily or permanently interfere with the location service attempt. For each such event notified to the VMSC, the VMSC shall employ one of the following error recovery actions.

Restart the Location Service

This action shall be employed for any event that temporarily impedes a location service attempt and cannot be delayed until the location service attempt is complete. When such an event is notified to the VMSC, it shall immediately cancel the location service attempt and the associated signaling dialogue with RAN, if this still exists by sending a "stop reporting" message to RAN. The "stop reporting" message shall contain the reason for the location procedure cancellation.

After aborting the location request dialogue with RAN, the VMSC may queue the location service request until the event causing the restart has terminated (if not already terminated). The VMSC may optionally wait for an additional time period (e.g. if the queuing delay is minimal) to ensure that any resources allocated in and by RAN have time to be released. The VMSC may then send another location service request to RAN associated with the target MS.

Abort the Location Service

This action shall be employed for any event that permanently impedes a location service attempt, such as loss of the dedicated signaling channel to the target MS. When such an event is notified to the VMSC, it shall cancel the current location service attempt and the associated signaling dialogue with RAN, if still existing, by sending a "stop reporting" message to RAN. The "stop reporting" message shall contain the reason for the location procedure cancellation. The VMSC shall then return an error response to the client or network entity from which the location request was originally received. The VMSC shall also release all resources specifically allocated for the location attempt.

The following table indicates the appropriate error recovery procedure for certain events. For events not listed in the table, the VMSC need take no action.

Table 9.1: LCS Error Recovery Procedures in the VMSC for certain Events

Event	VMSC Error Recovery
Release of radio channel to the MS	Abort
Any error response from RAN except for SRNC relocation or inter-MSC handover	Abort
In UMTS SRNC relocation	[Note: This is being discussed in in RAN WG2 and RAN WG3.]
In GSM inter-MSC Handover and inter-BSC handover	Restart after handover completed

If the RNC is in an overload condition, it may reject a location request by indicating congestion. The MSC may reduce the frequency of future location service requests until rejection due to overload has ceased.

9.4.2 Procedures in the MSC Server

9.4.3 Procedures in the SGSN

After the SGSN has requested a location service for a particular UE from RAN, certain events may occur that may temporarily or permanently interfere with the location service attempt. For each such event notified to the SGSN, the SGSN shall employ one of the following error recovery actions.

Restart the Location Service

This action shall be employed for any event that temporarily impedes a location service attempt and cannot be delayed until the location service attempt is complete. When such an event is notified to the SGSN, it shall immediately cancel the location service attempt and the associated signaling dialogue with RAN, if this still exists by sending a "stop reporting" message to RAN. The "stop reporting" message shall contain the reason for the location procedure cancellation.

After aborting the location request dialogue with RAN, the SGSN may queue the location service request until the event causing the restart has terminated (if not already terminated). The SGSN may optionally wait for an additional time period (e.g. if the queuing delay is minimal) to ensure that any resources allocated in and by RAN have time to be released. The SGSN may then send another location service request to RAN associated with the target MS.

Abort the Location Service

This action shall be employed for any event that permanently impedes a location service attempt, such as loss of the radio channel to the target MS. When such an event is notified to the SGSN, it shall cancel the current location service attempt and the associated signaling dialogue with RAN, if still existing, by sending a "stop reporting" message to RAN. The "stop reporting" message shall contain the reason for the location procedure cancellation. The SGSN shall then return an error response to the client or network entity from which the location request was originally received. The SGSN shall also release all resources specifically allocated for the location attempt.

The following table indicates the appropriate error recovery procedure for certain events. For events not listed in the table, the SGSN need take no action.

Table 9.x: LCS Error Recovery Procedures in the SGSN for certain Events

Event	SGSN Error Recovery
Release of radio channel to the MS	Abort
Any error response from RAN causing unavailable signalling connections	Abort
SRNC relocation (UMTS only)	[Note: This is being discussed in RAN WG2 and RAN WG3.]
Suspend of GPRS services (GSM only) (*During CS connection for class B MS*)	Abort

9.4.4 Procedures in the MS

CR-Form-v3

CHANGE REQUEST

⌘ **23.271** CR **009** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title: ⌘	Clarification of the privacy class selection		
Source: ⌘	Fujitsu		
Work item code: ⌘	LCS	***Date:*** ⌘	18/Dec/2000
Category: ⌘	**B** Critical correction	***Release:*** ⌘	REL-4

Use <u>one</u> of the following categories: *F (essential 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: ⌘	It is not clearly described in 23.271 how the privacy class applied to be selected if a user subscribes to more than one privacy class. This CR intends to make this issue clear.
Summary of change: ⌘	A flow diagram for the privacy class selection rule is added to the newly created normative ANNEX.
Consequences if not approved: ⌘	

Clauses affected: ⌘	9.5.2, ANNEX
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

9.5 Privacy

9.5.1 Privacy Override Indicator (POI)

The POI is used to determine whether the privacy settings of the subscriber to be positioned shall be overridden by the request for location services. The assignment of a POI value with an "override" or "not override" value in the LCS client profile is done during the LCS client provisioning. The type of LCS client requesting location information (i.e. emergency, law-enforcement etc.) shall determine the value of the POI assigned to the LCS client profile.

There are two distinct cases regarding the handling of the privacy override indicator.

Procedure A: If the subscriber to be positioned is in the same PLMN or same country as the GMLC then the POI shall override the subscriber's privacy options.

Procedure B: Otherwise the POI shall not override the subscriber's privacy options.

9.5.2 Privacy Procedures

The SLPP shall contain the privacy options defined in the HLR of the UE subscriber.

The SLPP shall be downloaded to the VMSC, MSC Server and SGSN together with the rest of his subscription information in the existing operation INSERT_SUBSCRIBER_DATA. It will be deleted with the existing operation DELETE_SUBSCRIBER_DATA.

The POI is transferred from the GMLC to the VMSC/MSC Server/SGSN in the location request. Based on the location of the GMLC the VMSC/MSC Server/SGSN evaluates whether to accept or ignore the received POI according to the definition in subclause.

If the POI is accepted the location requested is unconditionally performed. Otherwise if the POI is ignored the VMSC/MSC Server/SGSN evaluates the privacy options in the UE subscriber's subscription profile (assuming this is held in the VLR/MSC Server/SGSN). If the corresponding register does not contain the UE subscription profile, LCS will rely on the existing GSM recovery mechanisms to obtain the profile.

If more than one privacy class are subscribed, privacy class for an MT-LR is selected according to the rule described in the ANNEX A.

If the location request is allowed by the privacy options the location request is performed. Otherwise, if the location request is barred by the privacy options, the location request is refused an error response is returned to the GMLC with a cause code indicating that the request was rejected by the subscriber.
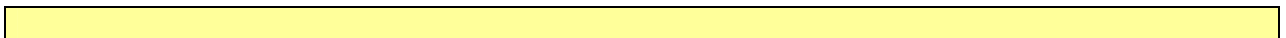
Annex A (normative):
Privacy Class selection rule

If more than one privacy class are subscribed, privacy class for an MT-LR is selected according to the following flow diagram.

An MT-LR may be applied to more than one privacy class. In this case, looser privacy setting shall be selected. The interrelation among each privacy setting in terms of privacy strictness is shown as follows:

| loose	-	Positioning allowed without notifying the UE user
↑	-	Positioning allowed with notification to the UE user
	-	Positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification
↓	-	Positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user
strict	-	Positioning not allowed
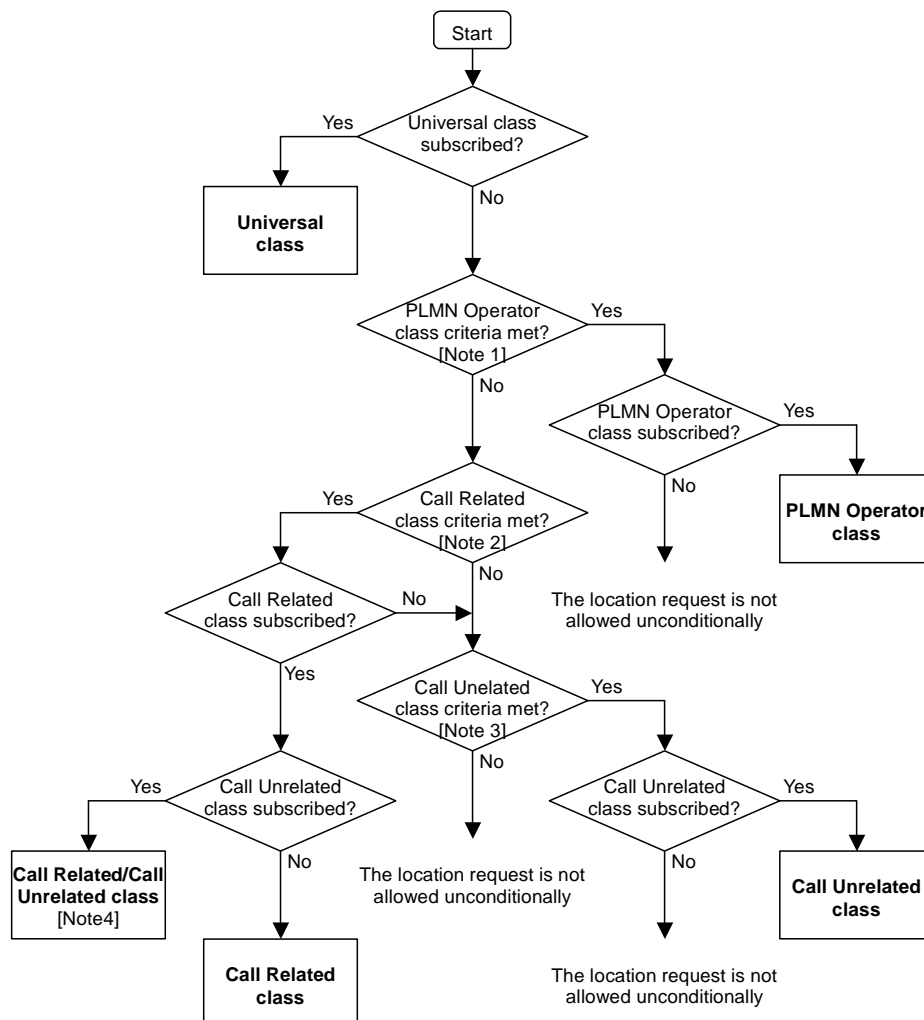
Figure A.1 Privacy Class selection flow diagram

Note 1: The client type indicates PLMN Operator service, and the client is within or associated with the VPLMN.
Note 2: The client type indicates value added service, and the Dialled by MS is available and matched with a call/session established.

Note 3: The client type indicates value added service.
Note 4: The looser privacy setting shall be selected.

Annex ~~A~~ B (informative):
Change history

Date	Version	Comment
September 2000	1.0.0	Presented for information to SA#9.
21.11.00	1.1.0	Changes and additions from LCS drafting group 16.11.00, sent out for S2 e-mail approval

CR-Form-v3

CHANGE REQUEST

⌘ **23.271** CR **010** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

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

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

Title: ⌘	Call related/unrelated is applicable only to value added service
Source: ⌘	Fujitsu
Work item code: ⌘ LCS	***Date:*** ⌘ 18/Dec/2000
Category: ⌘ **F** Critical correction	***Release:*** ⌘ REL-4

Use <u>one</u> of the following categories:
F *(essential 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: ⌘	According to 22.071, call related class and call unrelated class are applicable only MT-LRs from value added LCS clients. However such restriction is missing from 23.271. Since stage 1 seems to be correct, the relevant description in 23.271 is to be updated.
Summary of change: ⌘	The description of call related class and call unrelated class are updated to be applied only to value added MT-LR.
Consequences if not approved: ⌘	Inconsistency between 22.071 and 23.271 is kept.

Clauses affected: ⌘	9.5.3
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

9.5.3   MS Privacy Options

The UE privacy options in the SLPP apply to an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR and either indicate that no CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR is allowed for the UE (except as may be overridden by the POI or local regulatory requirements) or define the particular classes of LCS client for which an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR for location are allowed, with the following classes being possible:

[Editor's note: The text in this chapter became rather complex when combining several input documents, so the chapter should be edited for clarity. An e-mail comment pointed out that there are different cases still to be covered in the description of the classes: 1. the LCS Client identity is included in SLPP or 2. the LCS Client identity is NOT included in SLPP. Also some GMLC restriction conditions need to be mentioned.]

a) Universal Class – allow positioning by all LCS clients

b) Call/Session related Class – allow positioning by specific identified value added LCS client or groups of value added LCS Client to which the UE originated a call in CS domain or an value added LCS client with which the UE has a session via an active PDP context in PS domain indicated by a specific APN. For all clients in the call related class, OR For each identified LCS client or group of LCS Clients, one of the following subscription options shall apply:

c) Call/Session-unrelated Class – allow positioning by specific identified value added LCS Clients or groups of value added LCS Client with the following restrictions allowed for each identified value added LCS Client or group of value added LCS Clients

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** CR **A011** | ⌘ rev **A** | ⌘ Current version: **7.4.0** | ⌘ |

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

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

Title:	⌘	Correction; BSSMAP Location Information Report replaced by BSSMAP Connection Oriented Information
Source:	⌘	Ericsson
Work item code:	⌘ Location Services	*Date:* ⌘ 2001-01-15
Category:	⌘ **F**	*Release:* ⌘ R98

Use <u>one</u> of the following categories:
F (essential 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 message BSSMAP Location Information Report was replaced by the message BSSMAP Connection Oriented Information in version 7.2.0 of GSM 03.71. However a few places were missed and this CR is intended to fix those places.
Summary of change:	⌘	Replaced BSSMAP Location Information Report by the message BSSMAP Connection Oriented Information in three places.
Consequences if not approved:	⌘	Incorrect Stage Two specification for LCS.

Clauses affected:	⌘	8.4, 9.1.3, 10.3

Other specs affected:	⌘	☐ Other core specifications	⌘	
		☐ Test specifications		
		☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

8.4 Unsuccessful TA positioning procedure in BSC

There are three messages defined to handle error scenarios during positioning procedure in BSC.
The messages are 1) Reject, 2) Abort and 3) Reset . Please refer to GSM 8.71 for details.

After receiving the BSSLAP TA Request in BSC (message 2 in section 8.2 and message 1 in section 8.3), a Reject will be sent with proper cause value from BSC to SMLC in "BSSMAP ~~Location Information Report~~Connection Oriented Information" if TA positioning cannot be performed in BSC at that time for reasons other than handover or another ongoing RR management procedure.

Between messages 2 and 3 (in section 8.2) and between messages 1 and 2 in section 8.3, an Abort or Reset is possible if the TA positioning cannot be done in BSC during that time. Reset is sent to SMLC to indicate when the positioning needs to be restarted after temporary interruption due to intra BSC HO or other intra-BSC RR management. Abort is used to indicate to SMLC the failure of the current TA positioning attempt (e.g. due to inter-BSC handover) and allowing a new one from application level.

9.1.3   Successful TOA positioning procedure in BSC

There are three messages defined to handle error scenarios during positioning procedure in BSC.
The messages are 1) Reject, 2) Abort and 3) Reset . Please refer to GSM 8.71 for details.

After receiving the BSSLAP TOA Command in BSC (message 2 in section 9.1.1 and message 1 in section 9.1.2), a
Reject will be sent with proper cause value from BSC to SMLC in "BSSMAP ~~Location Information Report~~Connection
Oriented Information" if TOA positioning cannot be performed in BSC at that time for reasons other than handover or
another ongoing RR management procedure.

Between messages 3 and 7 in section 9.1.1 and between messages 2 and 4 in section 9.1.2 (i.e the duration of delta
timer in the BSC), an Abort or Reset is possible if the TOA positioning can not be done in BSC during that time. Reset
is sent to SMLC to indicate when the positioning needs to be restarted after temporary interruption due to an intra BSC
HO or other intra-BSC RR management procedure. If the Handover Complete or Handover Failure is not received
before the delta timer expires, Abort may be sent at the expiration of delta timer from BSC to SMLC. Abort is used to
indicate to SMLC the failure of the current TOA positioning attempt (e.g. due to inter-BSC handover) and allowing a
new one from application level.

10.3 Positioning for NSS based SMLC

This signaling flow is generic for all MS based or assisted location methods (MS Based E-OTD, MS Assisted E-OTD, GPS and Assisted GPS).
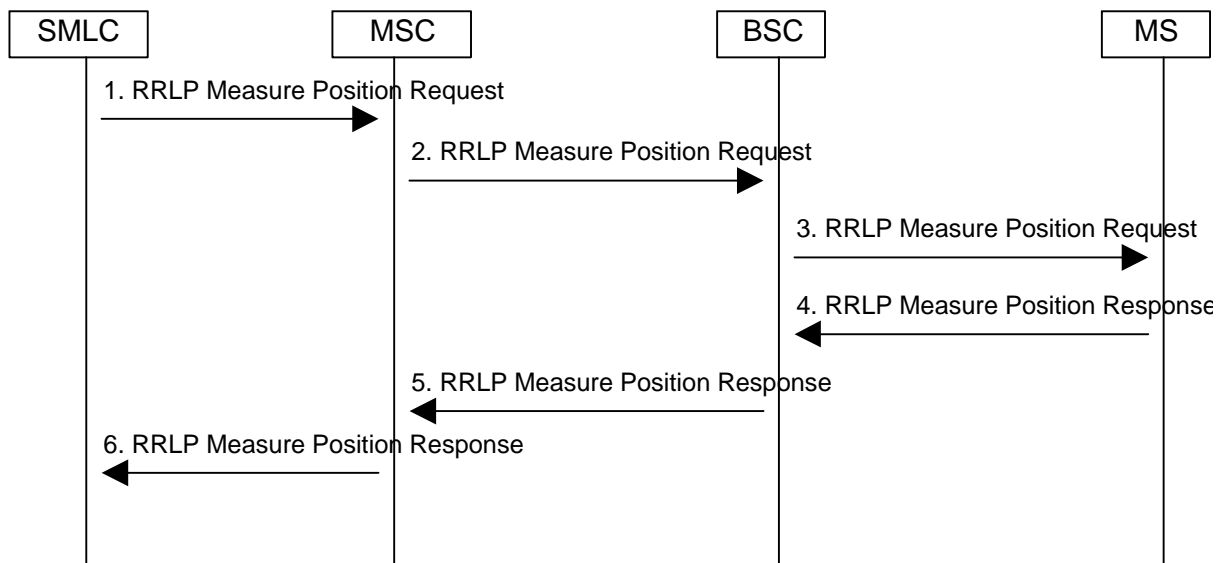

Figure 55: E-OTD/GPS Positioning Flow

1. The SMLC determines possible assistance data and sends RRLP MEASURE POSITION REQUEST to MSC.

2. The MSC forwards the RRLP MEASURE POSITION REQUEST to the BSC.

3. The BSC sends the positioning request including the QoS and any assistance data to the MS in a RRLP MEASURE POSITION REQUEST.

4. The MS performs the requested E-OTD or GPS measurements, if needed assistance data is available in MS. If the MS is able to calculate its own location and this is required and needed assistance data is available in MS, the MS computes an E-OTD or GPS location estimate. In case of E-OTD, any data necessary to perform these operations will be either provided in the RRLP MEASURE POSITOIN request or available from broadcast sources. In case of Assisted GPS and first positioning attempt, Acquisition Assistance data and optionally Differential GPS data will be provided in the RRLP MEASURE POSITION REQUEST. In case of MS based GPS and further positioning attempt (failure in first attempt due to missing assistance data), complete GPS assistance data excluding Acquisition Assistance data will be provided in the RRLP MEASURE POSITION REQUEST. The resulting E-OTD or GPS measurements or E-OTD or GPS location estimate are returned to the BSC in a RRLP MEASURE POSITION RESPONSE. If the MS was unable to perform the necessary measurements, or compute a location, a failure indication identifying the reason for failure (e.g. missing assistance data) is returned instead.

5. BSC sends measurement results in the MEASURE POSITION RESPONSE within BSSMAP ~~Location Information Report~~Connection Oriented Information message to MSC.

6. MSC forwards the measurement results in the MEASURE POSITION RESPONSE within LCS Information Report message to SMLC.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** CR | **A012** | ⌘ rev | **A** | ⌘ Current version: | **8.0.0** | ⌘ |

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

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

Title: ⌘	Correction; BSSMAP Location Information Report replaced by BSSMAP Connection Oriented Information	
Source: ⌘	Ericsson	
Work item code: ⌘	Location Services	**Date:** ⌘ 2001-01-15
Category: ⌘	**F**	**Release:** ⌘ R99

Use one of the following categories:
F (essential 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)

Reason for change: ⌘	The message BSSMAP Location Information Report was replaced by the message BSSMAP Connection Oriented Information in version 7.2.0 of GSM 03.71. However a few places were missed and this CR is intended to fix those places.
Summary of change: ⌘	Replaced BSSMAP Location Information Report by the message BSSMAP Connection Oriented Information in three places.
Consequences if not approved: ⌘	Incorrect Stage Two specification for LCS.

Clauses affected: ⌘	8.4, 9.1.3, 10.3

Other specs affected: ⌘	☐ Other core specifications ⌘		
	☐ Test specifications		
	☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

8.4   Unsuccessful TA positioning procedure in BSC

There are three messages defined to handle error scenarios during positioning procedure in BSC.
The messages are 1) Reject, 2) Abort and 3) Reset . Please refer to GSM 8.71 for details.

After receiving the BSSLAP TA Request in BSC (message 2 in section 8.2 and message 1 in section 8.3), a Reject will
be sent with proper cause value from BSC to SMLC in "BSSMAP ~~Location Information Report~~Connection Oriented
Information" if TA positioning cannot be performed in BSC at that time for reasons other than handover or another
ongoing RR management procedure.

Between messages 2 and 3 (in section 8.2) and between messages 1 and 2 in section 8.3, an Abort or Reset is possible
if the TA positioning cannot be done in BSC during that time. Reset is sent to SMLC to indicate when the positioning
needs to be restarted after temporary interruption due to intra BSC HO or other intra-BSC RR management. Abort is
used to indicate to SMLC the failure of the current TA positioning attempt (e.g. due to inter-BSC handover) and
allowing a new one from application level.

9.1.3 Successful TOA positioning procedure in BSC

There are three messages defined to handle error scenarios during positioning procedure in BSC.
The messages are 1) Reject, 2) Abort and 3) Reset . Please refer to GSM 8.71 for details.

After receiving the BSSLAP TOA Command in BSC (message 2 in section 9.1.1 and message 1 in section 9.1.2), a Reject will be sent with proper cause value from BSC to SMLC in "BSSMAP ~~Location Information Report~~Connection Oriented Information" if TOA positioning cannot be performed in BSC at that time for reasons other than handover or another ongoing RR management procedure.

Between messages 3 and 7 in section 9.1.1 and between messages 2 and 4 in section 9.1.2 (i.e the duration of delta timer in the BSC), an Abort or Reset is possible if the TOA positioning can not be done in BSC during that time. Reset is sent to SMLC to indicate when the positioning needs to be restarted after temporary interruption due to an intra BSC HO or other intra-BSC RR management procedure. If the Handover Complete or Handover Failure is not received before the delta timer expires, Abort may be sent at the expiration of delta timer from BSC to SMLC. Abort is used to indicate to SMLC the failure of the current TOA positioning attempt (e.g. due to inter-BSC handover) and allowing a new one from application level.

10.3 Positioning for NSS based SMLC

This signaling flow is generic for all MS based or assisted location methods (MS Based E-OTD, MS Assisted E-OTD, GPS and Assisted GPS).
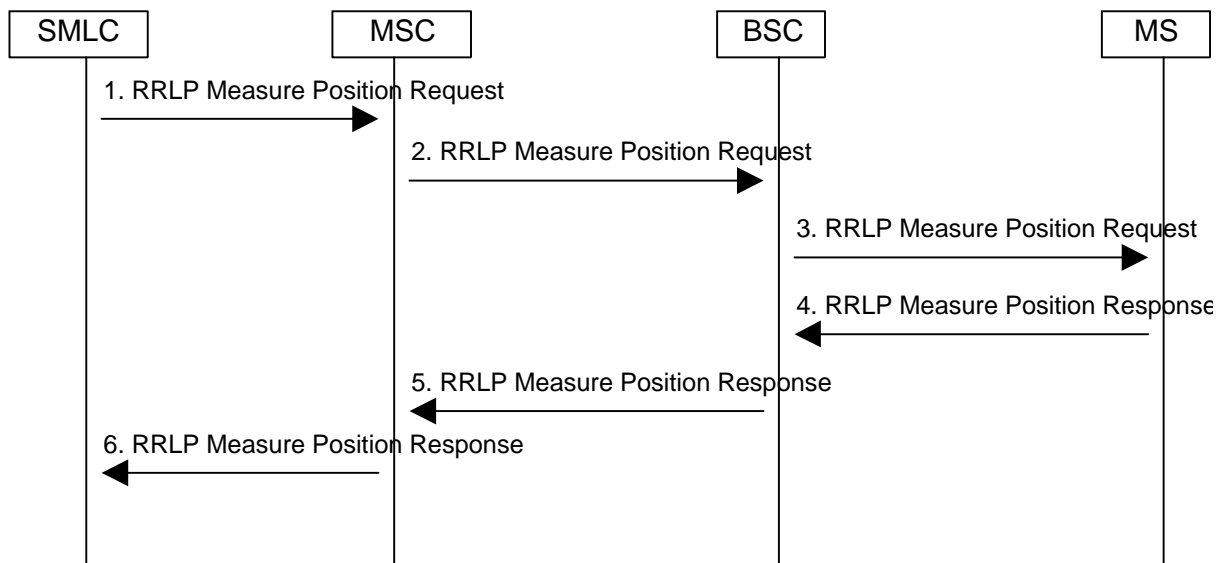

Figure 55: E-OTD/GPS Positioning Flow

1. The SMLC determines possible assistance data and sends RRLP MEASURE POSITION REQUEST to MSC.

2. The MSC forwards the RRLP MEASURE POSITION REQUEST to the BSC.

3. The BSC sends the positioning request including the QoS and any assistance data to the MS in a RRLP MEASURE POSITION REQUEST.

4. The MS performs the requested E-OTD or GPS measurements, if needed assistance data is available in MS. If the MS is able to calculate its own location and this is required and needed assistance data is available in MS, the MS computes an E-OTD or GPS location estimate. In case of E-OTD, any data necessary to perform these operations will be either provided in the RRLP MEASURE POSITOIN request or available from broadcast sources. In case of Assisted GPS and first positioning attempt, Acquisition Assistance data and optionally Differential GPS data will be provided in the RRLP MEASURE POSITION REQUEST. In case of MS based GPS and further positioning attempt (failure in first attempt due to missing assistance data), complete GPS assistance data excluding Acquisition Assistance data will be provided in the RRLP MEASURE POSITION REQUEST. The resulting E-OTD or GPS measurements or E-OTD or GPS location estimate are returned to the BSC in a RRLP MEASURE POSITION RESPONSE. If the MS was unable to perform the necessary measurements, or compute a location, a failure indication identifying the reason for failure (e.g. missing assistance data) is returned instead.

5. BSC sends measurement results in the MEASURE POSITION RESPONSE within BSSMAP ~~Location Information Report~~Connection Oriented Information message to MSC.

6. MSC forwards the measurement results in the MEASURE POSITION RESPONSE within LCS Information Report message to SMLC.

CR-Form-v3

CHANGE REQUEST

⌘ **23.271** CR **002** ⌘ rev ⌘ Current version: **4.0.0** ⌘

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

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

Title:	⌘	Correct Inconsistencies in LCS Stage 2 for the CN
Source:	⌘	Siemens
Work item code:	⌘ LCS	***Date:*** ⌘ 22 January 2001
Category:	⌘ **D**	***Release:*** ⌘ REL-4

Use <u>one</u> of the following categories:
F (essential 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:	⌘	Remove inconsistencies in the descriptive text and figures
Summary of change:	⌘	Editorial modifications and minor technical corrections
Consequences if not approved:	⌘	Inconsistency between Release 4 and 5 regarding status of the CSCF for LCS. Other errors and inconsistencies in the LCS stage 2 for the CN in R4.

Clauses affected:	⌘	3.3, 6, 6.2, 6.3.11

Other specs affected:	⌘ ☐	Other core specifications	⌘	
	☐	Test specifications		
	☐	O&M Specifications		

Other comments:	⌘	

3.3   Abbreviations

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

2G-	Second Generation
3G-	Third Generation
MSC	Mobile Services switching Center
SGSN	Serving GPRS Support Node
AC	Admission Control
AI	Application Interface (prefix to interface class method)
ANM	Answer Message (ISUP)
APN	Access Point Name
ARIB	Association of Radio Industries and Business
ATD	Absolute Time Difference
BCCH	Broadcast Control Channel
BER	Bit Error Rate
BTS	Base Transceiver 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
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
HSS	Home Subscriber Server
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
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 Execution Environment
MLC	Mobile Location Center

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
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
SGSN	Serving GPRS Support Node
SI	Service Interface (prefix to interface class method)
SIM	Subscriber Identity Module
SLPP	Subscriber LCS Privacy Profile
SMLC	Serving mMobile lLocation cCenter
SMS	Short Message Service
SIR	Signal Interference Ratio
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 UMTS TS 21.905.
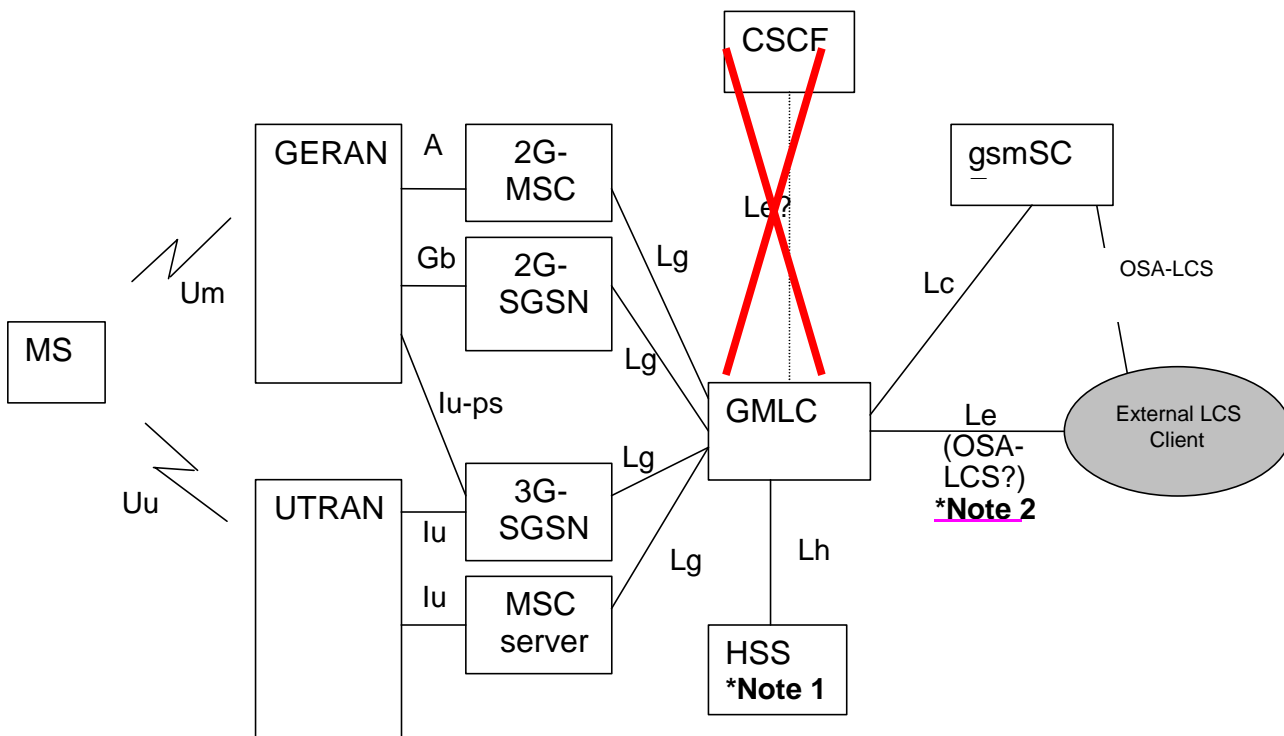
*** NEXT MODIFIED SECTION ***

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 MS. 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.

*Note 1: HSS includes both 2G-HLR and 3G-HLR functionality. LCS should be included in the overall network architecture in TS 23.002.

*Note 2: The Le interface is FFS. S1 agreed that LCS shall support OSA-API.

Figure 6.1: General arrangement of LCS

*** NEXT MODIFIED SECTION ***

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 MS.

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
	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 for UTRAN and in TS 43.059 for GERAN

Table 6.2: Allocation of LCS functional entities to network elements

	MS	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				
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					
	MS	**RAN**	**GMLC**	**SGSN**	**MSC/MSC Server**		**Client**
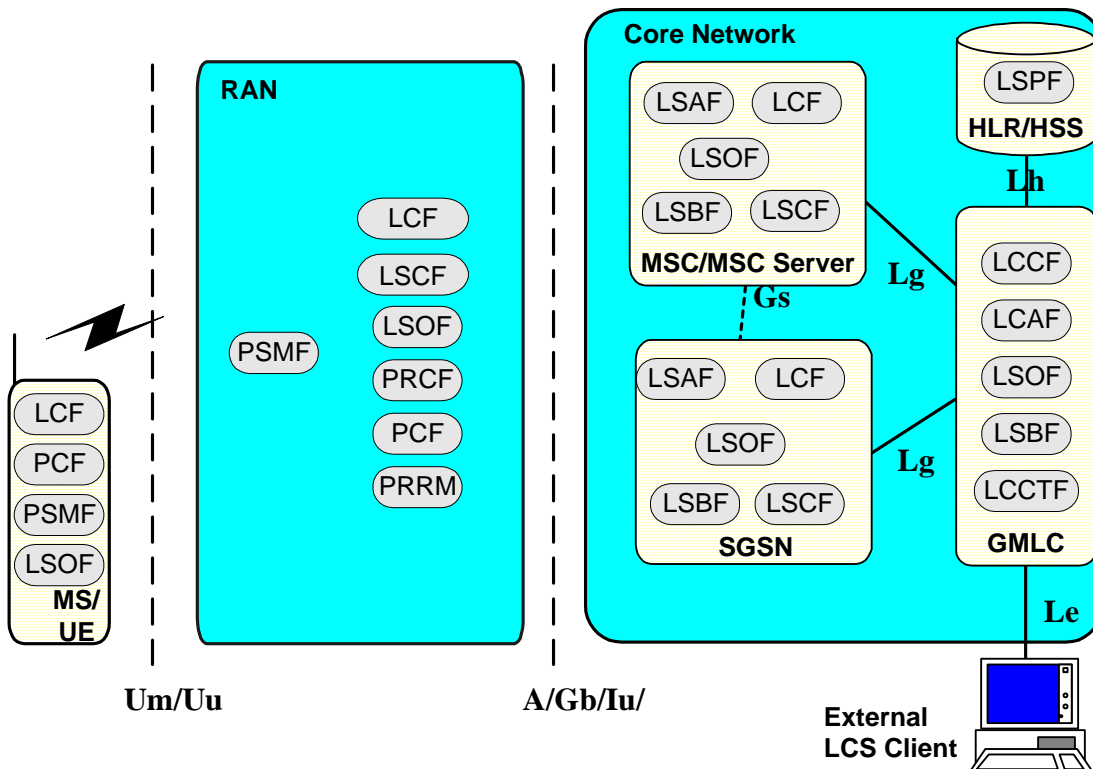
Figure 6.2: Generic LCS Logical Architecture

Editor's note for correction: The LSPF functions should be indicated in fig. 6.2 in SGSN and MSC/MSC server according table 6.2.

*** NEXT MODIFIED SECTION ***

6.3.11 CSCF

The role of CSCF is probably limited to handling of location information e.g. related to emergency calls. This is FFS.

*** NEXT MODIFIED SECTION ***

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.271** CR **007** | ⌘ rev | **-** | ⌘ | Current version: | **4.0.0** | ⌘ |

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

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

Title:	⌘	MT-LR PS and CS procedures
Source:	⌘	LCS drafting session
Work item code: ⌘	LCS	***Date:*** ⌘ 23/Jan/2001
Category:	⌘ **C**	***Release:*** ⌘ REL-4

Use <u>one</u> of the following categories: **F** (essential 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 MT-LR routing procedure should be common to CS and PS before each of which are chosen by the GMLC. The call/session related MT-LR should be routed to the domain in which the relevant call/session has been established.
Summary of change:	⌘	The routing procedure of the CS and PS MT-LR are aligned with each other. GMLC handles periodic LCS request in the same way for PS and CS. Corresponding editorial changes in the MT-LR procedures.
Consequences if not approved:	⌘	Differing procedures for MT-LR in CS and PS

Clauses affected:	⌘	9.1.1 9.1.2 9.1.3 9.1.4 9.1.5 9.1.6 9.1.7

Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

9.1 Mobile Terminating Location Request

9.1.1 MT-LR routing procedure in PS and CS domain
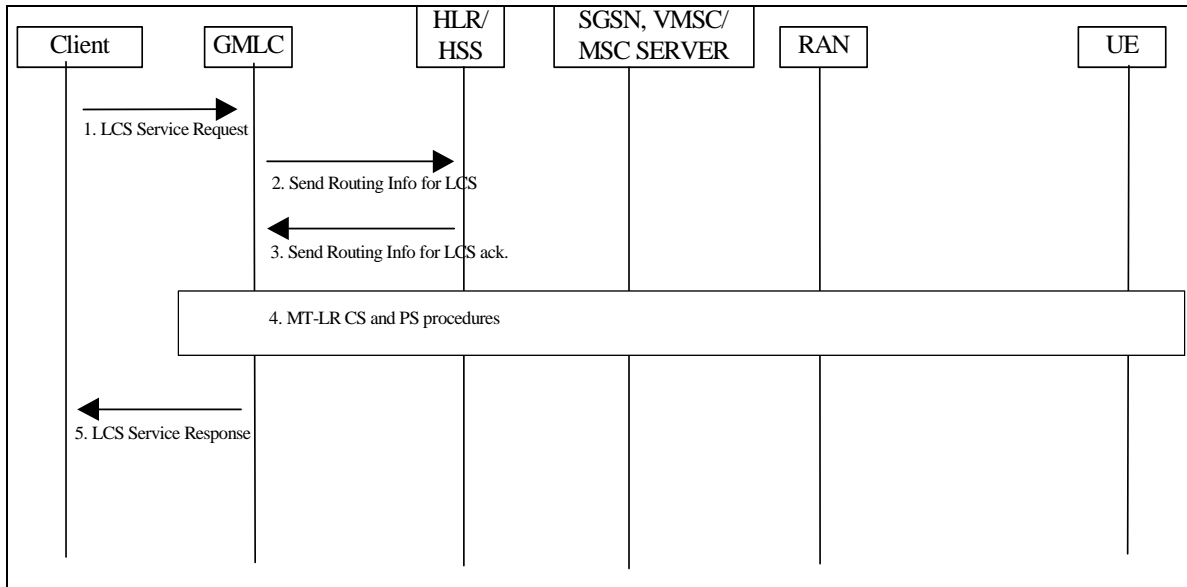
Figure 9.1: General Network Positioning for a MT-LR

9.1.1.1 Location Preparation Procedure

(1) An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI or PDP address, (NOTE: IP addressing in this context is FFS, one reason is the dynamic IP addressing used in IPv4.) 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 or session related location request, the GMLC obtains and authenticates the called party number of the LCS client [(refer to Annex A for further details)]. If location is required for more than one UE, or if periodic location is requested, the steps following 2 to 12 below may be repeated.
Note: This means that GMLC handles the periodicity of location requests as requested by the LCS client both in CS and PS domain.

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

(3) The HLR/HSS verifies that the calling party SCCP address of the GMLC corresponds to a known GSM/UMTS network element that is authorized to request UE location information. The HLR/HSS then returns one or several of the addresses, the current SGSN and/or VMSC/MSC server address , conceivably prioritizing one of the addresses to be used for positioning the UE and whichever of the IMSI and MSISDN was not provided in step (2) for the particular UEMS.
Note: HLR may prioritize between the MSC/VLR or SGSN address sent to GMLC. The priority criteria are for further study.

(4) In case 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 only shall be invoked. Otherwise, both CS-MT-LR and PS-MT-LR are applicable.

Note: The order in which these procedures are invoked and whether one or both procedures are used may depend on 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).

(5) GMLC sends the location service response to the LCS client. If the LCS client requires it, the GMLC may first transform the universal location co-ordinates provided by the SGSN or MSC/MSC server into some local geographic system. The GMLC may record billing for both the LCS client and inter-network revenue charges from the SGSN or MSC/MSC server's network.

The detailed CS-MT-LR and PS-MT-LR procedures in step 4 of figure 9.1 are described in 9.1.2 and 9.1.6.the following subchapters.

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

Figure 9.21 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.
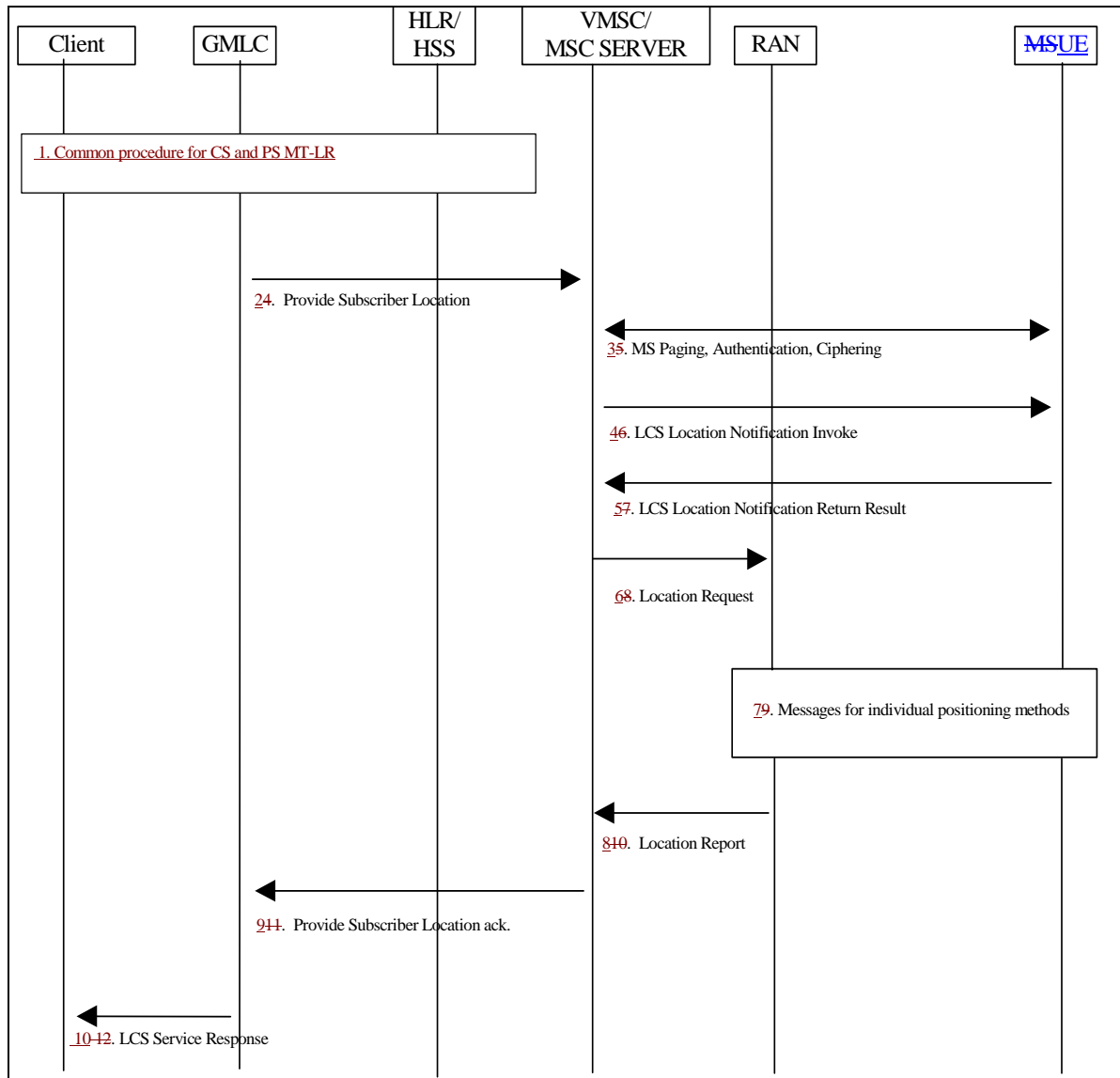
Figure 9.21: ~~General~~ Network Positioning for a CS-MT-LR

9.1.2.1 Location Preparation Procedure

~~Signaling steps (1), (2), (3) and (4) in Figure 9.2 are performed as described in chapter 9.1.1.~~

~~(5) An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. For a call related location request, the GMLC obtains and authenticates the called party number of the LCS client [(refer to Annex A for further details)]. If location is required for more than one UE, or if periodic location is requested, steps 2 to 12 below may be repeated.~~

~~(6) If the GMLC already knows both the VMSC/MSC server location and IMSI for the particular MSISDN (e.g. from a previous location request), this step and step 3 may be skipped. Otherwise, the GMLC sends a SEND_ROUTING_INFO_FOR_LCS message to the home HLR/HSS of the target UE to be located with either the IMSI or MSISDN of this UE.~~

~~(7) The HLR/HSS verifies that the calling party SCCP address of the GMLC corresponds to a known GSM/UMTS network element that is authorized to request UE location information. The HLR/HSS then returns the current VMSC/MSC server address and whichever of the IMSI and MSISDN was not provided in step (2) for the particular UE.~~

(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. [FFS: For a value added LCS client, the message shall carry the client name and, for a call unrelated location request, the identity of the LCS client. In other cases, inclusion of the client name and/or identity is optional.]

[NOTE: This step is for further study, it should be investigated e.g. which client identities should be required as mandatory, also the impacts of the redefined call/session-related privacy class in the service description TS 22.071 [4] should be considered.]

(3) If the GMLC is located in another PLMN or another country, the VMSC/MSC server first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The VMSC/MSC server then verifies LCS barring restrictions in the UE user's subscription profile in the MSC server. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC. Otherwise, if the UE is in idle mode, the Core Network performs paging, authentication and ciphering. If the target UE supports any UE based or UE assisted positioning method(s), the UE will also provide RAN and MSC/MSC server with the positioning method(s) it supports via UE classmark or UE capability information. 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.

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

(6)(4) If the location request comes from a value added LCS client and the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS (according to the UE Capability information), an LCS Location Notification Invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client and whether privacy verification is required. [FFS: For a call related location request, the LCS client identity shall be set to the LCS client's called party number if no separate LCS client identity was received from the GMLC.] Optionally, the VMSC/MSC server may after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 6̶8̶ without waiting for a LCS Location Notification Return Result message in step 5̶7̶.

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

(7)(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 4̶6̶, but before step 9̶1̶1̶. 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.

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

9.1.2.2 Positioning Measurement Establishment Procedure

(9)(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]. U̶E̶ U̶E̶

9.1.2.3 Location Calculation and Release Procedure

~~(10)~~(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. If a location estimate could not be obtained, RAN returns a Location Report message containing a failure cause and no location estimate.

~~(11)~~(9)The MSC/MSC server returns the location information and its age to the GMLC, if the VMSC/MSC server has not initiated the Privacy Verification process in step 4~~6~~. If step 4~~6~~ 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. If a LCS Location Notification Return Result message indicating that permission is not granted is received, or there is no response, with the UE subscription profile indicating barring of location in the absence of a response, the VMSC/MSC server shall return an error response to the GMLC. If RAN did not return a successful location estimate, but the privacy checks in steps 4~~6~~-5~~7~~ were successfully executed, the VMSC/MSC server may return the last known location of the target UE if this is known and the LCS client is requesting the current or last known location. The MSC server may then release the Mobility Management connection to the UE, if the UE was previously idle, and the MSC/MSC server may record billing information.

~~(12)~~(10)   The GMLC returns the UE location estimate to the requesting LCS client as described in chapter 9.1.1. ~~If the LCS client requires it, the GMLC may first transform the universal location co-ordinates provided by the MSC/MSC server into some local geographic system. The GMLC may record billing for both the LCS client and inter-network revenue charges from the MSC/MSC server's network.~~

9.1.3 CS-MT-LR without HLR Query - applicable to North America Emergency Calls only

Figure 9.3~~2~~ illustrates location for a North American Emergency Services call, where an emergency services client identifies the target UE using an IMSI, MSISDN or NA-ESRK plus, possibly IMEI, that were previously provided to it by the VMSC. The emergency services client also identifies the VMSC to the GMLC by providing an NA-ESRD or NA-ESRK or by referring to information for the target UE already stored in the GMLC. This allows the GMLC to request location from the VMSC without first querying the home HLR of the target UE. This is necessary when the home HLR either cannot be identified (e.g. client provides an NA-ESRK but not IMSI or MSISDN) or does not support the LCS query procedure.
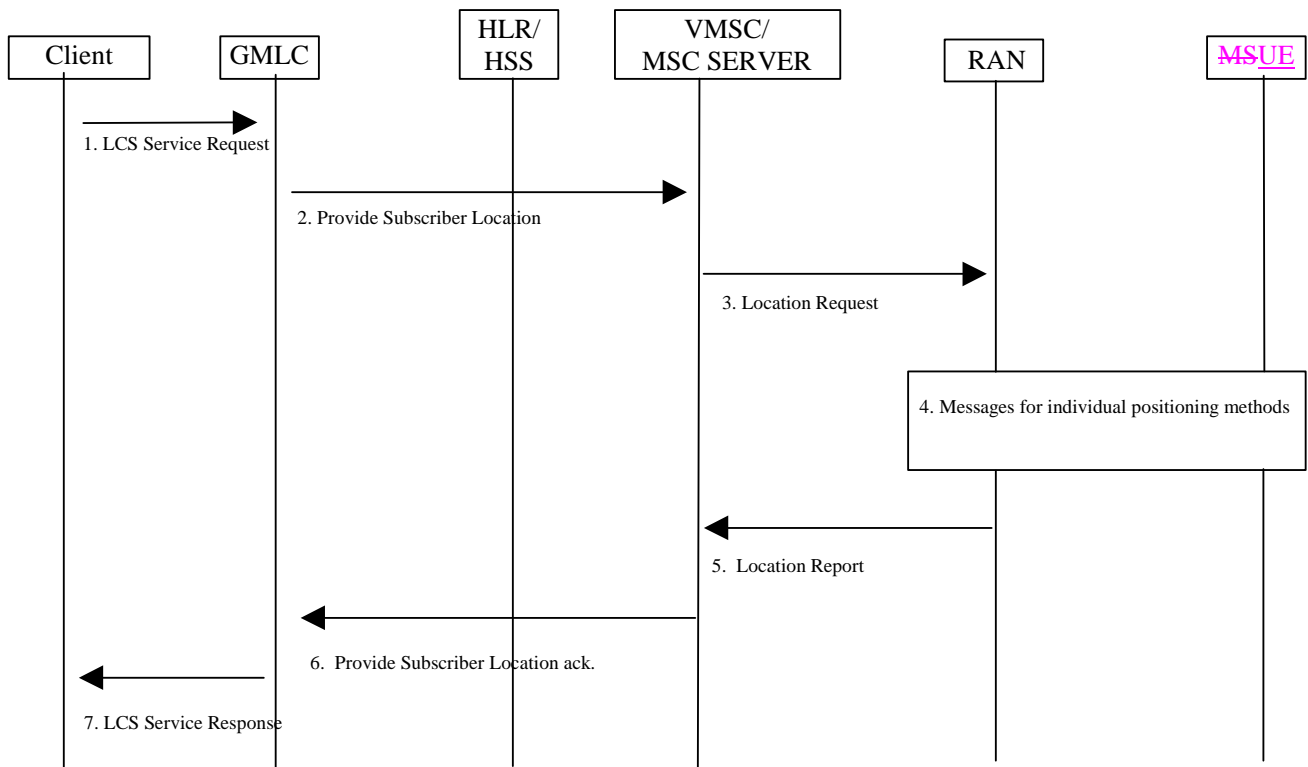
Figure 9.32: Positioning for a Emergency Services MT-LR without HLR Query

1) Same as step 1 in figure 9.1 but with the LCS client identifying first the target UE by an IMSI, MSISDN or NA-ESRK and possibly IMEI and, second, the VMSC by an NA-ESRK or NA-ESRD.

2) If the GMLC already has stored information for the target UE (e.g. from a prior location estimate delivery to the LCS client), the GMLC may determine the VMSC from this information. Otherwise, the GMLC determines the VMSC using the NA-ESRK or NA-ESRD – with use of the NA-ESRK taking priority over that of the NA-ESRD. The MAP_PROVIDE_SUBSCRIBER_LOCATION message sent to the VMSC carries the IMSI, MSISDN or NA-ESRK and, if provided, the IMEI for the target UE, as well as the required QoS and an indication of a location request from an emergency services client. The VMSC identifies the target UE using the IMSI, MSISDN or NA-ESRK and, if provided, the IMEI.

3) The MSC verifies that UE privacy is overridden by the emergency services provider and that positioning is not prevented for other reasons (e.g. unreachable UE, inapplicable call type to the UE). The VMSC then sends a L ocation Request to the RAN, as for a normal MT-LR.

4) RAN performs positioning as for a normal CS-MT-LR.

5) RAN returns a location estimate to the VMSC as for a normal CS-MT-LR.

6) Same as steps 911 for a normal CS-MT-LR.

7) Same as steps 1012 for a normal CS-MT-LR.

9.1.4 CS-MT-LR and PS-MT-LR for a previously obtained location estimate

Every time the location estimate of a target UE subscriber is returned by the RAN to the VMSC, MSC Server or SGSN, the corresponding entity may store the location estimate together with a time stamp. The MSC/MSC server may store this information in the subscriber's MSC server record.

The time stamp is the time at which the location estimate is stored at the corresponding entity i.e. after the RAN returns the location estimate to the VMSC, MSC Server or SGSN. The time stamp indicates the "age" of the location estimate.

9.1.4.1 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"*.

9.1.4.2 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.

9.1.4.3 Last known Location

The current location estimate and its associated time stamp are stored in MSC/VLR, MSC Server or SGSN and until replaced by a later location estimate and a new time stamp is referred to as the *"last known location"*. The last known location may be distinct from the initial location – i.e. more recent.

9.1.4.4 Security and Privacy

The handling of security and privacy of the target UE with regard to returning the last known or initial location estimate of the target UE shall be the same as when the target UE is reachable for positioning. (i.e. the requesting LCS client is authorized and the privacy of the target UE is secured before the VMSC/MSC server check the MSC server status of the target UE (i.e. whether the UE is marked as attached or detached in the MSC server). A similar status check apply for SGSN and MSC Server.

9.1.4.5 Failing to locate the target UE

In case of a "Detached" or "Not Reachable" target UE, the last known location and a time stamp stored at the VLR, MSC Server or SGSN, may be returned to a LCS client requesting location information if the LCS client specifically requested the current or last known location. This does not apply to a value added LCS client where the target UE subscribes to notification of the location request: if the notification cannot be performed, the VMSC, MSC Server or SGSN shall reject the location request.

> NOTE: Due to CAMEL, the MSC/MSC server/VLR may already be storing other location information parameters like location number, service area identity and MSC server number in the subscriber's MSC server record.

When a request for location information is received at the VMSC, MSC Server or SGSN, the request shall indicate whether the "last known location of the target UE MS" should be returned in case of a "detached" or "not reachable" target UEMS.

If the VLR, MSC Server or SGSN has a valid copy of the subscriber's permanent data and the target UE MS's privacy settings are such that positioning is allowed, then the following two cases can occur.

9.1.4.5.1 Target UE is "Not Reachable"

If the target UE is marked as "attached" in the VLR, MSC Server or SGSN, the corresponding entity orders paging of the target UE. If paging fails, due to target UE being "not reachable" then the corresponding VMSC, MSC Server or SGSN shall check whether the LCS client has requested "last known location" in case of "not reachable" target UEMS.

If such a request exists and notification to the target UE does not apply for a value added LCS client, the VMSC, MSC Server or SGSN shall include the last known location together with the time stamp available in its response to the request for location information.

An indicator of "last known location" returned shall be marked at the CDR at VMSC, MSC Server or SGSN correspondingly.

9.1.4.5.2 Target UE is "Detached"

If the target UE is marked as "detached" in the VLR, MSC Server or SGSN, the corresponding entity shall check whether the LCS client has requested "last known location" in case of "detached" target UEMS.

If such a request exists and notification to the target UE does not apply for a value added LCS client, the VMSC, MSC Server or SGSN includes the "last known location" together with the time stamp available in its response to the request for location information.

An indicator of "last known location" returned shall be marked at the CDR at VMSC, MSC Server or SGSN.

9.1.4.5.3   Target UE is Reachable but Positioning Fails

If the target UE is reachable (e.g. paging succeeds), but the VMSC, MSC Server or SGSN is unable to obtain a current location estimate, then the corresponding entity shall check whether the LCS client has requested "last known location".

If such a request exists and notification to the target UE either does not apply or was successfully executed for a value added LCS client, the VMSC, MSC Server or SGSN includes the "last known location" together with the time stamp available in its response to the request for location information. An indicator of "last known location" returned shall be marked at the CDR at VMSC,

9.1.4.5.4   MSC Server or SGSN.Target UE is "Purged"

If the target UE is marked as "Purged" in HLR/HSS, then an indication "Absent Subscriber" is returned to the GMLC.

9.1.5 Network Induced Location Request (NI-LR)

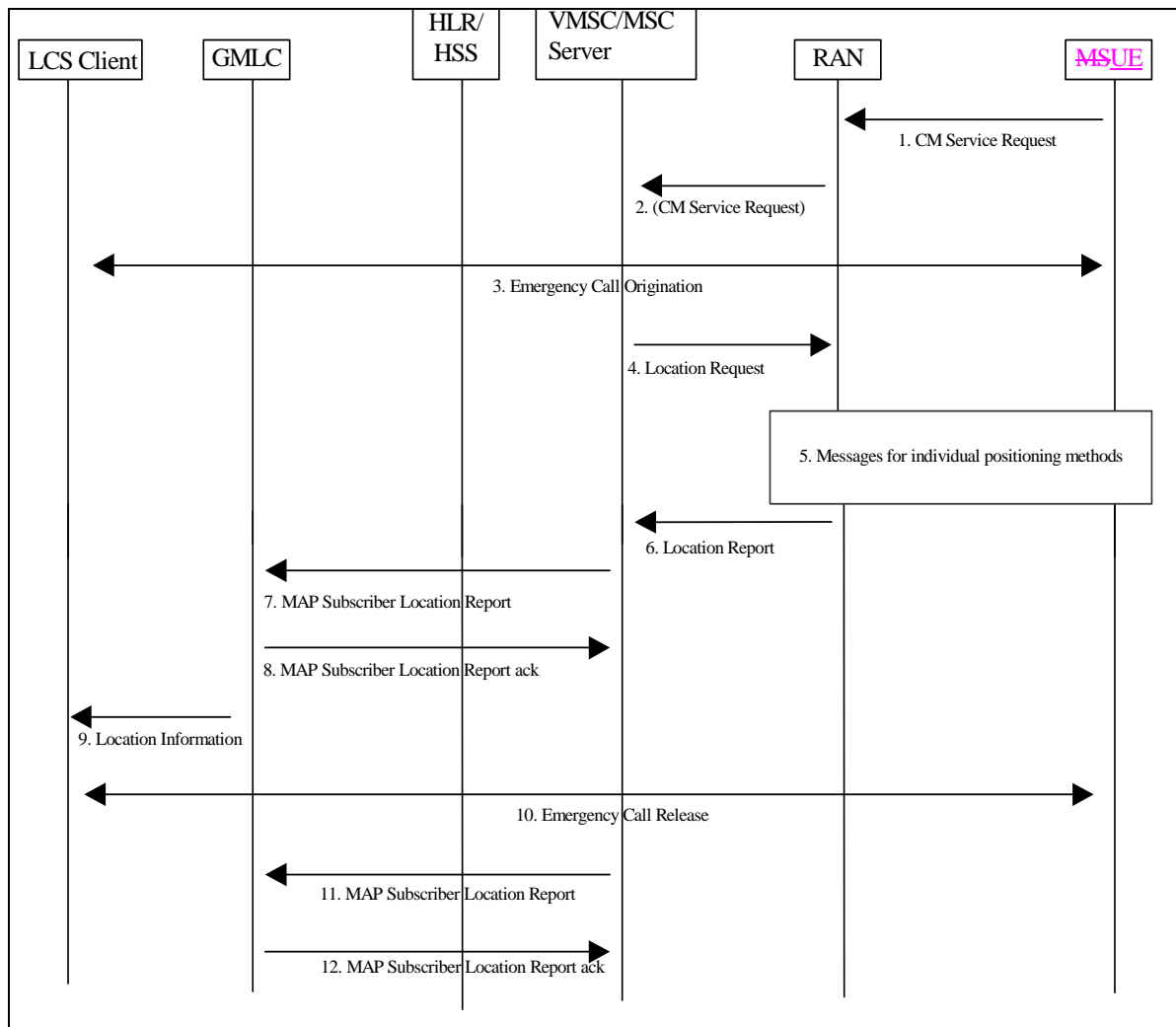Figure 9.43 illustrates positioning for an emergency service call.

Figure 9.43: Positioning for a NI-LR Emergency Service Call

9.1.5.1 Location Preparation Procedure

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

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

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

(4) At any time after step 1 UE UE UE , the VMSC/MSC server may initiate procedures to obtain the MSUE'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 MS's current location area (see step 8 for a MT-LR). This message includes the QoS required for an emergency call.

9.1.5.2 Positioning Measurement Establishment Procedure

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

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.

(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~~7~~, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling UE~~MS~~. 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~~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) 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].

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

Figure 9.5~~4~~ 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, PDP address or IMSI.
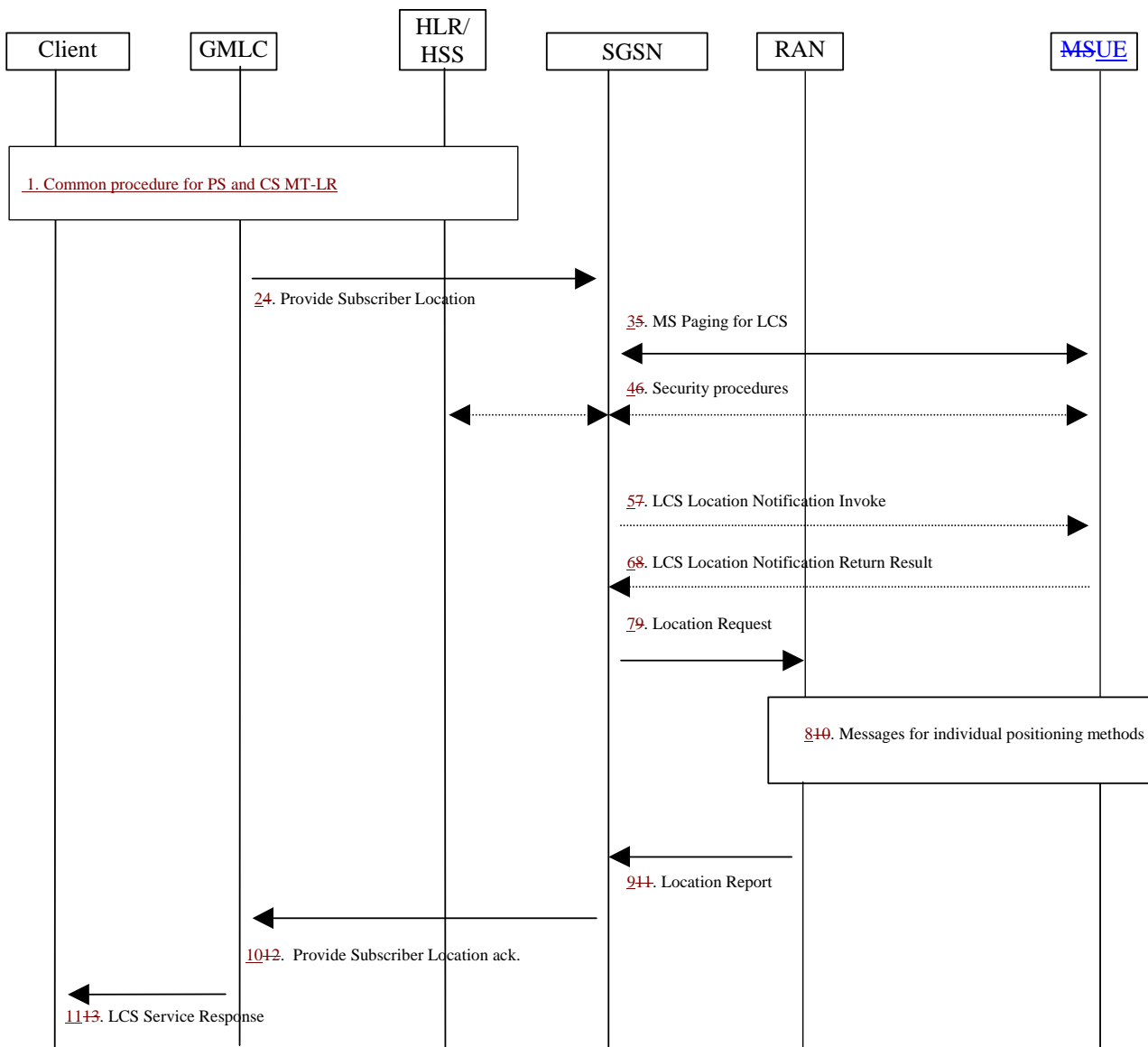
Figure 9.54: General Network Positioning for Packet Switched MT-LR

9.1.6.1 Location Preparation Procedure

Signaling steps (1), (2), (3) and (4) in Figure 9.5 are performed as described in chapter 9.1.1.

(13)An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the PDP address, (NOTE: IP addressing in this context is FFS). MSISDN or IMSI of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. If location is required for more than one UE steps 2 to 13 above may be repeated.

(14)If the GMLC already knows both the SGSN location and IMSI for the particular PDP address or MSISDN (e.g. from a previous location request), this step and step 3 may be skipped. Otherwise, the GMLC sends a Send Routing Info for LCS message to the home HLR of the target UE to be located with the IMSI, PDP address or MSISDN of this MS.

(15)The HLR verifies that the SCCP calling party address of the GMLC, corresponds to a known GSM/UMTS network element that is authorized to request UE location information. The HLR then returns one or several of the addresses, the current SGSN, VMSC and/or MSC Server, conceivably prioritizing one of the addresses to

~~be used for positioning the UE and whichever of the IMSI or MSISDN was not provided in step (2) for the particular MS.~~

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

(16)(2)~~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. In case SGSN is chosen then the~~ 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. The message shall carry the identity of the LCS client. This identity is APN for session related privacy class. For a value added LCS client, the message shall carry the client name.

(5)(3) If the GMLC is located in another PLMN or another country, the SGSN first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The SGSN then verifies LCS barring restrictions in the UE user's subscription profile in the SGSN. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC. Otherwise, the SGSN performs paging for location services. Paging is performed at the SGSN by sending a paging message indicating "Paging for LCS" to the RAN.

NOTE: "Paging for LCS" is for further study. In order to ease readibility within the figure the Paging is shown as an arrow from the SGSN towards the UE. However it is recognised that the RAN will send the relevant information over the Radio Interface corresponding to the Paging request from the SGSN.

The UE may be paged for location services even when in UMTS a signaling connection between mobile station and the network is established and in GSM when in Ready Mode. This makes it possible for the UE to start preparing an anticipated location service coming later by e.g. starting to measure GPS signals.
In GSM upon receipt of a Packet Paging Request message indicating paging for LCS, the UE shall respond with a layer 3 LCS Paging Response.
In UMTS upon receipt of a Packet Paging Request message indicating paging for LCS, the UE shall send a Service Request to establish PS signaling connection.

(6)(4) Security functions may be executed. These procedures are defined in TS 23.060**Error! Reference source not found.**.

(7)(5) If the location request comes from a value added LCS client and the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS, a notification invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client and whether privacy verification is required. Optionally, the SGSN may after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 7~~9~~ without waiting for a LCS Location Notification Return Result message in step 6~~8~~.

(8)(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~~7~~, but before step 10~~12~~. 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.

(9)(7) The SGSN sends a Location Request message to the RAN. This message includes the type of location information requested, the UE ~~MS~~'s location capabilities, the requested QoS and any other location information received in paging response.

9.1.6.2 Positioning Measurement Establishment Procedure

(10)(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 **Error! Reference source not found.** and in GERAN Stage 2 TS 43.059 **Error! Reference**

source not found.. 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, TA or RTT 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 oar 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.

9.1.6.3 Location Calculation and Release Procedure

(11)(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. If a location estimate could not be obtained, the RAN returns a Location Report message containing a failure cause and no location estimate.

(12)(10)   The SGSN returns the location information and its age to the GMLC, if the SGSN has not initiated the Privacy Verification process in step 57. If step 57 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. If a LCS Location Notification Return Result message indicating that permission is not granted is received, or there is no response, with the UE subscription profile indicating barring of location, the SGSN shall return an error response to the GMLC. If the SGSN did not return a successful location estimate, but the privacy checks were successfully executed, the SGSN may return the last known location of the target UE if this is known and the LCS client is requesting the current or last known location. The SGSN may record billing information.

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

NOTE: Steps 9 - 13 may be repeated a number of times in case of periodic location request.

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

Figure 9.65 illustrates a network induced location request from the SGSN. This procedure may be used e.g. for positioning of an emergency call.
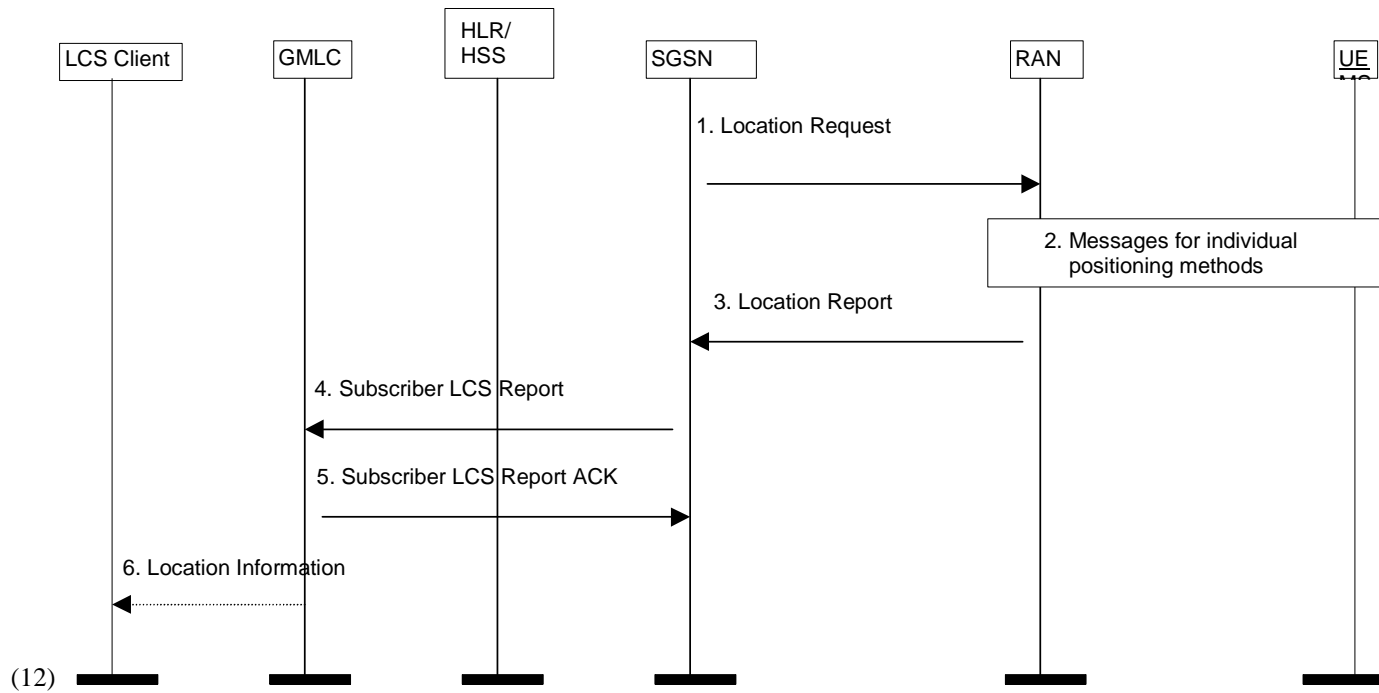
Figure 9.~~6~~5: Network Induced Location Request

(1)   The SGSN sends a Location Request message to the RAN. This message indicates the type of location information requested, the UE ~~MS~~'s location capabilities 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. TA or RTT), 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 GERAN Stage 2 **Error! Reference source not found.**. 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, TA or RTT 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 oar TA value. If the location estimate so obtained does not satisfy the requested accuracy and sufficient response time still remains, the RAN may instigate a further location attempt using the same or a different position method. If a vertical location co-ordinate is requested but the RAN can only obtain horizontal co-ordinates, these may be returned.

9.1.7.2 Location Calculation and Release Procedure

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

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

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

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

CR-Form-v3

CHANGE REQUEST

⌘   **23.271** CR **008**   ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

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

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

Title: ⌘	POI not applicable to PLMN operator service
Source: ⌘	Fujitsu
Work item code: ⌘ LCS	***Date:*** ⌘ 9/Jan/2001
Category: ⌘ **F** Critical correction	***Release:*** ⌘ REL-4

Use one of the following categories:
    F *(essential 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)*

Reason for change: ⌘	According to 22.071, Privacy Override Indicator is applicable only to lawful intercept and emergency services. However such restriction is missing from 23.271. Since stage 1 seems to be correct, the relevant description in 23.271 is to be updated.
Summary of change: ⌘	The description of applicability of POI is updated NOT to be applied to PLMN operator service MT-LR.
Consequences if not approved: ⌘	Inconsistency between 22.071 and 23.271 is kept and it causes confusion.

Clauses affected: ⌘	9.5.1, 10.3
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

9.5.1 Privacy Override Indicator (POI)

The POI is used to determine whether the privacy settings of the subscriber to be positioned shall be overridden by the request for location services. The POI is applicable only to Emergency service and Lawful intercept service. The assignment of a POI value with an "override" or "not override" value in the LCS client profile is done during the LCS client provisioning. The type of LCS client requesting location information (i.e. emergency, law-enforcement etc.) shall determine the value of the POI assigned to the LCS client profile.

There are two distinct cases regarding the handling of the privacy override indicator.

Procedure A: If the subscriber to be positioned is in the same PLMN or same country as the GMLC then the POI shall override the subscriber's privacy options.

Procedure B: Otherwise the POI shall not override the subscriber's privacy options.

10.3 GMLC

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.

Table10.6: 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	M	A list of one or more identifiers used to identify an external LCS client when making an MT-LR – the nature and content of the identifier(s) is outside the scope of the present document
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 or APNs (see NOTE) to identify the client for a call related MT-LR Each call related identity may be associated with a specific external identity. Each session-related identity shall be associated with a logical client name.
Call/session-unrelated identity	O	A list of one ore more international E.164 addresses or APNs to identify the client for a non-call related CS-MT-LR/PS-MT-LR. NOTE: A list of IP addresses or other appropriate PS specific identities may be added here. Each non-call related identity may be associated with a specific external identity. Each session-related identity shall be associated with a logical client name.
Client name	O	An address string which is a logical name associated with LCS client's E.164 address.
Override capability	O	Indication of whether the LCS client possesses the override capability (not applicable to a value added and PLMN operator serviceeclient)
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 Separate default QoS parameters may be maintained for each distinct LCS client identity (external, non-call related, call related)
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 • 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

NOTE: The LCS Client is identified with E.164 number or APN. APN is specified in TS 23.003 **Error! Reference source not found.**.
The APN identity of the LCS Client should be further defined, e.g. if it is global or GMLC related.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.271** CR **006** | ⌘ rev **4** ⌘ | Current version: | **4.0.0** | ⌘ |

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

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

Title:	⌘	Clarification of the use of the LCS client ID
Source:	⌘	Fujitsu
Work item code: ⌘	LCS	***Date:*** ⌘ 18/Dec/2000
Category:	⌘ **F** Critical correction	***Release:*** ⌘ REL-4

Use one of the following categories:
   F *(essential 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)*

Reason for change:	⌘	The LCS client ID is composed of several information elements however the presence condition of each element is not clearly described in the specification. They are used by privacy option so that the condition needs to be clarified. For the enhanced call/session related class, which needs the LCS external client ID for the comparison to the privacy exception list, the LCS client ID shall be always included in the PROVIDE SUBSCRIBER LOCATION message. For the PLMN operator services, the LCS internal client ID is necessary.
Summary of change: ⌘		For value added services, the LCS external client ID is necessary regardless of call related or call unrelated. For PLMN operator services, the LCS internal client ID is necessary.
Consequences if not approved:	⌘	

Clauses affected:	⌘	6.3.2¤ 9.1.1.1, 9.1.5.1, ANNEX B
Other specs affected:	⌘ ☐	Other core specifications ⌘
	☐	Test specifications
	☐	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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

6.3.2   LCS Clients and LCS applications

There are two classes of LCS Application – Internal applications and External applications. Internal applications represent entities internal to the GSM/UMTS that make use of location information for the (improved) operation of the network. Internal LCS client can be identified by LCS client internal ID. LCS client Internal ID distinguishes the following classes: (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). External applications represent entities (such as Commercial or Emergency services) that make use of location information for operations external to the mobile communications network. External LCS client can be identified by LCS client external ID. The LCS Applications interface to the LCS entities through their Location Client functions (LCF).

The LCS Client and LCS applications are outside the scope of the present document.

9.1 Mobile Terminating Location Request

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

Figure 9.1 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.
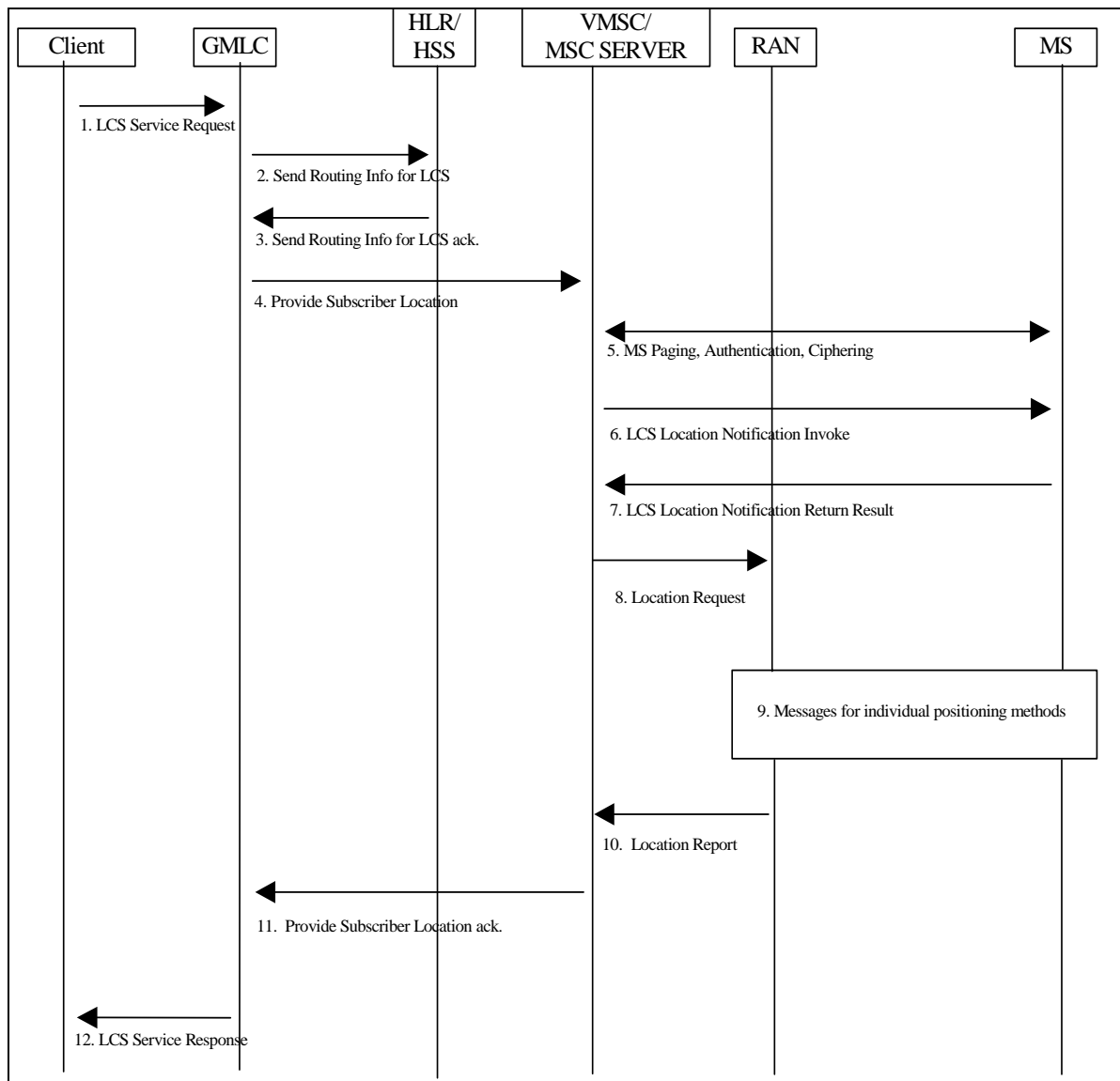
Figure 9.1: General Network Positioning for a CS-MT-LR

9.1.1.1   Location Preparation Procedure

(1) An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the
     identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI of
     the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client.
     For a call related location request, the GMLC obtains and authenticates the called party number of the LCS
     client [(refer to Annex A for further details)]. If location is required for more than one UE, or if periodic
     location is requested, steps 2 to 12 below may be repeated.

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

(3) The HLR/HSS verifies that the calling party SCCP address of the GMLC corresponds to a known GSM/UMTS
     network element that is authorized to request UE location information. The HLR/HSS then returns the current
     VMSC/MSC server address and whichever of the IMSI and MSISDN was not provided in step (2) for the
     particular MS.

(4)   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. [FFS: For a value added LCS client, the message shall carry the client name and, for a call unrelated location request, the external identity of the LCS client. For a PLMN operator LCS client, the message shall carry the internal identity of the LCS client.In other cases, inclusion of the client name and/or identity is optional.]

[NOTE: This step is for further study, it should be investigated e.g. which client identities should be required as mandatory, also the impacts of the redefined call/session-related privacy class in the service description TS 22.071 [4] should be considered.]

(5)   If the GMLC is located in another PLMN or another country, the VMSC/MSC server first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The VMSC/MSC server then verifies LCS barring restrictions in the UE user's subscription profile in the MSC server. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC. Otherwise, if the UE is in idle mode, the Core Network performs paging, authentication and ciphering. If the target UE supports any UE based or UE assisted positioning method(s), the UE will also provide RAN and MSC/MSC server with the positioning method(s) it supports via UE classmark or UE capability information. 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.

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

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

Figure 9.4 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, PDP address or IMSI.
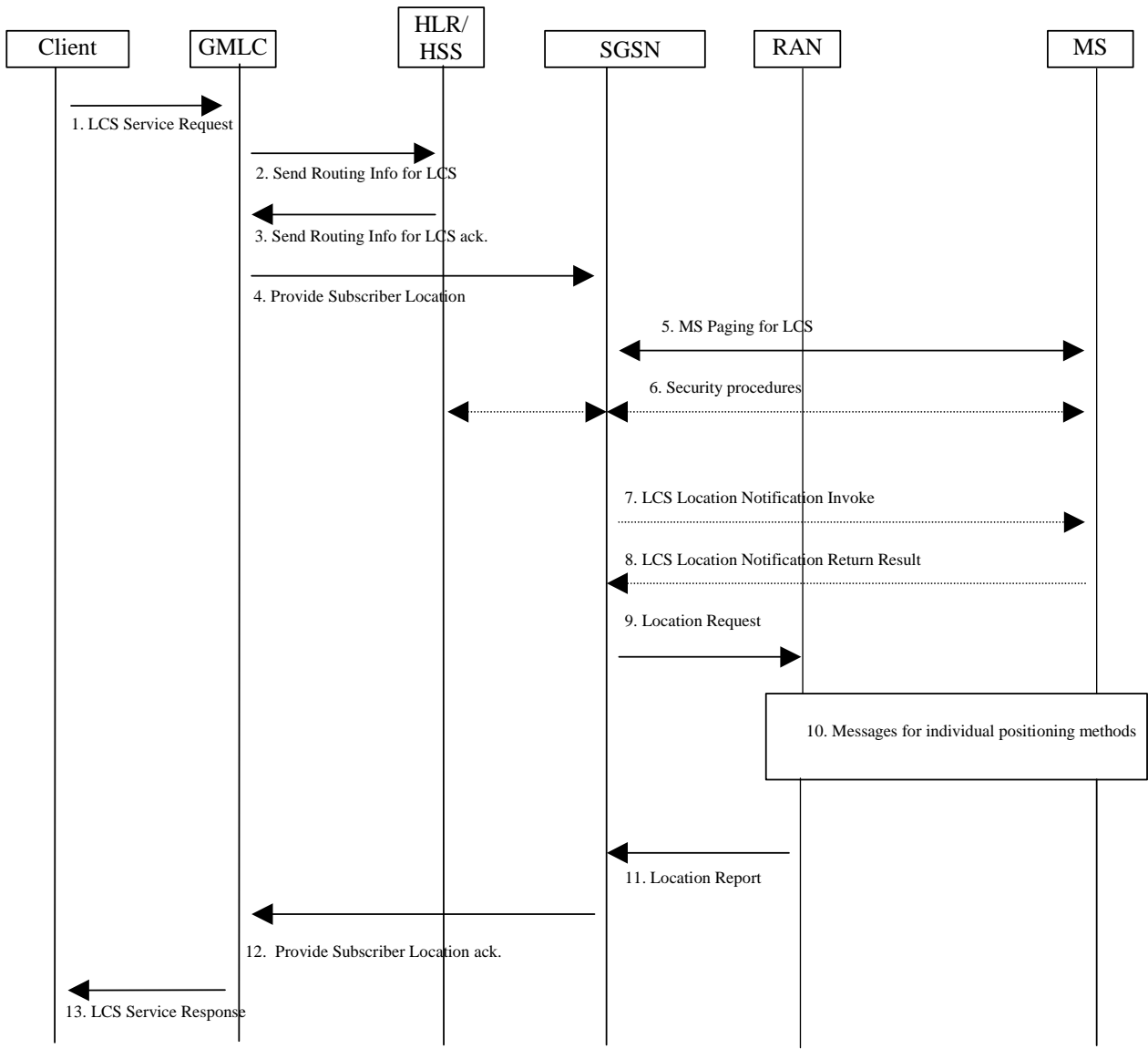

Figure 9.4: General Network Positioning for Packet Switched MT-LR

9.1.5.1   Location Preparation Procedure

(1) An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the PDP address, (NOTE: IP addressing in this context is FFS). MSISDN or IMSI of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. If location is required for more than one UE steps 2 to 13 above may be repeated.

(2) If the GMLC already knows both the SGSN location and IMSI for the particular PDP address or MSISDN (e.g. from a previous location request), this step and step 3 may be skipped. Otherwise, the GMLC sends a Send Routing Info for LCS message to the home HLR of the target UE to be located with the IMSI, PDP address or MSISDN of this MS.

(3) The HLR verifies that the SCCP calling party address of the GMLC, corresponds to a known GSM/UMTS network element that is authorized to request UE location information. The HLR then returns one or several of the addresses, the current SGSN, VMSC and/or MSC Server, conceivably prioritizing one of the addresses to be used for positioning the UE and whichever of the IMSI or MSISDN was not provided in step (2) for the particular MS.

(4) 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. In case SGSN is chosen then the 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 to which the user has established the session.~~The message shall carry the identity of the LCS client. This identity is APN for session related privacy class.~~ For a value added LCS client, the message shall carry the client name and the external identity of the LCS client. For a PLMN operator LCS client, the message shall carry the internal identity of the LCS client.

(5) If the GMLC is located in another PLMN or another country, the SGSN first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The SGSN then verifies LCS barring restrictions in the UE user's subscription profile in the SGSN. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC. Otherwise, the SGSN performs paging for location services. Paging is performed at the SGSN by sending a paging message indicating "Paging for LCS" to the RAN.

NOTE: "Paging for LCS" is for further study. In order to ease readibility within the figure the Paging is shown as an arrow from the SGSN towards the UE. However it is recognised that the RAN will send the relevant information over the Radio Interface corresponding to the Paging request from the SGSN.

The UE may be paged for location services even when in UMTS a signaling connection between mobile station and the network is established and in GSM when in Ready Mode. This makes it possible for the UE to start preparing an anticipated location service coming later by e.g. starting to measure GPS signals.
In GSM upon receipt of a Packet Paging Request message indicating paging for LCS, the UE shall respond with a layer 3 LCS Paging Response.
In UMTS upon receipt of a Packet Paging Request message indicating paging for LCS, the UE shall send a Service Request to establish PS signaling connection.

10.3 GMLC

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.

Table10.6: 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~~M~~	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. ~~the nature and content of the identifier(s) is outside the scope of the present document~~ 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 APNs (see NOTE) to identify the client for a call related MT-LR 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.
~~Call/session-unrelated identity~~	~~O~~	~~A list of one ore more international E.164 addresses or APNs to identify the client for a non-call related CS-MT-LR/PS-MT-LR.~~ ~~NOTE: A list of IP addresses or other appropriate PS specific identities may be added here.~~ ~~Each non-call related identity may be associated with a specific external identity. Each 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 a logical name associated with LCS client's external identity (i.e., E.164 address).
Override capability	O	Indication of whether the LCS client possesses the override capability (not applicable to a value added client)
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 Separate default QoS parameters may be maintained for each distinct LCS client identity (external, non-call related, call related)
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 • 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

NOTE: The LCS Client is identified with E.164 number or APN. APN is specified in TS 23.003 **Error! Reference source not found.**.

The APN identity of the LCS Client should be further defined, e.g. if it is global or GMLC related.

Annex B (Normative):
Presence of LCS client ID Components in MT-LR

The LCS client identity is composed of one or more than one of the following components: LCS client type, external identity, internal identity, call/session related identity, APN, and client name. The LCS client type shall always be present and for each LCS client type the presence of the other components are defined as follows:

Component LCS Client type	External identity	Internal identity	Call/session related identity	Client name
Emergency	O	N.A.	N.A.	N.A.
Value added	M	N.A.	O [Note]	M
PLMN operator	N.A.	M	N.A.	N.A.
Lawful Intercept	N.A.	N.A.	N.A.	N.A.

Note: This component shall be present if the MT-LR is associated to either CS call or PS session. If the MT-LR is associated with the CS call, the number dialled by MS is used. Otherwise if the MT-LR is associated with the PS session, the APN is used.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.171** CR **015** | ⌘ rev **A** ⌘ | Current version: | **3.2.0** | ⌘ |

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

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

Title: ⌘	Service Area definition in LCS stage 2	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 2001-Feb-12
Category: ⌘	**F**	***Release:*** ⌘ R99

Use <u>one</u> of the following categories:
F (essential 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: ⌘	According to 23.003 v3.7.0 §12.4, "*The Service Area Identifier (SAI) is used to uniquely identify an area consisting of one or more cells belonging to the same Location Area. Such an area is called a Service Area and can be used for indicating the location of a UE to the CN.*" . In LCS stage 2 23.171 v3.2.0 §7.2.1, a wrong definition of Service Area is given mentioning that it consists of one cell only.
Summary of change: ⌘	Remove the wrong Service Area definition from LCS stage 2.
Consequences if not approved: ⌘	LCS stage 2 against 23.003 specification about the Service Area definition.

Clauses affected: ⌘	7.2.1
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

7 Signaling Protocols and Interfaces

7.1 Signalling protocols for LCS support in UMTS

7.1.1 Protocol layering

The Iu protocol stacks are defined in TS 25.410. The functions performed by each protocol layer are described in reference [1].

7.2 Iu interface

The Iu interface is used to communicate between the LCS functional entities in the Core Network and the LCS entities in the Access Network.

This interface passes the location requests and responses from authenticated external and internal LCS applications between the LCS entities in the Core Network and the Access Network LCS entities. Support for LCS signaling over Iu is specified in TS 25.413 RANAP signalling [14].

7.2.1 Core network location request

The core network request for a location estimate of a target MS shall contain sufficient information to enable location of the Target UE according to the required QoS using any positioning method supported by the PLMN and, where necessary, UE. For location services the core network may request the geographical co-ordinates of the Target UE. The core network may also request in which Service Area ~~(consisting of one cell)~~ the Target UE is located. The Service Area information may be used for routing of corresponding Emergency calls, or for CAMEL services and this corresponds to the usage of Cell ID in the core network of GSM. (The MSC shall not send the Service Area Identity to GMLC).

It should be noted that the Service Area concept is different from the Localized Service Area concept used for SoLSA services.

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

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** CR | **A016** | ⌘ | rev | **1** | ⌘ | Current version: | **7.4.0** | ⌘ |

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

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

Title:	⌘	Corrections of A-GPS Broadcast Descriptions
Source:	⌘	Motorola
Work item code: ⌘		***Date:*** ⌘ Feb. 23, 2001
Category:	⌘ **F**	***Release:*** ⌘ Release 1998

Use one of the following categories:	*Use one of the following releases:*
F *(essential correction)*	*2* *(GSM Phase 2)*
A *(corresponds to a correction in an earlier release)*	*R96* *(Release 1996)*
B *(Addition of feature),*	*R97* *(Release 1997)*
C *(Functional modification of feature)*	*R98* *(Release 1998)*
D *(Editorial modification)*	*R99* *(Release 1999)*
Detailed explanations of the above categories can	*REL-4* *(Release 4)*
be found in 3GPP TR 21.900.	*REL-5* *(Release 5)*

Reason for change:	⌘	GSM 04.35 has been approved since last April for 3 GPS broadcast messages: DGPS, Ephemeris, and Almanac. Because 03.71 was accepted before last April, these messages have not been described accordingly.

Le is not described in 02.71, but is referred in this spec. |
| **Summary of change:** | ⌘ | Modify the description of GPS broadcast messages

Remove the partial sentence that refers Le to 02.71 |
| **Consequences if not approved:** | ⌘ | Inconsistence in the specs |

Clauses affected:	⌘	
Other specs affected:	⌘ ☐	Other core specifications ⌘
	☐	Test specifications
	☐	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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

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

5.1 LCS access interfaces and reference points

There is one reference point between the LCS PLMN server and LCS client called Le. Its~~Le is described in GSM 02.71 however the~~ protocol specifics are for further study. 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 exchanges and needs to be fully recognized.

There is an inter-LCS PLMN interface called Lg that connects two independent LCS networks for message exchange.

Figure 1: LCS Access Interfaces and Reference Points

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

10.7   Broadcast OF ASSISTANCE DATA

In MS Based E-OTD, MS Based GPS and MS Assisted GPS systems, there is a need for assistance data to be broadcast to the MS. The assistance data to be broadcast for MS Based E-OTD contains the Real Time Difference (RTD) values (in case of a non-synchronized network) and Base Transceiver Station (BTS) coordinates. In addition, the broadcast data contains other information simplifying the E-OTD measurements. In GPS the broadcast of differential corrections to the MS increases the location accuracy for MS Based implementations. The broadcast of GPS ephemeris and clock correction data navigation message bits and acquisition assistance data makes available the ephemeris and clock correction data. The broadcast of GPS almanac and other data makes available almanac data, ionospheric delay elements, universal time coordinate (UTC) offset, and other information, The later two messages can be used by the MS to increases the sensitivity, enables LMU-independent GPS time dissemination and assists the acquisition of satellite signal for both MS Based and MS Assisted implementations.

The E-OTD assistance data to be broadcast is in compressed format where the redundant information is not included. The MS is capable to reconstruct the E-OTD assistance data using the message header information. The length of the message is depending on how many neighbors are included in the E-OTD assistance data as well as whether the redundant information can be removed from the message. The typical size of one broadcast message will be less than 82 octets. Part of the broadcast message (serving and neighbor base station coordinates) may be ciphered.

There are threewo types of broadcast GPS assistance data. Their corresponding messages share the same message header that contains optional ciphering information for the rest of the message. One type of GPS assistance data to be broadcast is included in DGPS Correction Assistance Data message that consists of reference time, reference location, and GPS differential corrections. The amount of data is similar to the E-OTD assistance data, containing the maximum amount of 11 satellites 12 which can be encapsulated into 8271 octets GPS assistance data message. The message contains header information, reference time, reference location, and the differential corrections. Part of the broadcast message (GPS differential corrections) may be ciphered. The second type of GPS assistance data to be broadcast is included in Ephemeris and Clock CorrectionGPS Navigation Message Bits Data message that consists of GPS ephemeris and clock correction datanavigation bits and acquisition assistance. One broadcast message has fixed information data length of 656 bits and Tthe length of broadcast GPS navigation message bitthis message is 63620 bits. The remaining 2036 bits are filled with '0' and are reserved for future expansion. Part of the broadcast message (GPS navigation message bits, Doppler and code phase) may be ciphered. The third type of GPS assistance data to be broadcast is included in Almanac and Other Data message that consists of GPS almanac data, ionospheric delay elements, UTC offset, and other information. The length of this message is 651 bits. The remaining 5 bits are filled with '0' and are reserved for future expansion.

The contents of the broadcast message for the E-OTD and GPS assistance data is described in GSM TS 04.35. The support for these broadcast messages is optional for network and MS.

The broadcast channel which is used to broadcast the E-OTD and GPS assistance data make use of the existing basic or extended CBCH and SMSCB DRX service. The LCS broadcast messages (E-OTD Aassistance Ddata, DGPS differential Ccorrections Dataand, GPS Ephemeris and Clock Correctionnavigation message bits data message Data, and GPS Almanac and Other Data) need to be either scheduled, or prioritized over other broadcast messages to avoid any delay.

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

10.7.2   Ciphering

In order for the operators to control the access to the assistance data, parts of the broadcast data may be ciphered. Ciphering is done with a specific key delivered by NW for this purpose. The deciphering keys may be requested by MS during a location update (IMSI Attach, Normal or Periodic Location Update) with the generic DTAP MO-LR Location Services Invoke command. . The Follow-On Procedure operation is used to keep the point-to-point connection between MS and NW open after location update. The deciphering keys are Location Area specific.

The LCS Broadcast Data, when ciphered, will be partially ciphered according the LCS broadcast message definitions specified in GTS 04.35. The parts that will be ciphered in E-OTD LCS Broadcast Data message are neighbor RTD values, serving and neighbor BTS coordinates. For GPS the differential correction data, the navigation message bits, Doppler and code phase data are ciphered except the common message header of the DGPS Correction Data message, the Ephemeris and Clock Correction Data message, and the Almanac and Other Data message. The ciphering operation will be conducted by SMLC. The MS is capable to decipher the broadcast message (ciphered parts) using the cipher key (56 bits) delivered from NW to MS and using the Ciphering Serial Number (16 bits) included in the broadcast message.

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

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

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

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

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

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

CR-Form-v3

CHANGE REQUEST

⌘ **03.71** CR **A017** ⌘ rev **1** ⌘ Current version: **8.0.0** ⌘

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

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

Title:	⌘	Corrections of A-GPS Broadcast Descriptions
Source:	⌘	Motorola
Work item code: ⌘		***Date:*** ⌘ Feb. 23, 2001
Category:	⌘ **F**	***Release:*** ⌘ Release 1999

Use <u>one</u> of the following categories:
F (essential 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:	⌘	GSM 04.35 has been approved since last April for 3 GPS broadcast messages: DGPS, Ephemeris, and Almanac. Because 03.71 was accepted before last April, these messages have not been described accordingly.

Le is not described in 02.71, but is referred in this spec. |
| ***Summary of change:*** ⌘ | | Modify the description of GPS broadcast messages

Remove the partial sentence that refers Le to 02.71 |
| ***Consequences if not approved:*** | ⌘ | Inconsistence in the specs |

Clauses affected:	⌘	
Other specs affected:	⌘ ☐	Other core specifications ⌘
	☐	Test specifications
	☐	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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

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

5.1 LCS access interfaces and reference points

There is one reference point between the LCS PLMN server and LCS client called Le. Its~~Le is described in GSM 02.71 however the~~ protocol specifics are for further study. 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 exchanges and needs to be fully recognized.

There is an inter-LCS PLMN interface called Lg that connects two independent LCS networks for message exchange.

Figure 1: LCS Access Interfaces and Reference Points

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

10.7 Broadcast OF ASSISTANCE DATA

In MS Based E-OTD, MS Based GPS and MS Assisted GPS systems, there is a need for assistance data to be broadcast to the MS. The assistance data to be broadcast for MS Based E-OTD contains the Real Time Difference (RTD) values (in case of a non-synchronized network) and Base Transceiver Station (BTS) coordinates. In addition, the broadcast data contains other information simplifying the E-OTD measurements. In GPS the broadcast of differential corrections to the MS increases the location accuracy for MS Based implementations. The broadcast of GPS ephemeris and clock correction data ~~navigation message bits and acquisition assistance data~~ makes available the ephemeris and clock correction data. The broadcast of GPS almanac and other data makes available almanac data, ionospheric delay elements, universal time coordinate (UTC) offset, and other information, The later two messages can be used by the MS to increase~~s~~ the sensitivity, enables LMU-independent GPS time dissemination and assists the acquisition of satellite signal for both MS Based and MS Assisted implementations.

The E-OTD assistance data to be broadcast is in compressed format where the redundant information is not included. The MS is capable to reconstruct the E-OTD assistance data using the message header information. The length of the message is depending on how many neighbors are included in the E-OTD assistance data as well as whether the redundant information can be removed from the message. The typical size of one broadcast message will be less than 82 octets. Part of the broadcast message (serving and neighbor base station coordinates) may be ciphered.

There are three~~wo~~ types of broadcast GPS assistance data. Their corresponding messages share the same message header that contains optional ciphering information for the rest of the message. One type of GPS assistance data to be broadcast is included in DGPS Correction ~~Assistance~~ Data message that consists of reference time, reference location, and GPS differential corrections. The amount of data is similar to the E-OTD assistance data, containing the maximum amount of 11 satellites ~~12~~ which can be encapsulated into 82~~71~~ octets ~~GPS assistance data~~ message. The message contains ~~header information,~~ reference time, reference location, and the differential corrections. ~~Part of the broadcast message (GPS differential corrections) may be ciphered.~~ The second type of GPS assistance data to be broadcast is included in Ephemeris and Clock Correction~~GPS Navigation Message Bits~~ Data message that consists of GPS ephemeris and clock correction data~~navigation bits and acquisition assistance~~. ~~One broadcast message has fixed information data length of 656 bits and T~~the length of ~~broadcast GPS navigation message bit~~this message is 63~~620~~ bits. The remaining 20~~36~~ bits are filled with '0' and are reserved for future expansion. ~~Part of the broadcast message (GPS navigation message bits, Doppler and code phase) may be ciphered.~~ The third type of GPS assistance data to be broadcast is included in Almanac and Other Data message that consists of GPS almanac data, ionospheric delay elements, UTC offset, and other information. The length of this message is 651 bits. The remaining 5 bits are filled with '0' and are reserved for future expansion.

The contents of the broadcast message for the E-OTD and GPS assistance data is described in GSM TS 04.35. The support for these broadcast messages is optional for network and MS.

The broadcast channel which is used to broadcast the E-OTD and GPS assistance data make use of the existing basic or extended CBCH and SMSCB DRX service. The LCS broadcast messages (E-OTD A~~a~~ssistance D~~d~~ata, DGPS ~~differential C~~correction~~s~~ Data~~and,~~ GPS Ephemeris and Clock Correction~~navigation message bits data message~~ Data, and GPS Almanac and Other Data) need to be either scheduled, or prioritized over other broadcast messages to avoid any delay.

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

10.7.2   Ciphering

In order for the operators to control the access to the assistance data, parts of the broadcast data may be ciphered. Ciphering is done with a specific key delivered by NW for this purpose. The deciphering keys may be requested by MS during a location update (IMSI Attach, Normal or Periodic Location Update) with the generic DTAP MO-LR Location Services Invoke command. . The Follow-On Procedure operation is used to keep the point-to-point connection between MS and NW open after location update. The deciphering keys are Location Area specific.

The LCS Broadcast Data, when ciphered, will be ~~partially~~ ciphered according the LCS broadcast message definitions specified in GTS 04.35. The parts that will be ciphered in E-OTD LCS Broadcast Data message are neighbor RTD values, serving and neighbor BTS coordinates. For GPS the ~~differential correction data, the navigation message bits, Doppler and code phase~~ data are ciphered except the common message header of the DGPS Correction Data message, the Ephemeris and Clock Correction Data message, and the Almanac and Other Data message. The ciphering operation will be conducted by SMLC. The MS is capable to decipher the broadcast message (ciphered parts) using the cipher key (56 bits) delivered from NW to MS and using the Ciphering Serial Number (16 bits) included in the broadcast message.

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

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

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

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

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

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

CR-Form-v3

CHANGE REQUEST

⌘	**03.71**	CR	**A018**	⌘	rev	**1**	⌘	Current version:	**7.4.0** ⌘

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

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

Title:	⌘	Applicability of LCS services in CS domain to GPRS mobile stations
Source:	⌘	Alcatel, Ericsson
Work item code: ⌘	LCS	*Date:* ⌘ 20 February 2001
Category:	⌘ **F**	*Release:* ⌘ R98

Use <u>one</u> of the following categories: **F** *(essential 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: ⌘		There is some inconsistency between 03.60 and 03.71 related to paging handling for CS domain. It is not clear in 03.71 how the CS paging is handled in case the CS terminal even have GPRS capability. In case of CS-MT-LR when the MS is both IMSI and GPRS attached the CS paging can according to 03.60 even be performed via the Gs interface. This possibillity is not described in 03.71.
Summary of change: ⌘		This CR updates the 03.71 to reflect the missing paging handling.
Consequences if not approved:	⌘	It is unclear whether the LCS services apply to CS mobile stations that also have GPRS capability.

Clauses affected:	⌘	Sections 3.2, 3.3, 4.1, 5.6, 5.6.7, new 5.6.11, 7.6.1.1 bullet 5

Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

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
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

3.3   Symbols

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

<div style="padding-left:2em">

Gb   Interface between SGSN and BSS
Gs   Interface between MSC and SGSN
Lb   Interface between Serving MLC and BSC (BSC interface)
Lc   Interface between gateway MLC and gsmSCF (CAMEL interface)
Le   Interface between External User and MLC (external interface)
Lh   Interface between Gateway MLC and HLR (HLR interface)
Lg   Interface between Gateway MLC and VMSC (gateway MLC interface)
Lp   Interface between SMLC and peer SMLC (peer interface)
Ls   Interface between Serving MLC and VMSC (serving MLC interface)
Um   Air Interface to an LMU (measurement interface)

</div>

4   Main concepts

LCS utilizes one or more positioning mechanisms in order to determine the location of a Mobile Station. Positioning a target MS involves two main steps: signal measurements and location estimate computation based on the measured signals.

Three positioning mechanisms are proposed for LCS: Uplink Time of Arrival (TOA), Enhanced Observed Time Difference (E-OTD), and Global Positioning System (GPS) assisted.

4.1   Assumptions

- Support an SMLC that can be either BSS based or NSS based. While the SMLC is considered to be a separate logical entity, it may still be physically part of an MSC or BSC.

- Standardize a similar open interface to the SMLC whether it is NSS or BSS based. This simplifies migration from an NSS to a BSS based location architecture and avoids two different types of SMLC.

- Support "Type A" LMUs accessed over the GSM air interface using the same signaling protocols for both BSS and NSS based SMLC interaction. A type A LMU supports the RR and MM signaling procedures defined in GSM 04.08. A type A LMU may have a subscription profile in the HLR and may support certain CM services – e.g. outgoing data calls for SW download and SMS for SIM card download.

- Support "Type B" LMUs accessed over the Abis interface. The LMU may be either free standing (support Abis signaling) or associated with a BTS – either integrated or connected by proprietary means. If free standing, a type B LMU could be identified using a pseudo cell ID.

- Employ the same application protocol defined in GSM 04.71 for all types of LMU.

- Use MTP, SCCP, BSSAP as the basis for all LCS signaling between the SMLC, BSC, MSC and (for GPRS) SGSN, since these are the only protocols that are all supported in a BSC, MSC and SGSN. Substitution of TCP/IP or FR could be used in 3G. An important consequence of this change is that TCAP and MAP are no longer needed for signaling to an SMLC (since retention of TCAP and MAP would only be feasible for an NSS based SMLC, thereby producing two distinct types of SMLC).

- Provide enough flexibility to enable usage of transport protocols other than MTP/SCCP to support LCS for GPRS and 3G.

- Employ SCCP connection oriented signaling in the NSS and BSS to access a type A LMU or target MS to enable LCS messages to be easily relayed through an MSC and BSC.

- Add signaling between peer SMLCs to enable an SMLC to request or receive E-OTD, TOA or GPS positioning and assistance measurements obtained by an LMU belonging to another SMLC.

- Enable migration from an NSS based SMLC to BSS based SMLCs.

- Provide positioning procedures through the circuit-switched domain are also applicable to GPRS mobile stations which are GPRS and IMSI attached.

5.6 Logical architecture

LCS is logically implemented on the GSM structure through the addition of one network node, the Mobile Location Center (MLC). It is necessary to name a number of new interfaces. A generic LCS logical architecture is shown in figure 3. LCS generic architecture can be combined to produce LCS architecture variants. No inference should be drawn about the physical configuration on an interface from figure 3.

Figure 3: Generic LCS Logical Architecture

5.6.1 BSS

The BSS is involved in the handling of various positioning procedures. Specific BSS functionality is specified in each of the positioning procedures section.

5.6.2 LCS Client

The LCS client is outside the scope of this standard.

5.6.3 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 via the Lh interface. After performing registration authorization, it sends positioning requests to and receives final location estimates from the VMSC via the Lg interface.

5.6.4 SMLC

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

The SMLC manages the overall coordination and scheduling of resources required to perform positioning of a mobile. It also calculates the final location estimate and accuracy.

Two types of SMLC are possible:

NSS based SMLC: supports the Ls interface.

BSS based SMLC: supports the Lb interface.

An NSS based SMLC supports positioning of a target MS via signaling on the Ls interface to the visited MSC. A BSS based SMLC supports positioning via signaling on the Lb interface to the BSC serving the target MS. Both types of SMLC may support the Lp interface to enable access to information and resources owned by another SMLC.

The SMLC controls a number of LMUs for the purpose of obtaining radio interface measurements to locate or help locate MS subscribers in the area that it serves. The SMLC is administered with the capabilities and types of measurement produced by each of its LMUs. Signaling between an NSS based SMLC and LMU is transferred via the MSC serving the LMU using the Ls interface and either the Um interface for a Type A LMU or the Abis interface for a Type B LMU. Signaling between a BSS based SMLC and LMU is transferred via the BSC that serves or controls the LMU using the Lb interface and either the Um interface for a Type A LMU or the Abis interface for a Type B LMU.

The SMLC and GMLC functionality may be combined in the same physical node, combined in existing physical nodes, or reside in different nodes.

For Location Services, when a Cell Broadcast Center (CBC) is associated with a BSC, the SMLC may interface to a CBC in order to broadcast assistance data using existing cell broadcast capabilities. The SMLC shall behave as a user, Cell Broadcast Entity, to the CBC (refer to GSM.03.41).

5.6.5　MS

The MS may be involved in the various positioning procedures.　Specific MS involvement is specified in each of the positioning procedures section.

5.6.6　LMU

An LMU makes radio measurements to support one or more positioning methods. These measurements fall into one of two categories:

a)　Location measurements specific to one MS used to compute the location of this MS

b)　Assistance measurements specific to all MSs in a certain geographic area

All location and assistance measurements obtained by an LMU are supplied to a particular SMLC associated with the LMU. Instructions concerning the timing, the nature and any periodicity of these measurements are either provided by the SMLC or are pre-administered in the LMU.

Two types of LMU are defined:

Type A LMU:　accessed over the normal GSM air interface.

Type B LMU:　accessed over the Abis interface.

A type A LMU is accessed exclusively over the GSM air interface (Um interface): there is no wired connection to any other network element. A type A LMU has a serving BTS and BSC that provide signaling access to a controlling SMLC. With an NSS based SMLC, a type A LMU also has a serving MSC and VLR and a subscription profile in an HLR. A type A LMU always has a unique IMSI and supports all radio resource and mobility management functions of the GSM air interface that are necessary to support signaling using an SDCCH to the SMLC. A type A LMU supports those connection management functions necessary to support LCS signaling transactions with the SMLC and may support certain call control functions of to support signaling to an SMLC using a circuit switched data connection.

NOTE:　A network operator may assign specific ranges of IMSI for its LMUs and may assign certain digits within the IMSI to indicate the associated SMLC. Certain digits in the IMSI may also be used as a local identifier for an LMU within an SMLC.

To ensure that a Type A LMU and its associated SMLC can always access one another, an LMU may be homed (camped) on a particular cell site or group of cell sites belonging to one BSC or one MSC. For any Type A LMU with a subscription profile in an HLR (applies only with an NSS based SMLC), a special profile is used indicating no supplementary services, except possibly SMS-PP MT (for data download via the SIM application toolkit), and barring of all incoming and possibly outgoing calls. An identifier in the HLR profile also distinguishes an LMU from a normal MS. All other data specific to an LMU is administered in the LMU and in its associated SMLC.

A Type B LMU is accessed over the Abis interface from a BSC. The LMU may be either a standalone network element addressed using some pseudo-cell ID or connected to or integrated in a BTS. Signaling to a Type B LMU is by means of messages routed through the controlling BSC for a BSS based SMLC or messages routed through a controlling BSC and MSC for an NSS based SMLC.

The following assistance measurements obtained by an LMU have a generic status in being usable by more than one position method:

> Radio Interface Timing measurements – comprise Absolute Time Differences (ATDs) or Real Time Differences (RTDs) of the signals transmitted by Base Stations, where timing differences are measured relative to either some absolute time difference (ATD) or the signals of another Base Station (RTD).

5.6.7   MSC

The MSC contains functionality responsible for MS subscription authorization and managing call-related and non-call related positioning requests of GSM LCS. The MSC is accessible to the GMLC via the Lg interface and the SMLC via the Ls interface. If connected to SGSN through the Gs interface, it checks whether the mobile station is GPRS attached to decide whether to page the mobile station on the A or Gs interface.

5.6.8   HLR

The HLR contains LCS subscription data and routing information. The HLR is accessible from the GMLC via the Lh interface. For roaming MSs, HLR may be in a different PLMN that the current SMLC.

5.6.9   gsmSCF

The Lc interface supports CAMEL access to LCS and is applicable only in CAMEL phase 3. The procedures and signaling associated with it are defined in GSM 03.78 and GSM 09.02, respectively.

5.6.10   LMU and SMLC association

The LCS architecture is intended to support a high degree of flexibility, whereby any physical SMLC can support multiple Ls or Lb interfaces (e.g. allowing a BSS based SMLC to serve multiple BSCs) and whereby a mixture of different SMLC types can serve a single network or single MSC area. Figure 4 illustrates the case where different SMLC types and different LMU types are supported in a single MSC area.
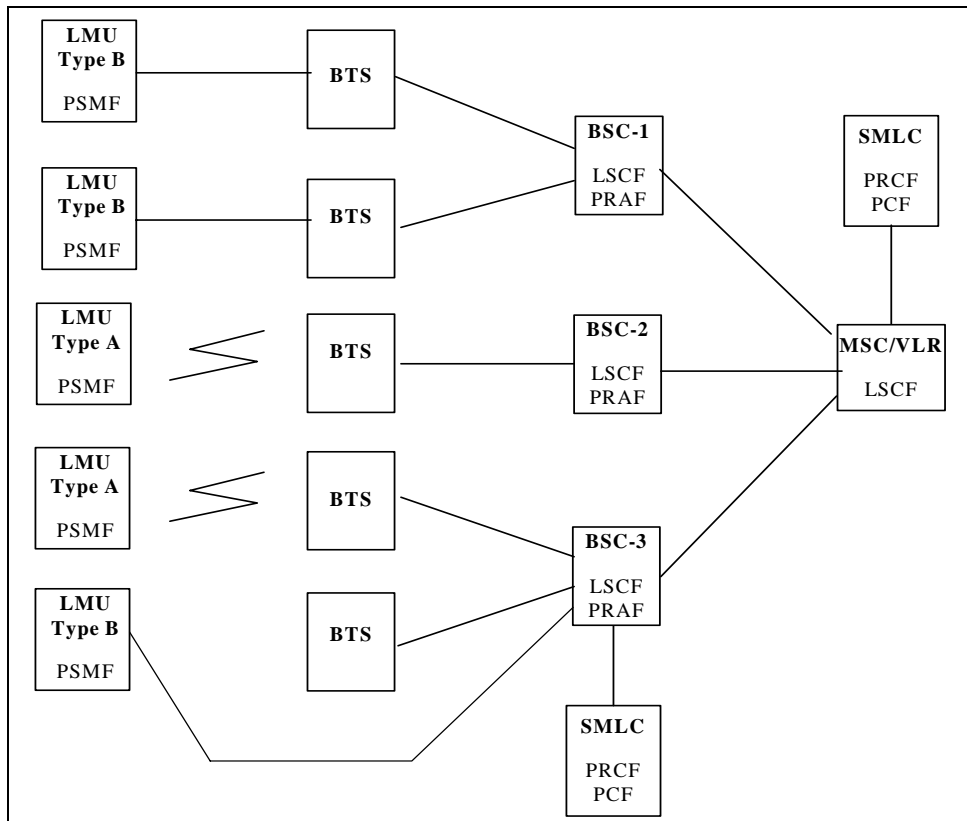
Figure 4: Mixed Network with BSS and NSS based SMLCs and Type A and B LMUs

5.6.11 SGSN

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

7.6.1 Mobile Terminating Location Request (MT-LR)

Figure 29 illustrates general network positioning for LCS clients external to the PLMN. In this scenario, it is assumed that the target MS is identified using either an MSISDN or IMSI.
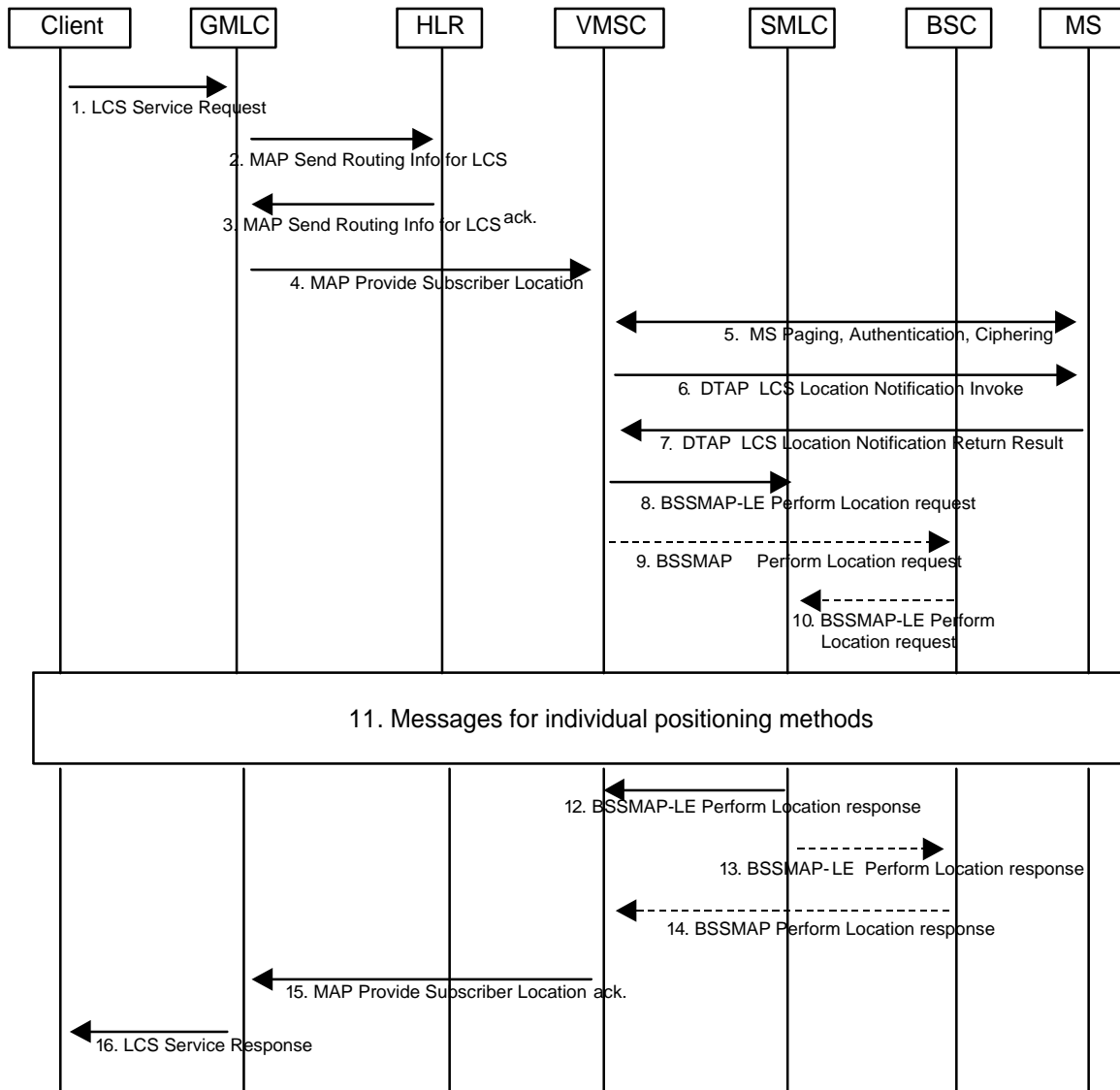

Figure 29: General Network Positioning for a MT-LR

7.6.1.1 Location Preparation Procedure

1) An external LCS client requests the current location of a target MS from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI of the target MS 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 GMLC obtains and authenticates the called party number of the LCS client (refer to Annex A for further details). If location is required for more than one MS, or if periodic location is requested, steps 2 to 12 below may be repeated.

2) If the GMLC already knows both the VMSC location and IMSI for the particular MSISDN (e.g. from a previous location request), this step and step 3 may be skipped. Otherwise, the GMLC sends a MAP_SEND_ROUTING_INFO_FOR_LCS message to the home HLR of the target MS to be located with either the IMSI or MSISDN of this MS.

3) The HLR verifies that the SCCP calling party address of the GMLC, corresponds to a known GSM network element that is authorized to request MS location information. The HLR then returns the current VMSC address and whichever of the IMSI and MSISDN was not provided in step 2 for the particular MS.

4) The GMLC sends a MAP_PROVIDE_SUBSCRIBER_LOCATION message to the VMSC indicated by the HLR. This message carries the type of location information requested (e.g. current location), the MS 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 if available and, for a call unrelated location request, the identity of the LCS client. In other cases, inclusion of the client name and/or identity is optional.

5) If the GMLC is located in another PLMN or another country, the VMSC first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. If the target MS 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 the SMLC to decide, on the basis of the applicable position methods and requested QoS, whether positioning is possible. The VMSC then verifies LCS barring restrictions in the MS user's subscription profile in the VLR. 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 MS 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 MS is in idle mode, the VLR performs paging, authentication and ciphering. The MSC will page a GPRS attached MS either through A or Gs interface, depending on the presence of the Gs interface (see Note). This procedure will provide the MS user's current cell ID and certain location information that includes the TA value in the BSSMAP Complete layer 3 Information used to convey the Paging Response. If the target MS supports any MS based or MS assisted positioning method(s), the MS will also provide the BSC and MSC with the positioning method(s) it supports via controlled early classmark sending (see GSM 04.08 and 08.08). If the MS is instead in dedicated mode, the VMSC will already have any early classmark information and will have been supplied with the current cell ID from either the serving BSC or serving MSC in the case of an established call with MSC-MSC handover.

   Note: In some network mode of operation, a GPRS capable MS may not receive the CS paging. In addition, upon receipt of a CS paging, a GPRS capable MS may immediately answer to the Paging Request or delay the answer, as defined in 3GPP TS 02.60 and 03.60. A GPRS MS in class B mode may also suspend its GPRS traffic, sending a GPRS Suspension Request to the network.

6) If the location request comes from a value added LCS client and the MS subscription profile indicates that the MS must either be notified or notified with privacy verification and the MS supports notification of LCS (according to the MS Classmark 2), a DTAP LCS Location Notification Invoke message is sent to the target MS indicating the type of location request (e.g. current location), the identity of the LCS client and whether privacy verification is required. For a call related location request, the LCS client identity shall be set to the LCS client's called party number if no separate LCS client identity was received from the GMLC. Optionally, the VMSC may after sending the DTAP LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 8 without waiting for a DTAP LCS Location Notification Return Result message in step 7.

7) The target MS notifies the MS user of the location request and, if privacy verification was requested, the target MS indicates to the MS 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 MS then returns a DTAP LCS Location Notification Return Result to the VMSC indicating, if privacy verification was requested, whether permission is granted or denied. Optionally, the DTAP LCS Location Notification Return Result message can be returned some time after step 6, but before step 15. If the MS user does not respond after a predetermined time period, the VMSC shall infer a "no response" condition. The VMSC shall return an error response to the GMLC if privacy verification was requested and either the MS user denies permission or there is no response with the MS subscription profile indicating barring of the location request in the absence of a response.

8) The VMSC sends a MAP_PERFORM_LOCATION message to the SMLC associated with the MS's current cell location. The BSSMAP-LE message includes the type of location information requested, the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the requested QoS and the current Cell ID and, if available, any location information including the TA value received in step 5.

9) If the SMLC is BSS based, the VMSC instead sends the BSSMAP PERFORM LOCATION message to the serving BSC for the target MS.

10) In the case of a BSS based SMLC, the BSC forwards the BSSMAP-LE PERFORM LOCATION request received in step 9 to the SMLC. The BSC may add additional measurement data to the message to assist with positioning. The message is transported inside an SCCP connection request.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** | CR | **A019** | ⌘ | rev | **1** | ⌘ | Current version: | **8.0.0** | ⌘ |

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

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

Title:	⌘	Applicability of LCS services in CS domain to GPRS mobile stations
Source:	⌘	Alcatel, Ericsson
Work item code:⌘	LCS	**Date:** ⌘ 20 February 2001
Category:	⌘ **F**	**Release:** ⌘ R99

Use <u>one</u> of the following categories:	*Use <u>one</u> of the following releases:*
F *(essential correction)*	2 *(GSM Phase 2)*
A *(corresponds to a correction in an earlier release)*	R96 *(Release 1996)*
B *(Addition of feature),*	R97 *(Release 1997)*
C *(Functional modification of feature)*	R98 *(Release 1998)*
D *(Editorial modification)*	R99 *(Release 1999)*
Detailed explanations of the above categories can	REL-4 *(Release 4)*
be found in 3GPP TR 21.900.	REL-5 *(Release 5)*

Reason for change:	⌘	There is some inconsistency between 03.60 and 03.71 related to paging handling for CS domain. It is not clear in 03.71 how the CS paging is handled in case the CS terminal even have GPRS capability. In case of CS-MT-LR when the MS is both IMSI and GPRS attached the CS paging can according to 03.60 even be performed via the Gs interface. This possibillity is not described in 03.71.
Summary of change: ⌘		This CR updates the 03.71 to reflect the missing paging handling.
Consequences if not approved:	⌘	It is unclear whether the LCS services apply to CS mobile stations that also have GPRS capability.

Clauses affected:	⌘	Sections 3.2, 3.3, 4.1, 5.6, 5.6.7, new 5.6.11, 7.6.1.1 bullet 5
Other specs affected:	⌘ ☐	Other core specifications ⌘
	☐	Test specifications
	☐	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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

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
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

3.3 Symbols

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

Gb   Interface between SGSN and BSS
Gs   Interface between MSC and SGSN
Lb   Interface between Serving MLC and BSC (BSC interface)
Lc   Interface between gateway MLC and gsmSCF (CAMEL interface)
Le   Interface between External User and MLC (external interface)
Lh   Interface between Gateway MLC and HLR (HLR interface)
Lg   Interface between Gateway MLC and VMSC (gateway MLC interface)
Lp   Interface between SMLC and peer SMLC (peer interface)
Ls   Interface between Serving MLC and VMSC (serving MLC interface)
Um   Air Interface to an LMU (measurement interface)

4 Main concepts

LCS utilizes one or more positioning mechanisms in order to determine the location of a Mobile Station. Positioning a target MS involves two main steps: signal measurements and location estimate computation based on the measured signals.

Three positioning mechanisms are proposed for LCS: Uplink Time of Arrival (TOA), Enhanced Observed Time Difference (E-OTD), and Global Positioning System (GPS) assisted.

4.1 Assumptions

- Support an SMLC that can be either BSS based or NSS based. While the SMLC is considered to be a separate logical entity, it may still be physically part of an MSC or BSC.

- Standardize a similar open interface to the SMLC whether it is NSS or BSS based. This simplifies migration from an NSS to a BSS based location architecture and avoids two different types of SMLC.

- Support "Type A" LMUs accessed over the GSM air interface using the same signaling protocols for both BSS and NSS based SMLC interaction. A type A LMU supports the RR and MM signaling procedures defined in GSM 04.08. A type A LMU may have a subscription profile in the HLR and may support certain CM services – e.g. outgoing data calls for SW download and SMS for SIM card download.

- Support "Type B" LMUs accessed over the Abis interface. The LMU may be either free standing (support Abis signaling) or associated with a BTS – either integrated or connected by proprietary means. If free standing, a type B LMU could be identified using a pseudo cell ID.

- Employ the same application protocol defined in GSM 04.71 for all types of LMU.

- Use MTP, SCCP, BSSAP as the basis for all LCS signaling between the SMLC, BSC, MSC and (for GPRS) SGSN, since these are the only protocols that are all supported in a BSC, MSC and SGSN. Substitution of TCP/IP or FR could be used in 3G. An important consequence of this change is that TCAP and MAP are no longer needed for signaling to an SMLC (since retention of TCAP and MAP would only be feasible for an NSS based SMLC, thereby producing two distinct types of SMLC).

- Provide enough flexibility to enable usage of transport protocols other than MTP/SCCP to support LCS for GPRS and 3G.

- Employ SCCP connection oriented signaling in the NSS and BSS to access a type A LMU or target MS to enable LCS messages to be easily relayed through an MSC and BSC.

- Add signaling between peer SMLCs to enable an SMLC to request or receive E-OTD, TOA or GPS positioning and assistance measurements obtained by an LMU belonging to another SMLC.

- Enable migration from an NSS based SMLC to BSS based SMLCs.

- Provide positioning procedures through the circuit-switched domain are also applicable to GPRS mobile stations which are GPRS and IMSI attached.

5.6 Logical architecture

LCS is logically implemented on the GSM structure through the addition of one network node, the Mobile Location Center (MLC). It is necessary to name a number of new interfaces. A generic LCS logical architecture is shown in figure 3. LCS generic architecture can be combined to produce LCS architecture variants. No inference should be drawn about the physical configuration on an interface from figure 3.

Figure 3: Generic LCS Logical Architecture

5.6.1   BSS

The BSS is involved in the handling of various positioning procedures. Specific BSS functionality is specified in each of the positioning procedures section.

5.6.2   LCS Client

The LCS client is outside the scope of this standard.

5.6.3   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 via the Lh interface. After performing registration authorization, it sends positioning requests to and receives final location estimates from the VMSC via the Lg interface.

5.6.4   SMLC

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

The SMLC manages the overall coordination and scheduling of resources required to perform positioning of a mobile. It also calculates the final location estimate and accuracy.

Two types of SMLC are possible:

    NSS based SMLC: supports the Ls interface.

    BSS based SMLC: supports the Lb interface.

An NSS based SMLC supports positioning of a target MS via signaling on the Ls interface to the visited MSC. A BSS based SMLC supports positioning via signaling on the Lb interface to the BSC serving the target MS. Both types of SMLC may support the Lp interface to enable access to information and resources owned by another SMLC.

The SMLC controls a number of LMUs for the purpose of obtaining radio interface measurements to locate or help locate MS subscribers in the area that it serves. The SMLC is administered with the capabilities and types of measurement produced by each of its LMUs. Signaling between an NSS based SMLC and LMU is transferred via the MSC serving the LMU using the Ls interface and either the Um interface for a Type A LMU or the Abis interface for a Type B LMU. Signaling between a BSS based SMLC and LMU is transferred via the BSC that serves or controls the LMU using the Lb interface and either the Um interface for a Type A LMU or the Abis interface for a Type B LMU.

The SMLC and GMLC functionality may be combined in the same physical node, combined in existing physical nodes, or reside in different nodes.

For Location Services, when a Cell Broadcast Center (CBC) is associated with a BSC, the SMLC may interface to a CBC in order to broadcast assistance data using existing cell broadcast capabilities. The SMLC shall behave as a user, Cell Broadcast Entity, to the CBC (refer to GSM.03.41).

5.6.5   MS

The MS may be involved in the various positioning procedures. Specific MS involvement is specified in each of the positioning procedures section.

5.6.6   LMU

An LMU makes radio measurements to support one or more positioning methods. These measurements fall into one of two categories:

   a) Location measurements specific to one MS used to compute the location of this MS

   b) Assistance measurements specific to all MSs in a certain geographic area

All location and assistance measurements obtained by an LMU are supplied to a particular SMLC associated with the LMU. Instructions concerning the timing, the nature and any periodicity of these measurements are either provided by the SMLC or are pre-administered in the LMU.

Two types of LMU are defined:

   Type A LMU: accessed over the normal GSM air interface.

   Type B LMU: accessed over the Abis interface.

A type A LMU is accessed exclusively over the GSM air interface (Um interface): there is no wired connection to any other network element. A type A LMU has a serving BTS and BSC that provide signaling access to a controlling SMLC. With an NSS based SMLC, a type A LMU also has a serving MSC and VLR and a subscription profile in an HLR. A type A LMU always has a unique IMSI and supports all radio resource and mobility management functions of the GSM air interface that are necessary to support signaling using an SDCCH to the SMLC. A type A LMU supports those connection management functions necessary to support LCS signaling transactions with the SMLC and may support certain call control functions of to support signaling to an SMLC using a circuit switched data connection.

   NOTE: A network operator may assign specific ranges of IMSI for its LMUs and may assign certain digits within the IMSI to indicate the associated SMLC. Certain digits in the IMSI may also be used as a local identifier for an LMU within an SMLC.

To ensure that a Type A LMU and its associated SMLC can always access one another, an LMU may be homed (camped) on a particular cell site or group of cell sites belonging to one BSC or one MSC. For any Type A LMU with a subscription profile in an HLR (applies only with an NSS based SMLC), a special profile is used indicating no supplementary services, except possibly SMS-PP MT (for data download via the SIM application toolkit), and barring of all incoming and possibly outgoing calls. An identifier in the HLR profile also distinguishes an LMU from a normal MS. All other data specific to an LMU is administered in the LMU and in its associated SMLC.

A Type B LMU is accessed over the Abis interface from a BSC. The LMU may be either a standalone network element addressed using some pseudo-cell ID or connected to or integrated in a BTS. Signaling to a Type B LMU is by means of messages routed through the controlling BSC for a BSS based SMLC or messages routed through a controlling BSC and MSC for an NSS based SMLC.

The following assistance measurements obtained by an LMU have a generic status in being usable by more than one position method:

> Radio Interface Timing measurements – comprise Absolute Time Differences (ATDs) or Real Time Differences (RTDs) of the signals transmitted by Base Stations, where timing differences are measured relative to either some absolute time difference (ATD) or the signals of another Base Station (RTD).

5.6.7 MSC

The MSC contains functionality responsible for MS subscription authorization and managing call-related and non-call related positioning requests of GSM LCS. The MSC is accessible to the GMLC via the Lg interface and the SMLC via the Ls interface. If connected to SGSN through the Gs interface, it checks whether the mobile station is GPRS attached to decide whether to page the mobile station on the A or Gs interface.

5.6.8 HLR

The HLR contains LCS subscription data and routing information. The HLR is accessible from the GMLC via the Lh interface. For roaming MSs, HLR may be in a different PLMN that the current SMLC.

5.6.9 gsmSCF

The Lc interface supports CAMEL access to LCS and is applicable only in CAMEL phase 3. The procedures and signaling associated with it are defined in GSM 03.78 and GSM 09.02, respectively.

5.6.10 LMU and SMLC association

The LCS architecture is intended to support a high degree of flexibility, whereby any physical SMLC can support multiple Ls or Lb interfaces (e.g. allowing a BSS based SMLC to serve multiple BSCs) and whereby a mixture of different SMLC types can serve a single network or single MSC area. Figure 4 illustrates the case where different SMLC types and different LMU types are supported in a single MSC area.
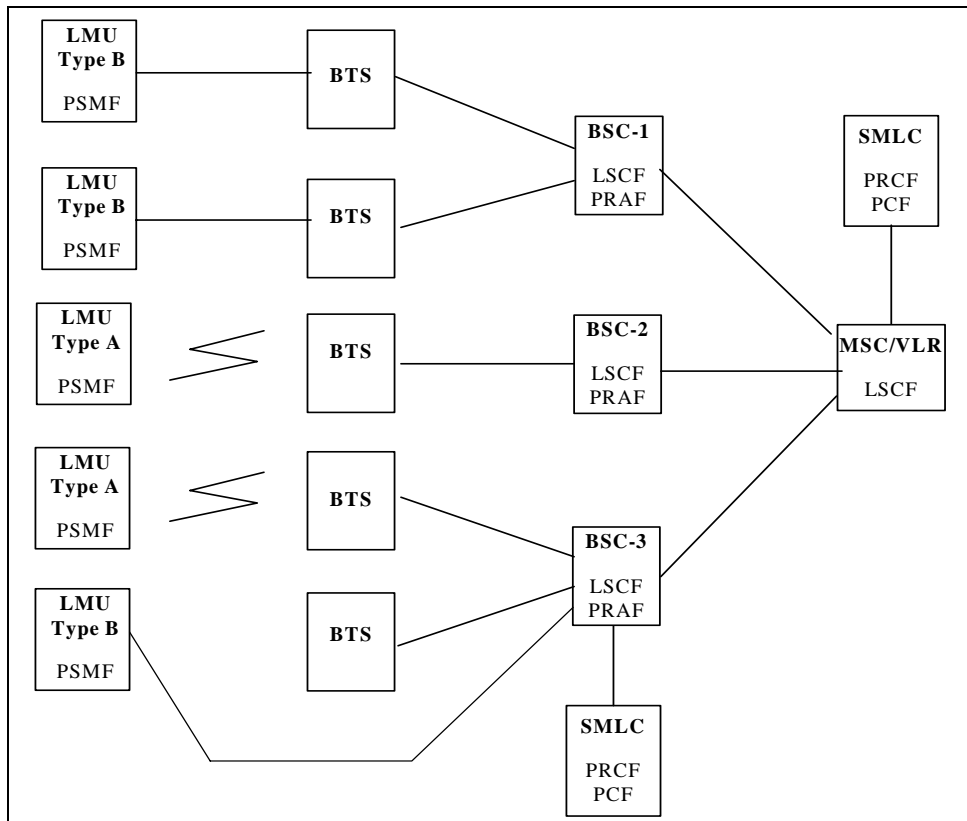
Figure 4: Mixed Network with BSS and NSS based SMLCs and Type A and B LMUs

5.6.11 SGSN

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

7.6.1   Mobile Terminating Location Request (MT-LR)

Figure 29 illustrates general network positioning for LCS clients external to the PLMN. In this scenario, it is assumed that the target MS is identified using either an MSISDN or IMSI.
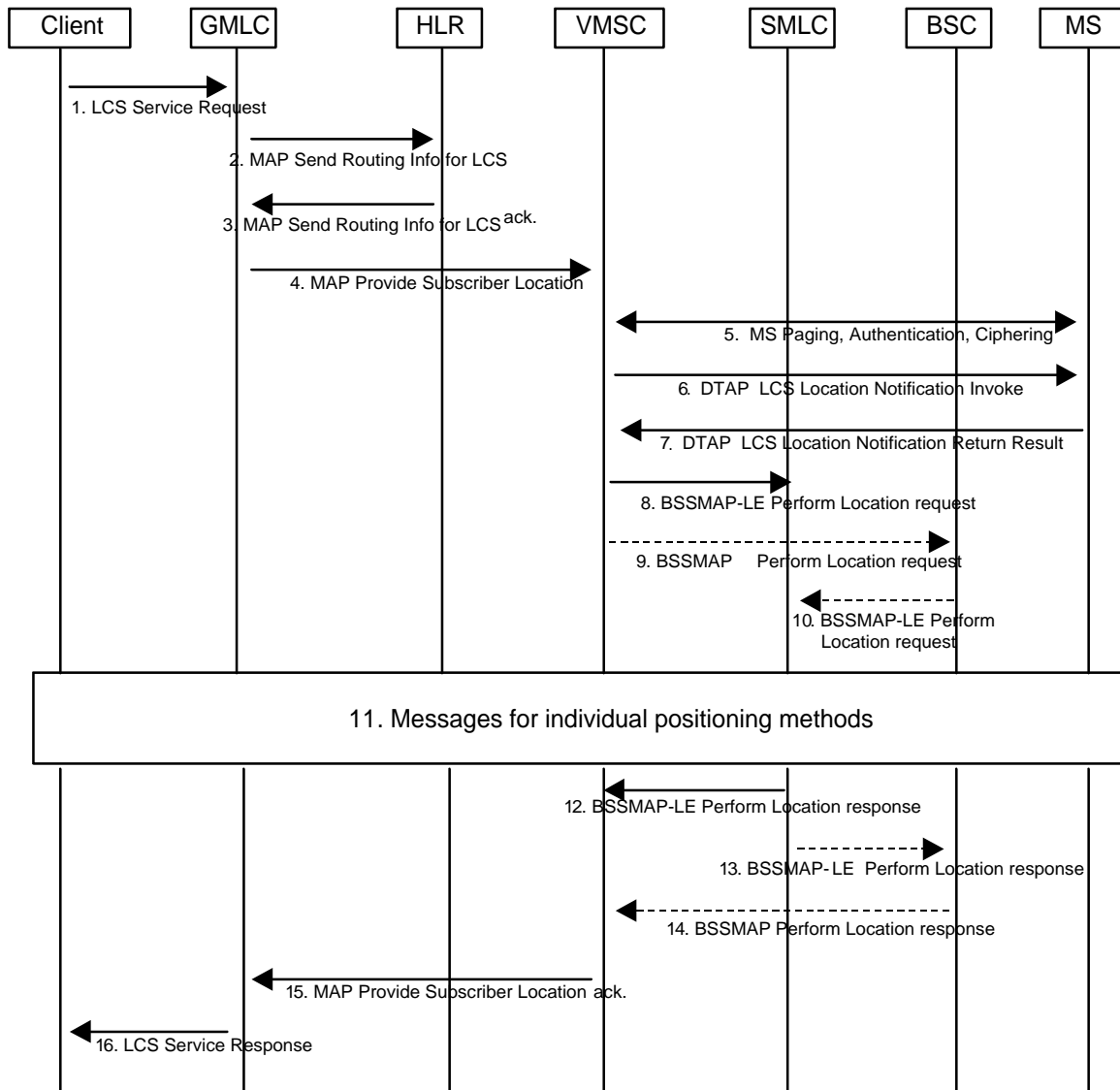
Figure 29: General Network Positioning for a MT-LR

7.6.1.1   Location Preparation Procedure

1) An external LCS client requests the current location of a target MS from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI of the target MS 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 GMLC obtains and authenticates the called party number of the LCS client (refer to Annex A for further details). If location is required for more than one MS, or if periodic location is requested, steps 2 to 12 below may be repeated.

2) If the GMLC already knows both the VMSC location and IMSI for the particular MSISDN (e.g. from a previous location request), this step and step 3 may be skipped. Otherwise, the GMLC sends a MAP_SEND_ROUTING_INFO_FOR_LCS message to the home HLR of the target MS to be located with either the IMSI or MSISDN of this MS.

3) The HLR verifies that the SCCP calling party address of the GMLC, corresponds to a known GSM network element that is authorized to request MS location information. The HLR then returns the current VMSC address and whichever of the IMSI and MSISDN was not provided in step 2 for the particular MS.

4) The GMLC sends a MAP_PROVIDE_SUBSCRIBER_LOCATION message to the VMSC indicated by the HLR. This message carries the type of location information requested (e.g. current location), the MS 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 if available and, for a call unrelated location request, the identity of the LCS client. In other cases, inclusion of the client name and/or identity is optional.

5) If the GMLC is located in another PLMN or another country, the VMSC first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. If the target MS 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 the SMLC to decide, on the basis of the applicable position methods and requested QoS, whether positioning is possible. The VMSC then verifies LCS barring restrictions in the MS user's subscription profile in the VLR. 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 MS 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 MS is in idle mode, the VLR performs paging, authentication and ciphering. The MSC will page a GPRS attached MS either through A or Gs interface, depending on the presence of the Gs interface (see Note). This procedure will provide the MS user's current cell ID and certain location information that includes the TA value in the BSSMAP Complete layer 3 Information used to convey the Paging Response. If the target MS supports any MS based or MS assisted positioning method(s), the MS will also provide the BSC and MSC with the positioning method(s) it supports via controlled early classmark sending (see GSM 04.08 and 08.08). If the MS is instead in dedicated mode, the VMSC will already have any early classmark information and will have been supplied with the current cell ID from either the serving BSC or serving MSC in the case of an established call with MSC-MSC handover.

   Note: In some network mode of operation, a GPRS capable MS may not receive the CS paging. In addition, upon receipt of a CS paging, a GPRS capable MS may immediately answer to the Paging Request or delay the answer, as defined in 3GPP TS 02.60 and 03.60. A GPRS MS in class B mode may also suspend its GPRS traffic, sending a GPRS Suspension Request to the network.

6) If the location request comes from a value added LCS client and the MS subscription profile indicates that the MS must either be notified or notified with privacy verification and the MS supports notification of LCS (according to the MS Classmark 2), a DTAP LCS Location Notification Invoke message is sent to the target MS indicating the type of location request (e.g. current location), the identity of the LCS client and whether privacy verification is required. For a call related location request, the LCS client identity shall be set to the LCS client's called party number if no separate LCS client identity was received from the GMLC. Optionally, the VMSC may after sending the DTAP LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 8 without waiting for a DTAP LCS Location Notification Return Result message in step 7.

7) The target MS notifies the MS user of the location request and, if privacy verification was requested, the target MS indicates to the MS 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 MS then returns a DTAP LCS Location Notification Return Result to the VMSC indicating, if privacy verification was requested, whether permission is granted or denied. Optionally, the DTAP LCS Location Notification Return Result message can be returned some time after step 6, but before step 15. If the MS user does not respond after a predetermined time period, the VMSC shall infer a "no response" condition. The VMSC shall return an error response to the GMLC if privacy verification was requested and either the MS user denies permission or there is no response with the MS subscription profile indicating barring of the location request in the absence of a response.

8) The VMSC sends a MAP_PERFORM_LOCATION message to the SMLC associated with the MS's current cell location. The BSSMAP-LE message includes the type of location information requested, the MS's location capabilities and currently assigned radio channel type (SDCCH, TCH-FR or TCH-HR), the requested QoS and the current Cell ID and, if available, any location information including the TA value received in step 5.

9) If the SMLC is BSS based, the VMSC instead sends the BSSMAP PERFORM LOCATION message to the serving BSC for the target MS.

10) In the case of a BSS based SMLC, the BSC forwards the BSSMAP-LE PERFORM LOCATION request received in step 9 to the SMLC. The BSC may add additional measurement data to the message to assist with positioning. The message is transported inside an SCCP connection request.

3GPP TSG-SA WG2 Meeting #17
Goteborg, Sweden, 26th Feb – 02nd Mar 2001

Tdoc S2-010775(LCS-16)
(S2-010517,
S2-010760(LCS-1),
S2-010771(LCS-12))

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.171 CR 016** | ⌘ rev **D** | ⌘ Current version: | **3.2.0** | ⌘ |

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

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

Title: ⌘	Stop reporting procedure for UMTS	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 2001-Feb-12
Category: ⌘	**F**	***Release:*** ⌘ R99

Use one of the following categories: ***F*** *(essential 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)*

Reason for change: ⌘	RANAP 25.413 v3.4.0 cleary states that LOCATION REPORTING CONTROL "Stop reporting" message needs to be sent from CN to UTRAN only when referred to a previous LOCATION REPORTING CONTROL "report at change of service area". RANAP 25.413 v3.4.0 does not specify any reason for cancellation in LOCATION REPORTING CONTROL when referred to a "Stop reporting".
Summary of change: ⌘	Make it clear in LCS stage 2 when the "stop reporting" procedure is referred to a "direct" or "upon at change of service area" report. Make it clear in LCS stage 2 that reason for cancellation in LOCATION REPORTING CONTROL has not to be provided for UTRAN.
Consequences if not approved: ⌘	LCS stage 2 and RANAP stage 3 specification will not be aligned about the stop reporting procedure.

Clauses affected: ⌘	8.10.1
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

8.10.1   Procedures in the VMSC

After the VMSC has requested a location service for a particular UE from the SRNC, certain events may occur that may temporarily or permanently interfere with the location service attempt. For each such event notified to the VMSC, the VMSC shall employ one of the following error recovery actions.

Restart the Location Service

This action shall be employed for any event that temporarily impedes a location service attempt and cannot be delayed until the location service attempt is complete. When such an event is notified to the 3G-VMSC, it shall immediately cancel the location service attempt and the associated RANAP dialogue with SRNC, if this still exists by sending a "stop reporting" message to the SRNC. The "stop reporting" message shall contain the ~~reason for the location procedure cancellation~~ indication about the type of location request to cancel (e.g. direct).

After aborting the location request dialogue with the SRNC, the 3G-VMSC may queue the location service request until the event causing the restart has terminated (if not already terminated). The 3G-VMSC may optionally wait for an additional time period (e.g. if the queuing delay is minimal) to ensure that any resources allocated in and by the SRNC have time to be released. The 3G-VMSC may then send another location service request to the SRNC associated with the target UE.

Abort the Location Service

This action shall be employed for any event that permanently impedes a location service attempt, such as loss of the dedicated signaling channel to the target MS. When such an event is notified to the 3G-VMSC, it shall cancel the current location service attempt and the associated RANAP dialogue with the SRNC, if still existing, by sending a "stop reporting" message to the SRNC. The "stop reporting" message shall contain the ~~reason for the location procedure cancellation~~ indication about the type of location request to cancel (e.g. direct). The 3G-VMSC shall then return an error response to the client or network entity from which the location request was originally received. The 3G-VMSC shall also release all resources specifically allocated for the location attempt.

The following table indicates the appropriate error recovery procedure for certain events. For events not listed in the table, the 3G-VMSC need take no action.

Table 8.1: LCS Error Recovery Procedures in the VMSC for certain Events

Event	VMSC Error Recovery
Release of radio channel to the UE	Abort
Any error response from the SRNC except for inter-SRNC or inter-MSC handover	Abort
Inter-SRNC Handover	Restart after handover completed
Inter-MSC Handover	Restart after handover completed

If the RNC is in an overload condition, it may reject a location request by indicating congestion. The MSC may reduce the frequency of future location service requests until rejection due to overload has ceased.

3GPP TSG-SA WG2 Meeting #17
Goteborg, Sweden, 26th Feb – 02nd Mar 2001

Tdoc S2-010776(LCS-17)
(S2-010518,
S2-010769(LCS-10),
S2-010772(LCS-13))

CR-Form-v3

CHANGE REQUEST

⌘	**23.271** CR **015**	⌘ rev **D** ⌘	Current version:	**4.0.0**	⌘

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

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

Title: ⌘	Stop reporting procedure for UMTS	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 2001-Feb-12
Category: ⌘	**A**	***Release:*** ⌘ REL-4

	Use <u>one</u> of the following categories: ***F*** *(essential 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: ⌘	RANAP 25.413 v3.4.0 cleary states that LOCATION REPORTING CONTROL "Stop reporting" message needs to be sent from CN to UTRAN only when referred to a previous LOCATION REPORTING CONTROL "report at change of service area". RANAP 25.413 v3.4.0 does not specify any reason for cancellation in LOCATION REPORTING CONTROL when referred to a "Stop reporting".
Summary of change: ⌘	Make it clear in LCS stage 2 when the "stop reporting" procedure is referred to a "direct" or "upon at change of service area" report. Make it clear in LCS stage 2 that reason for cancellation in LOCATION REPORTING CONTROL has not to be provided for UTRAN.
Consequences if not approved: ⌘	LCS stage 2 and RANAP stage 3 specification will not be aligned about the stop reporting procedure.

Clauses affected: ⌘	9.4.1
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

9.4.1 Procedures in the VMSC

After the VMSC has requested a location service for a particular UE from RAN, certain events may occur that may temporarily or permanently interfere with the location service attempt. For each such event notified to the VMSC, the VMSC shall employ one of the following error recovery actions.

Restart the Location Service

This action shall be employed for any event that temporarily impedes a location service attempt and cannot be delayed until the location service attempt is complete. When such an event is notified to the VMSC, it shall immediately cancel the location service attempt and the associated signaling dialogue with RAN, if this still exists by sending a "stop reporting" message to RAN. The "stop reporting" message shall contain the reason for the location procedure cancellation in case of GERAN in A/Gb mode or the indication about the type of location request to cancel (e.g. direct) in case of GERAN and UTRAN in Iu mode.

After aborting the location request dialogue with RAN, the VMSC may queue the location service request until the event causing the restart has terminated (if not already terminated). The VMSC may optionally wait for an additional time period (e.g. if the queuing delay is minimal) to ensure that any resources allocated in and by RAN have time to be released. The VMSC may then send another location service request to RAN associated with the target MS.

Abort the Location Service

This action shall be employed for any event that permanently impedes a location service attempt, such as loss of the dedicated signaling channel to the target MS. When such an event is notified to the VMSC, it shall cancel the current location service attempt and the associated signaling dialogue with RAN, if still existing, by sending a "stop reporting" message to RAN. The "stop reporting" message shall contain the reason for the location procedure cancellation in case of GERAN in A/Gb mode or the indication about the type of location request to cancel (e.g. direct) in case of GERAN and UTRAN in Iu mode. The VMSC shall then return an error response to the client or network entity from which the location request was originally received. The VMSC shall also release all resources specifically allocated for the location attempt.

The following table indicates the appropriate error recovery procedure for certain events. For events not listed in the table, the VMSC need take no action.

Table 9.1: LCS Error Recovery Procedures in the VMSC for certain Events

Event	VMSC Error Recovery
Release of radio channel to the MS	Abort
Any error response from RAN except for SRNC relocation or inter-MSC handover	Abort
In UMTS SRNC relocation	[Note: This is being discussed in in RAN WG2 and RAN WG3.]
In GSM inter-MSC Handover and inter-BSC handover	Restart after handover completed

If the RNC is in an overload condition, it may reject a location request by indicating congestion. The MSC may reduce the frequency of future location service requests until rejection due to overload has ceased.

3GPP TSG-SA2 Meeting #17
Gotheborg, Sweden, 26 February – 02 March, 2001

Tdoc S2-010779(LCS-20)
(S2-010522,
S2-010762(LCS-3),
S2-010766(LCS-7))

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** CR **A015** | ⌘ rev **D** | ⌘ | Current version: | **7.4.0** | ⌘ |

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

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

Title: ⌘	Privacy Check procedures for Call Related MT-LR	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 2001-Feb-15
Category: ⌘	**F**	***Release:*** ⌘ R98

Use <u>one</u> of the following categories:
   F *(essential 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 privacy checks for a Call related MT-LR cannot be performed in cases of IN rerouting (i.e. LCS client reached via IN).
Summary of change: ⌘	The call related MT-LR privacy check is always performed upon the number dialed by the MS and the called party number (call-related identity) sent by the GMLC can also be an E.164 number not in "international" format. It is up to the GMLC to use the valid national specific number in case of toll free number or abbreviated number routing when positioning an MS in the visited country.
Consequences if not approved: ⌘	The call related MT-LR privacy checks would always fail in case the LCS client is reached via IN rerouting.

Clauses affected: ⌘	7.12.3, 12.3
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

7.12.3   MS Privacy Options

The MS privacy options in the SLPP apply to an MT-LR or NI-LR and either indicate that no MT-LR or NI-LR is allowed for the MS (except as may be overridden by the POI or local regulatory requirements) or define the particular classes of LCS client for which an MT-LR or NI-LR for location are allowed, with the following classes being possible:

a)   Universal Class – allow positioning by all LCS clients

b)   Call related Class – comprises any LCS client to which the MS originated a call that is currently established. For all clients in the call related class, one of the following subscription options shall apply:

   -   positioning allowed without notifying the MS user (default case);

   -   positioning allowed with notification to the MS user;

   -   positioning requires notification and verification by the MS user; positioning is allowed only if granted by the MS user or if there is no response to the notification;

   -   positioning requires notification and verification by the MS user; positioning is allowed only if granted by the MS user;

c)   Non-Call related Class – allow positioning by specific identified LCS Clients or groups of LCS Client with the following restrictions allowed for each identified LCS Client or group of LCS Clients

   -   Location request allowed only from GMLCs identified in the SLPP

   -   Location request allowed only from a GMLC in the home country

   -   Location request allowed from any GMLC

   For each identified value added LCS client in the privacy exception list one of the following subscription options shall apply:

   -   positioning allowed without notifying the MS user (default case);

   -   positioning allowed with notification to the MS user;

   -   positioning requires notification and verification by the MS user; positioning is allowed only if granted by the MS user or if there is no response to the notification;

   -   positioning requires notification and verification by the MS user; positioning is allowed only if granted by the MS user;

   For all value added LCS clients sending a non-call related MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

   -   positioning not allowed (default case);

   -   positioning allowed with notification to the MS user;

   -   positioning requires notification and verification by the MS user; positioning is allowed only if granted by the MS user or if there is no response to the notification;

   -   positioning requires notification and verification by the MS user; positioning is allowed only if granted by the MS user;

d)   PLMN operator Class – 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 MS is currently being served by the HPLMN)

   -   O&M client in the VPLMN

   -   Clients recording anonymous location information without any MS identifier

- Clients enhancing or supporting any supplementary service, IN service, bearer service or teleservice subscribed to by the target MS subscriber

If the MS subscribes to the universal class, any MT-LR or NI-LR shall be allowed by the VMSC. If local regulatory requirements mandate it, any MT-LR for an emergency services LCS client and any NI-LR for an emergency services call origination shall be allowed by the VMSC.

If the MS subscribes to the call-related class, an MT-LR may be allowed if the MS previously originated a call that is still established and the called party number either dialed by the MS or used by the VMSC for routing matches the called party number received from the GMLC. If the called party number conditions are satisfied, the MT-LR shall be allowed if the MS user subscribes to either location without notification or location with notification. If the MS user subscribes to location with notification and privacy verification, the MT-LR shall be allowed following notification to the MS if the MS user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the MT-LR shall be restricted.

If the MS subscribes to the non-call related class, an MT-LR may be allowed by the network if the identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met. If the LCS client is correctly matched in this way and any GMLC restrictions are satisfied, the MT-LR shall be allowed if the MS user subscribes to either location without notification or location with notification. If the MS user subscribes to location with notification and privacy verification, the MT-LR shall be allowed following notification to the MS if the MS user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the MT-LR shall be restricted.

If the MS subscribes to the non-call related class, an MT-LR from an LCS client that is not contained in the MS's SLPP shall allowed or restricted according to the following conditions. For any non-matched LCS client, the MT-LR shall be allowed if the MS user subscribes to location with notification. If the MS user subscribes to location with notification and privacy verification, the MT-LR shall be allowed following notification to the MS if the MS user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the MT-LR shall be restricted.

If the MS subscribes to the PLMN class, an NI-LR or MT-LR shall be allowed if the client within the VPLMN, for an NI-LR, or the client identified by the GMLC, for an MT-LR, either matches a generic type of client contained in the MS's SLPP or is otherwise authorized by local regulatory requirements to locate the MS.

In evaluating privacy where any address "A" associated with the LCS client (e.g. LCS client ID or GMLC address) needs to be compared with a corresponding address "B" in the target MS's SLPP, a match shall be determined if a match is found for each of the following components of each address:

   a) Numbering Plan

   b) Nature of Address Indicator

   c) Corresponding address digits for all digits in "B" (the digits or initial digits in "A" must match all the digits in "B", but "A" may contain additional digits beyond those in "B")

All addresses shall be transferred to the MSC/VLR in international format., except for the called party number received from the GMLC during a Call Related MT-LR when the LCS client was reached via IN or abbreviated number routing (e.g. toll free number or emergency call routing). In these cases it is up to the GMLC to use the valid national specific number of the visited country.

*** NEXT MODIFIED SECTION ***

12.3   GMLC

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

Table10: 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	M	A list of one or more identifiers used to identify an external LCS client when making an MT-LR – the nature and content of the identifier(s) is outside the scope of this specification
Authentication data	M	Data employed to authenticate the identity of an LCS client – details are outside the scope of this specification
Call related identity	O	A list of one or more international E.164 addresses 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 MS 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
Non-call related identity	O	A list of one ore more international E.164 addresses to identify the client for a non-call related MT-LR. Each non-call related identity may be associated with a specific external identity
Override capability	O	Indication of whether the LCS client possesses the override capability (not applicable to a value added client)
Authorized MS 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 Separate default QoS parameters may be maintained for each distinct LCS client identity (external, non-call related, call related)
Allowed LCS Request Types	M	Indicates which of the following are allowed: - Non-call related MT-LR - Call related MT-LR - Specification or negotiation of priority - Specification or negotiation of QoS parameters - Request of current location - Request of current or last known location
Local Coordinate System	O	Definition of the coordinate system(s) in which a location estimate shall be provided – details are outside the scope of this specification
Access Barring List(s)	O	List(s) of MSISDNs or groups of MSISDN for which a location request is barred

3GPP TSG-SA2 Meeting #17
Gotheborg, Sweden, 26 February – 02 March, 2001

Tdoc S2-010780(LCS-21)
(S2-010523,
S2-010763(LCS-4),
S2-010767(LCS-8))

CR-Form-v3

CHANGE REQUEST

⌘ **23.171 CR 017** ⌘ rev **D** ⌘ Current version: **3.2.0** ⌘

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

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

Title: ⌘	Privacy Check procedures for call related MT-LR	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	**Date:** ⌘ 2001-Feb-15
Category: ⌘	**A**	**Release:** ⌘ R99

	Use one of the following categories:		*Use one of the following releases:*
	***F** (essential correction)*		*2 (GSM Phase 2)*
	***A** (corresponds to a correction in an earlier release)*		*R96 (Release 1996)*
	***B** (Addition of feature),*		*R97 (Release 1997)*
	***C** (Functional modification of feature)*		*R98 (Release 1998)*
	***D** (Editorial modification)*		*R99 (Release 1999)*
	Detailed explanations of the above categories can		*REL-4 (Release 4)*
	be found in 3GPP TR 21.900.		*REL-5 (Release 5)*

Reason for change: ⌘	The privacy checks for a Call related MT-LR cannot be performed in cases of IN rerouting (i.e. LCS client reached via IN).
Summary of change: ⌘	The call related MT-LR privacy check is always performed upon the number dialed by the UE and the called party number (call-related identity) sent by the GMLC can also be an E.164 number not in "international" format. It is up to the GMLC to use the valid national specific number in case of toll free number or abbreviated number routing when positioning an UE in the visited country.
Consequences if not approved: ⌘	The call related MT-LR privacy checks would always fail in case the LCS client is reached via IN rerouting.

Clauses affected: ⌘	8.11.3, 9.3
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

8.11.3   UE Privacy Options

The UE privacy options in the SLPP apply to an MT-LR or NI-LR and either indicate that no MT-LR or NI-LR is allowed for the UE (except as may be overridden by the POI or local regulatory requirements) or define the particular classes of LCS client for which an MT-LR or NI-LR for location are allowed, with the following classes being possible:

a) Universal Class – allow positioning by all LCS clients

b) Call related Class – comprises any LCS client to which the UE originated a call that is currently established. For all clients in the call related class, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

c) Non-Call related Class – allow positioning by specific identified LCS Clients or groups of LCS Client with the following restrictions allowed for each identified LCS Client or group of LCS Clients

- Location request allowed only from GMLCs identified in the SLPP

- Location request allowed only from a GMLC in the home country

- Location request allowed from any GMLC (default case)

For each identified value added LCS client in the privacy exception list, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a non-call related MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

d) PLMN operator Class – 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 universal class, any MT-LR or NI-LR shall be allowed by the VMSC. If local regulatory requirements mandate it, any MT-LR for an emergency services LCS client and any NI-LR for an emergency services call origination shall be allowed by the VMSC.

If the UE subscribes to the call-related class, an MT-LR may be allowed if the UE previously originated a call that is still established and the called party number either dialled by the UE or used by the VMSC for routing matches the called party number received from the GMLC. If the called party number conditions are satisfied, the MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the MT-LR shall be restricted.

If the UE subscribes to the non-call related class, an MT-LR may be allowed by the network if the identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met.

If the LCS client is correctly matched in this way and any GMLC restrictions are satisfied, the MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the MT-LR shall be restricted.

If the UE subscribes to the non-call related class, an MT-LR from an LCS client that is not contained in the UE's SLPP shall allowed or restricted according to the following conditions. For any non-matched LCS client, the MT-LR shall be allowed if the UE user subscribes to location with notification. If the UE user subscribes to location with notification and privacy verification, the MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the MT-LR shall be restricted.

If the UE subscribes to the PLMN class, an NI-LR or MT-LR shall be allowed if the client within the VPLMN, for an NI-LR, or the client identified by the GMLC, for an 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.

In evaluating privacy where any address "A" associated with the LCS client (e.g. LCS client ID or GMLC address) needs to be compared with a corresponding address "B" in the target UE's SLPP, a match shall be determined if a match is found for each of the following components of each address:

a) Numbering Plan

b) Nature of Address Indicator

c) Corresponding address digits for all digits in "B" (the digits or initial digits in "A" must match all the digits in "B", but "A" may contain additional digits beyond those in "B")

All addresses shall be transferred to the MSC/VLR in international format, except for the called party number received from the GMLC during a Call Related MT-LR when the LCS client was reached via IN or abbreviated number routing (e.g. toll free number or emergency call routing). In these cases it is up to the GMLC to use the valid national specific number of the visited country.

*** NEXT MODIFIED SECTION ***

9.3　GMLC

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

Table 9.6: 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	M	A list of one or more identifiers used to identify an external LCS client when making an MT-LR – the nature and content of the identifier(s) is outside the scope of the present document
Authentication data	M	Data employed to authenticate the identity of an LCS client – details are outside the scope of the present document
Call related identity	O	A list of one or more international E.164 addresses 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
Non-call related identity	O	A list of one ore more international E.164 addresses to identify the client for a non-call related MT-LR. Each non-call related identity may be associated with a specific external identity
Override capability	O	Indication of whether the LCS client possesses the override capability (not applicable to a value added client)
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 Separate default QoS parameters may be maintained for each distinct LCS client identity (external, non-call related, call related)
Allowed LCS Request Types	M	Indicates which of the following are allowed: • Non-call related MT-LR • Call related MT-LR • Specification or negotiation of priority • Specification or negotiation of QoS parameters • 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

3GPP TSG-SA2 Meeting #17
Gotheborg, Sweden, 26 February – 02 March, 2001

Tdoc S2-010781(LCS-22)
(S2-010524,
S2-010764(LCS-5),
S2-010768(LCS-9))

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.271** CR **016** | ⌘ rev **D** | ⌘ Current version: | **4.0.0** | ⌘ |

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

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

Title: ⌘	Privacy Check procedures for CS Call Related MT-LR	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 2001-Feb-15
Category: ⌘	**A**	***Release:*** ⌘ REL-4

Use one of the following categories: **F** *(essential 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)*

Reason for change: ⌘	The privacy checks for a call related CS-MT-LR cannot be performed in cases of IN rerouting (i.e. LCS client reached via IN).
Summary of change: ⌘	The call related CS-MT-LR privacy check is always performed upon the number dialed by the UE and the called party number (call-related identity) sent by the GMLC can also be an E.164 number not in "international" format. It is up to the GMLC to use the valid national specific number in case of toll free number or abbreviated number routing when positioning an UE in the visited country.
Consequences if not approved: ⌘	The call related CS-MT-LR privacy checks would always fail in case the LCS client is reached via IN rerouting.

Clauses affected: ⌘	9.5.3, 10.3

Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

9.5.3 MS Privacy Options

The UE privacy options in the SLPP apply to an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR and either indicate that no CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR is allowed for the UE (except as may be overridden by the POI or local regulatory requirements) or define the particular classes of LCS client for which an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR for location are allowed, with the following classes being possible:

a) Universal Class – allow positioning by all LCS clients

b) Call/Session related Class – allow positioning by specific identified LCS client or groups of LCS Client to which the UE originated a call in CS domain or an LCS client with which the UE has a session via an active PDP context in PS domain indicated by a specific APN. For all clients in the call related class, OR For each identified LCS client or group of LCS Clients, one of the following subscription options shall apply:

- Location request allowed only from GMLCs identified in the SLPP

- Location request allowed only from a GMLC in the home country

- Location request allowed from any GMLC (default case)

For each identified value added LCS client or group of LCS Clients in the privacy exception list, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

c) Call/Session-unrelated Class – allow positioning by specific identified LCS Clients or groups of LCS Client with the following restrictions allowed for each identified LCS Client or group of LCS Clients

- Location request allowed only from GMLCs identified in the SLPP

- Location request allowed only from a GMLC in the home country

- Location request allowed from any GMLC (default case)

For each identified value added LCS client in the privacy exception list, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a non-call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

d) PLMN operator Class – 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

All UE privacy options of above four classes are commonly used for both CS and PS domain.

Note: If a privacy option setting in a domain is updated, same modification will be applied to the other domain.

If the UE subscribes to the universal class, any CS-MT-LR or NI-LR shall be allowed by the VMSC/MSC Server and any PS-MT-LR or PS-NI-LR shall be allowed by the SGSN. If local regulatory requirements mandate it, any MT-LR for an emergency services LCS client and any NI-LR for an emergency services call origination shall be allowed by the VMSC/MSC Server.

If the UE subscribes to the call/session-related class, an CS-MT-LR may be allowed if both of following conditions are met:

- The UE previously originated a call in CS domain that is still established and the called party number ~~either~~ dialled by the UE ~~or used by the VMSC/MSC Server for routing~~ matches the called party number received from the GMLC.

- The identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's/UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met

If these conditions are satisfied, the CS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the CS-MT-LR shall be restricted.

If the UE subscribes to the call/session-related class, a PS-MT-LR may be allowed if both of the following conditions are met:

- The UE previously originated a PDP-context towards the network where the external client is located and that this context is still established

- The APN negotiated between the UE and SGSN matches the APN received from the GMLC.

If these conditions are satisfied, the PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that

location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the PS-MT-LR shall be restricted.

If the UE subscribes to the call/session related class, a CS-MT-LR or PS-MT-LR from an LCS client that is NOT contained in the SLPP of the target UE shall be allowed or restricted according to the following conditions:

- For any non-matched LCS client, the CS-MT-LR or PS-MT-LR shall be allowed, if the UE user subscribes to either location without notification or location with notification.

- If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR or PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR or PS-MT-LR shall be restricted.

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR may be allowed by the MSC/MSC server or SGSN if the identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met.

If the LCS client is correctly matched in this way and any GMLC restrictions are satisfied, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR from an LCS client that is not contained in the MS's SLPP shall be allowed or restricted according to the following conditions. For any non-matched LCS client, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

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 MS's SLPP or is otherwise authorized by local regulatory requirements to locate the MS.

In evaluating privacy where any address "A" associated with the LCS client (e.g. LCS client ID, APN or GMLC address) needs to be compared with a corresponding address "B" in the target MS's SLPP, a match shall be determined if a match is found for each of the following components of each address:

a) Numbering Plan

b) Nature of Address Indicator

c) Corresponding address digits for all digits in "B" (the digits or initial digits in "A" must match all the digits in "B", but "A" may contain additional digits beyond those in "B")

All addresses shall be transferred to the MSC/VLR, MSC server or SGSN in international format, except for the called party number received from the GMLC during a Call-Related CS MT-LR when the LCS client was reached via IN or abbreviated number routing (e.g. toll-free number or emergency call routing). In these cases it is up to the GMLC to use the valid national specific number of the visited country.

*** NEXT MODIFIED SECTION ***

10.3 GMLC

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.

Table10.6: 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	M	A list of one or more identifiers used to identify an external LCS client when making an MT-LR – the nature and content of the identifier(s) is outside the scope of the present document
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 or APNs (see NOTE 1) 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 session-related identity shall be associated with a logical client name.
Call/session-unrelated identity	O	A list of one ore more international E.164 addresses or APNs to identify the client for a non-call related CS-MT-LR/PS-MT-LR. NOTE: A list of IP addresses or other appropriate PS specific identities may be added here. Each non-call related identity may be associated with a specific external identity. Each session-related identity shall be associated with a logical client name.
Client name	O	An address string which is a logical name associated with LCS client's E.164 address.
Override capability	O	Indication of whether the LCS client possesses the override capability (not applicable to a value added client)
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 Separate default QoS parameters may be maintained for each distinct LCS client identity (external, non-call related, call related)
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 • 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

NOTE 1: The LCS Client is identified with E.164 number or APN. APN is specified in TS 23.003 [18].
          The APN identity of the LCS Client should be further defined, e.g. if it is global or GMLC related.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.271** | CR | **011** | ⌘ | rev | **4** | ⌘ | Current version: | **4.0.0** | ⌘ |

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

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

Title:	⌘	Interwoking with pre-Rel'4 LCS
Source:	⌘	Fujitsu Limited
Work item code: ⌘	LCS1	**Date:** ⌘ 1/03/2001
Category:	⌘ **F**	**Release:** ⌘ REL-4

Use <u>one</u> of the following categories:
F (essential 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 scenario for interworking with a node, which supports only pre-Rel'4 LCS features, was introduced into 23.271 since in Rel'4 LCS call-related class was extended to have an External LCS client list. However SA1 also agreed to extend the maximum number of LCS clients registered in the External LCS client lists of both call-related and call-unrelated class. (Currently the maximum number of LCS clients registered in the list is 5) Therefore the interworking scenario between pre-Rel'4 LCS node and Rel'4 LCS node is required for call-unrelated class service as well as call-related class service. Current interworking scenario for call-related class specified in section 10.5.1 can be applied to call-unrelated class.

Expecting the future extension using the same mechanism, the concept of LCS capability set should be introduced and defined as follows.
- LCS core network signalling capability set 1: R98 and R99 LCS
- LCS core network signalling capability set 2: Rel'4 or later LCS

<u>Besides as commented in the SA2#16 meeting, existing description for interworking scenario in 23.271 refers to only VLR, therefore this should be generalised to cover both CS and PS domains.</u>

Summary of change: ⌘	Besides the concept of LCS capability sets was introduced and LCS core network signalling capability set 1 and capability set 2 were defined.
Consequences if not approved: ⌘	

Clauses affected: ⌘	10.5

Other specs affected:	⌘	☐	Other core specifications	⌘	
		☐	Test specifications		
		☐	O&M Specifications		

Other comments: ⌘	<u>Revision 2 of this CR has been already approved in the last SA2 meeting in Los</u>

Angeles and the corresponding Stage3 CR was submitted to CN4. As a result of the discussion on the Stage3 CR, consensus of the meeting was that following should be clearly specified in the agreed Stage2 CR.

- The serving node, which notified the HLR that it supports LCS capability set 2, shall be able to handle the extended LCS Client list (i.e. more than 5 LCS Clients) from the HLR.

This CR also clarifies following for consistency.

- The serving node, which notified the HLR that it supports LCS capability set 2, shall be able to handle the LCS Client list for Call-Related Class from the HLR.

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at:
http://www.3gpp.org/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

10.5   Interworking with pre-Rel'4 LCS

This section describes possible scenarios for interworking with a node which support only pre-Rel'4 LCS features and functions.

10.5.1   Interworking with the VLR supporting only pre-Rel'4 LCS

The VLR that supports only pre-Rel'4 LCS cannot handle the extended privacy control for call-related/call-unrelated class of the Rel'4 LCS. That is, the VLR cannot provide the extended call-related/call-unrelated class service to the user who subscribes to the Rel'4 LCS. Therefore HLR/HSS does not send the subscriber data on call-related/call-unrelated class for users who subscribe to the call-related/call-unrelated class of Rel'4 LCS to the VLR that supports only pre-Rel'4 LCS. The HLR/HSS is notified whether the VLR supports Rel'4 LCS or not by an indication (e.g. Supported LCS phases indicator), which indicates the highest LCS core network signalling capability the VLRsupports, from the VLR during location update procedure. Following two LCS core network signalling capabilities are identified in current version of this specification.

-     LCS core network signalling capability set 1:R98 and R99 LCS (pre-Rel'4 LCS)
-     LCS core network signalling capability set 2:Rel'4 or later LCS

   The serving node, which notified the HLR/HSS that it supports LCS core network signalling capability set 2, shall be able to handle the extended LCS Client list and LCS Client List for call-related class from the HLR.

[Note1: this interworking scenario can be also applied for PS domain. Generalization of the description in this sub clause to cover both CS and PS domain should be done.]

[Note2: the concept of LCS capability set is newly introduced in Rel4 so that it doesn't appear in the specifications for R98 and R99 LCS]

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.271** CR | **019** | ⌘ rev | **1** | ⌘ Current version: | **4.0.0** | ⌘ |

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

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

Title:	⌘	Changing MS to UE
Source:	⌘	Nokia
Work item code: ⌘	LCS	***Date:*** ⌘ 20th February 2001
Category: ⌘	D	***Release:*** ⌘ Release 4

Use one of the following categories:
F *(essential 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)*

Reason for change:	⌘	MS should be UE , References corrected
Summary of change:	⌘	
Consequences if not approved:	⌘	

Clauses affected:	⌘	
Other specs Affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

3G TS 23.271 V 2.0.0 (2000-12)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
Functional stage 2 description of LCS
(Release 4)

Keywords

3GPP

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

http://www.3gpp.org

Contents

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

1. Scope

The present document specifies the stage 2 of the LoCation Services (LCS) feature in UMTS and GSM, which provides the mechanisms to support mobile location services for operators, subscribers and third party service providers.

This specification TS 23.271 replaces the specifications TS 23.171 (Release 99) and GSM 03.71 in Release 4.

Location Services may be considered as a network provided enabling technology consisting of standardised service capabilities, which enable the provision of location applications. The application(s) may be service provider specific. The description of the numerous and varied possible location applications which are enabled by this technology are outside the scope of the present document. However, clarifying examples of how the functionality being described may be used to provide specific location services may be included.

This stage 2 service description covers the LCS system functional model for the whole system, the LCS system architecture, state descriptions, message flows, etc.

2. References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

2.1 Normative references

[1]   3G TR 25.305: "Functional stage 2 specification of location services in UTRAN".

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

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

[4]   TS 22.071: "Location Services (LCS); Service description, Stage 1".

[5]   GSM 03.71: "Location Services (LCS); (Functional description) - Stage 2".

[6]   GSM 08.08: "Mobile-services Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification"

[7]   3G TS 22.100: "UMTS phase 1 Release 99".

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

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

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

[11]   TS 23.032 (&GSM03.32): "Universal Geographical Area Description (GAD)"

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

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

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

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

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

[17] [More references to GSM specifications should be added.]

[18] 3G TS 23.003: "Numbering, addressing and identification"

[19] 3G TS 23.060: "General Packet Radio Service (GPRS);Service description Stage 2"

[20] 3G TS 29.002: "Mobile Application Part (MAP) specification"

2.2 Informative references

[21] Third generation (3G) mobile communication system; Technical study report on the location services and technologies, ARIB ST9 December 1998.

[22] The North American Interest Group of the GSM MoU ASSOCIATION: Location Based Services, Service Requirements Document of the Services Working Group.

3. Definitions and abbreviations

3.1 Definitions

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

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

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

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

Global Positioning System: the 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: a 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: the 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: a 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: an optional list of MSISDNs per LCS Client where the LCS Client is not allowed to locate any MSISDN therein

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

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

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

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

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

PLMN Access barring list: an 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): a principle and/or algorithm which the estimation of geographical location is based on, e.g. AOA, TOA, TDOA. For example, GPS is based on TOA, whilst OTDOA and E-OTD (on GSM) are based on TDOA

Positioning technology (/locating technology): a technology or system concept including the specifications of RF interfaces, data types, etc. to process the estimation of a geographical location, e.g. GPS, E-OTD (GSM), and OTDOA (WCDMA)

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

Prohibited area: an 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)

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

Target UE: the UE being positioned

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

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

3.2 Symbols

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

Lc	Interface between gateway MLC and gsmSCF (CAMEL interface)
Le	Interface between External User and MLC (external interface)
Lh	Interface between Gateway MLC and HLR (HLR interface)
Lg	Interface between Gateway MLC - VMSC, GMLC - MSC Server, GMLC - SGSN (gateway MLC interface)
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
MSC	Mobile Services switching Center
SGSN	Serving GPRS Support Node
AC	Admission Control
AI	Application Interface (prefix to interface class method)
ANM	Answer Message (ISUP)
APN	Access Point Name
ARIB	Association of Radio Industries and Business
ATD	Absolute Time Difference
BCCH	Broadcast Control Channel
BER	Bit Error Rate
BTS	Base Transceiver 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
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
LCF	Location Client Function
LCS	LoCation Services
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 Execution Environment
MLC	Mobile Location Center
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
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
SGSN	Serving GPRS Support Node
SI	Service Interface (prefix to interface class method)
SIM	Subscriber Identity Module
SLPP	Subscriber LCS Privacy Profile
SMS	Short Message Service
SIR	Signal Interference Ratio
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 UMTS TS 21.905 [3].

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).

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 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] 2.1 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.

4.1 Assumptions

As a basis for the further development work on LCS in GSM and UMTS the following assumptions apply:

- Positioning methods are Access Network specific, although commonalties should be encouraged between Access Networks.

- Commercial location services are only applicable for an UE with a valid SIM or USIM.

- The provision of the location services in the Access Network is optional through support of the specified method(s).

- The provision of location services is optional in MSC and SGSN.

- LCS is applicable to any target UE whether or not the UE supports LCS, but with restrictions on choice of positioning method or notification of a location request to the UE user when LCS or individual positioning methods, respectively, are not supported by the ~~MS~~UE.

- LCS shall be applicable for both circuit switched and packet switched services.

- The location information may be used for internal system operations to improve system performance.

- It shall be possible to accommodate future techniques of measurement and processing to take advantage of advancing technology so as to meet new service requirements.

- It may be necessary to support LCS signaling between separate access networks via the core network. The Iur interface should be used if available.

4.2 Location Services Categories

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

- The **Commercial LCS** (or **Value Added Services**) will typically be associated with an application that provides a value-added service through knowledge of the UE location to the subscriber of the service. This may be, for example, a directory of restaurants in the local area of the UE, together with directions for reaching them from the current UE location.

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

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

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

4.3 Positioning methods

The LCS feature utilises one or more positioning methods in order to determine the location of user equipment (UE). Determining the position of a UE involves two main steps:

- Radio signal measurements; and

- Position estimate computation based on the measurements.

The positioning methods for UTRAN are further described in TS 25.305 2.12.1[1].

4.3.1 Standard LCS Methods in UTRAN

The specification 25.305 UTRAN Stage 2 specifies the locating methods to be supported:

- Cell coverage based positioning method.

- OTDOA positioning method;

- GPS based positioning methods

For more details on these positioning methods, refer to TS 25.305 [1].

4.3.2 Standard LCS Methods in GERAN

The specification TS 43.059 GERAN LCS Stage 2 [16] specificies the locating methods to be supported in GERAN:

- Cell coverage based positioning method.

- Enhanced Observed Time Difference (E-OTD) positioning method;

- GPS based positioning methods

5. General LCS architecture

5.1 LCS access interfaces and reference points

There is one reference point between the LCS server and LCS client called Le, see Figure 5.1. Le is described in TS 22.071 [4], however the protocol specifics are for further study. 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 exchanges and needs to be fully recognized.

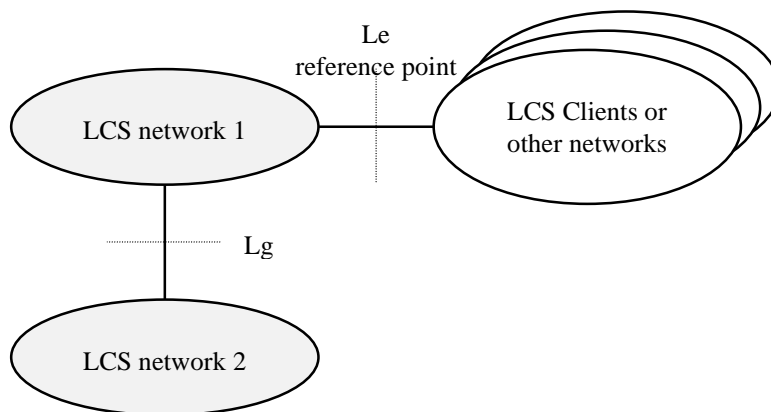There is an interface called Lg that connects two independent LCS networks (different PLMNs) for message exchange.

Figure 5.1: LCS Access Interfaces and Reference Points

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.
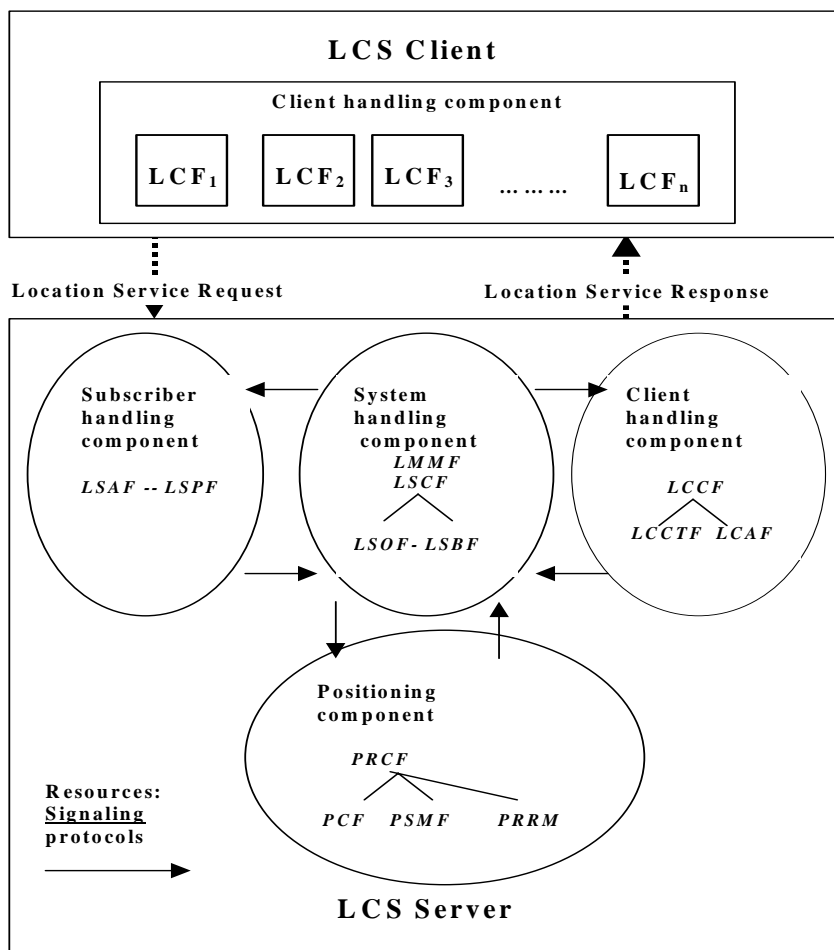

Figure 5.2: LCS capability server Functional Diagram

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 subclause.

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

5.3 LCS Client functional group

An LCS client contains an LCS component with one or more client(s), which by using location information can provide location, based services.

An LCS client is a logical functional entity that requests from the LCS server in the PLMN location information for one or more than one target UE within a specified set of parameters such as Quality of Service (QoS). The LCS Client may reside in an entity (including the UE) within the PLMN or in an entity external to the PLMN.

The specification of the LCS Client's internal logic and its relation to the external use is outside the scope of the present document.

5.3.1 External Location Client Function (LCF)

The Location Client Function (LCF) provides a logical interface between the LCS client and the LCS server.

This function is responsible for requesting location information for one or more ~~MEs/MSs~~UE, with a specified "QoS" and receiving a response, which contains either location information or a failure indicator.

[Editor's note: this is only possible if the location request originates in the core network]

5.4 LCS Server functional group

The LCS server functional group consists of the functions that are needed for GSM and UMTS to support Location Services.

5.4.1 Client handling component

5.4.1.1 Location Client Control Function (LCCF)

The Location Client Control Function (LCCF) manages the external interface towards LCF. The LCCF identifies the LCS client by requesting client verification and authorization (i.e. verifies that the LCS client is allowed to position the subscriber) through interaction with the Location Client Authorization Function (LCAF). The LCCF handles mobility management for location services (LCS) e.g., forwarding of positioning requests to VMSC or SGSN. The LCCF determines if the final positioning estimate satisfies the QoS for the purpose of retry/reject. The LCCF provides flow control of positioning requests between simultaneous positioning requests. It may order the Location Client Co-ordinate Transformation Function (LCCTF) to perform a transformation to local co-ordinates. It also generates charging and billing related data for LCS via the Location System Billing Function (LSBF).

5.4.1.2 Location Client Authorization Function (LCAF)

The Location Client Authorization Function (LCAF) is responsible for providing access and subscription authorization to a client. Specifically, it provides authorization to a LCS client requesting access to the network and authorizes the subscription of a client. LCAF provides authorization to a LCS client requesting Location Information of a specific ~~MS~~UE.

5.4.1.2.1 Access Subfunction

An *Access Subfunction* enables LCS clients to access LCS services. This subfunction provides verification and authorization of the requesting client.

When a LCS is requested, the Access Subfunction uses the information stored in the LCS client *subscription profile* to verify that:

- the LCS client is registered; and

- the LCS client is authorized to use the specified LCS request type;

- the LCS client is allowed to request location information for the subscriber(s) specified in the LCS request.

5.4.1.2.2 Subscription Subfunction

The LCS client Subscription profile shall contain a minimum set of parameters assigned on per LCS client basis for an agreed contractual period. The LCS client profile shall contain the following set of access parameters:

- LCS client identity;

- Allowed LCS request types (i.e. LIR, LDR or both); (see note)

- Maximum number of subscribers allowed in a single LCS request;

- Priority;

- Position override indicator;

- State(s);

- Event(s) (applicable to LDR requests only);

- Local coordinate system;

- LCS client access barring list (optional);

- PLMN access barring list applicability;

    NOTE: LIR = Location Immediate Request; and LDR = Location Deferred Request.

For certain authorized LCS client internal to the PLMN, a subscription profile is unnecessary. These clients are empowered to access any defined service that is not barred for an UE subscriber. This permits positioning of emergency calls without the need for pre-subscription.

5.4.1.3 Location Client Co-ordinate Transformation Function (LCCTF)

The Location Client Co-ordinate Transformation Function (LCCTF) provides conversion of a location estimate expressed according to a universal latitude and longitude system into an estimate expressed according to a local geographic system understood by the LCF and known as location information. The local system required for a particular LCF will be either known from subscription information or explicitly indicated by the LCF.

5.4.2 System handling component

5.4.2.1 Location System Control Function(LSCF)

The Location System Control Function (LSCF) is responsible for co-ordinating location requests. This function manages call-related and non-call-related positioning requests of LCS and allocates network resources for handling them. The LSCF retrieves UE classmark information for the purpose of determining a positioning method. [NOTE: UMTS UE capabilities to be added here.] The LSCF performs call setup if required as part of a LCS e.g., putting the ME on dedicated radio resources. It also caters for co-ordinating resources and activities with regard to requests related to providing assistance data needed for positioning. This function interfaces with the LCCF, LSPF, LSBF and PRCF. Using these interfaces, it conveys positioning requests to the PRCF, relays positioning data to the LCCF and passes charging related data to the LSBF.

The U-LSCF for UTRAN is further described in TS 25.305 2.12.1[1], LSCF for GERAN is described in TS 43.059 [16].

5.4.2.2 Location System Billing Function (LSBF)

The Location System Billing Function (LSBF) is responsible for charging and billing activity within the network related to location services (LCS). This includes charging and billing of both clients and subscribers. Specifically, it collects charging related data and data for accounting between PLMNs.

5.4.2.3 Location System Operations Function (LSOF)

The Location System Operations Function (LSOF) is responsible for provisioning of data, positioning capabilities, data related to clients and subscription (LCS client data and UE data), validation, fault management and performance management of LCS.

An LSOF may be associated with each entity.

[Editor's note: This is being studied in GSM. FFS in UMTS. Internal LCF may be part of O&M functions.]

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 OTDOA or assisted GPS positioning methods.

5.4.3 Subscriber handling Component

5.4.3.1 Location Subscriber Authorization Function (LSAF)

The Location Subscriber Authorization Function (LSAF) is responsible for authorizing the provision of a location service (LCS) for a particular mobile station (UE with SIM/USIM). Specifically, this function validates that a LCS can be applied to a given subscriber. In case LCF is in the UE then LSAF verifies that the UE subscriber has subscribed to the requested LCS service.

5.4.3.2 Location Subscriber Privacy Function (LSPF)

The Location Subscriber Privacy function is responsible performs all privacy related authorizations. For a target UE it shall authorize the positioning request versus the privacy options of the target UE, if any.

5.4.4 Positioning components

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

For location services the Access Network shall send the result of the positioning to the core network in geographical co-ordinates as defined in TS 23.032. The Access Network shall map the cell(s) the Target UE is associated with into geographical co-ordinates, but this mapping is not standardized.

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

5.5 Information Flows between Client and Server

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

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

5.5.1 Location Service Request

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

- Location Immediate Request (LIR); and

- Location Deferred Request (LDR).

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

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

- Target MSUE;

- LCS identity;

- State (idle, dedicated);

- Event (applicable to LDR requests only);

- Requested Quality of Service information;

- Local coordinate reference system;

- Geographical area, [should be checked with the meaning of "Geographical area" in TS 03.71 [5].]

5.5.2 Location Service Response

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

- Immediate Response; and

- 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;

- Location of UE as an ellipsoid with axes and direction of all axis;

- Estimated achieved QoS;

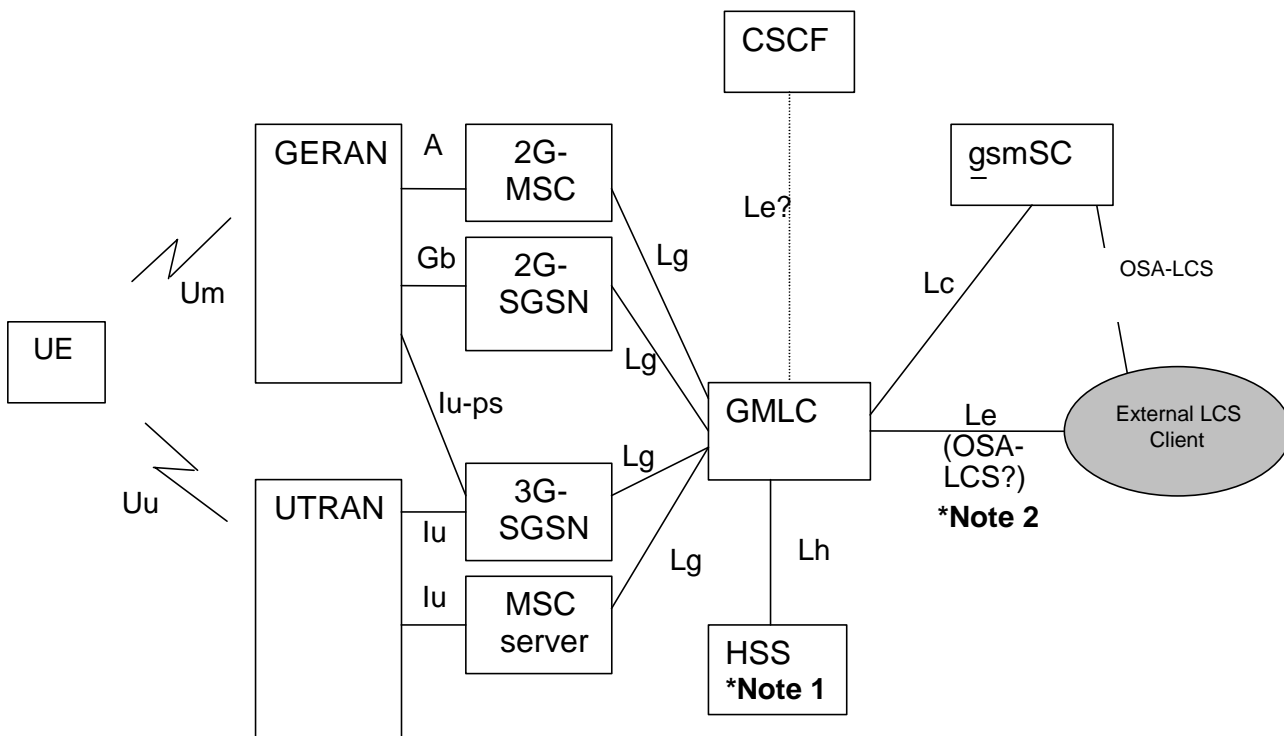- Indication when UE enters or leaves the Geographical area.

Some information attributes may be common and repeated for the location service request and location service response, such as Target UE, LCS identity, State, Event, Local co-ordinate system, geographical area.

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 MSUE. 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.

*Note 1: HSS includes both 2G-HLR and 3G-HLR functionality. LCS should be included in the overall network architecture in TS 23.002.

*Note 2: The Le interface is FFS. S1 agreed that LCS shall support OSA-API.

Figure 6.1: General arrangement of LCS

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 2.12.1[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 authorized to request the location of the UE or subscriber;

– verify that LCS is supported by the MSUE;

– 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 2.12.1[1] for UTRAN and TS 43.059 [16] for GERAN:

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 MSUE.

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.G roup	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
	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 2.1~~2.1~~~~[1]~~ for UTRAN and in TS 43.059 [16] for GERAN

Table 6.2: Allocation of LCS functional entities to network elements

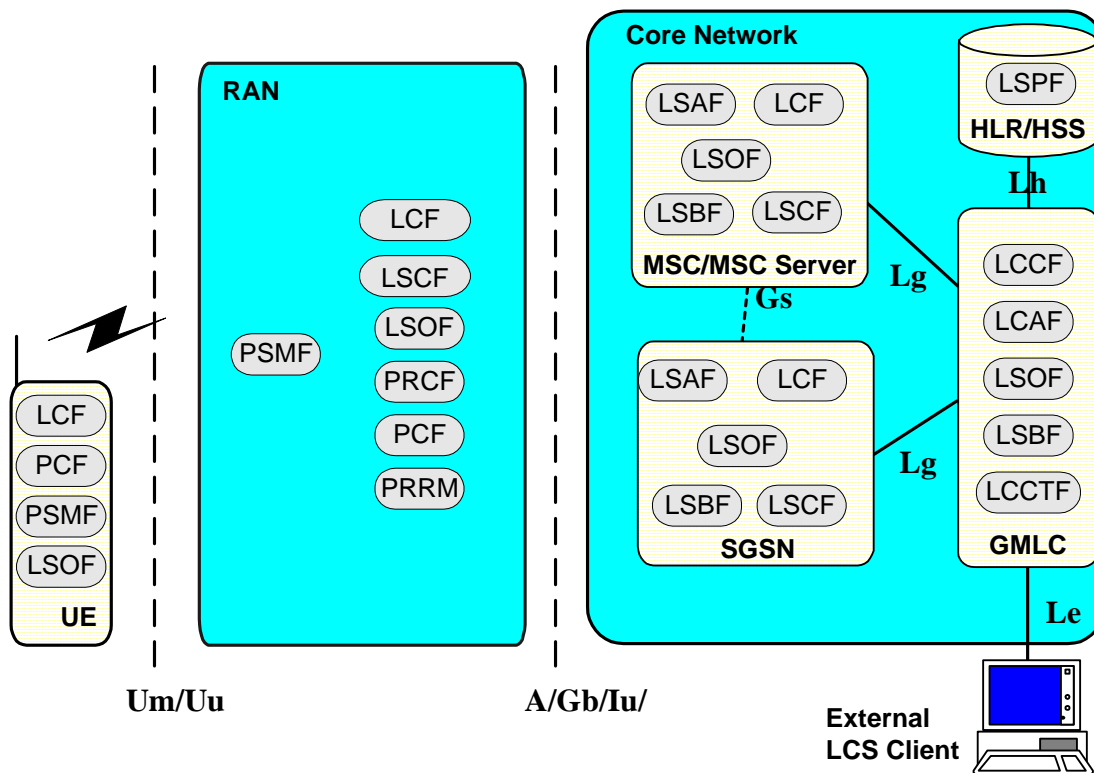|	~~MS~~UE	RAN	GMLC	SGSN	MSC/MSC Server	HLR/HSS	Client
Location client functions							
LCF	X			X	X		X
LCF Internal	Ffs	X					
Client handling functions							
LCCTF			X				
LCCF			X				
LCAF			X				
System handling functions							
LSCF		X		X	X		
LSBF			X	X	X		
LSOF	X	X	X	X	X		
Subscriber handling functions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

Figure 6.2: Generic LCS Logical Architecture

6.3 Functional description of LCS per network element

6.3.1 Access Network

The Access Network is involved in the handling of various positioning procedures.

The LCS specific functionalities of the radio access network elements are specified in TS 25.305 2.1 [1]for UTRAN and TS 43.059 [16] for GERAN.

6.3.2 LCS Clients and LCS applications

There are two classes of LCS Application – Internal applications and External applications. Internal applications represent entities internal to the GSM/UMTS that make use of location information for the (improved) operation of the network. External applications represent entities (such as Commercial or Emergency services) that make use of location information for operations external to the mobile communications network. The LCS Applications interface to the LCS entities through their Location Client functions (LCF).

The LCS Client and LCS applications are outside the scope of the present document.

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 VMSC, SGSN or MSC Server and receives final location estimates from the corresponding entity via Lg interface.

6.3.4 LCS support in the UE

The UE may be involved in the various positioning procedures. Specific UE involvement is specified in each of the positioning procedures specified in TS 25.305 2.12.1[1] for UTRAN and TS 43.059 [16] for GERAN.

The UE interacts with the measurement co-ordination functions to transmit the needed signals for uplink based LCS measurements and to make measurements of downlink signals. The measurements to be made will be determined by the chosen location method.

The UE may also contain LCS applications, or access a LCS application through communication with a network accessed by the UE or an application residing in the MSUE. This application may include the needed measurement and calculation functions to determine the MSUE's location with or without assistance of the GSM/UMTS LCS entities.

The UE may also, for example, contain an independent location function (e.g. Global Satellite Positioning Service GPS) and thus be able to report its location, independent of the RAN transmissions. The UE with an independent location function may also make use of information broadcast by the RAN that assists the function.

6.3.5 MSC/VLR

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

6.3.6 MSC Server

The MSC Server handles the same functionality as the MSC/VLR including charging and billing, LCS co-ordination, location request, authorization and operation of the LCS services. The MSC Server is accessible to the GMLC via the Lg interface.

6.3.7 SGSN

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

6.3.8 Home Location Register, HLR

The HLR contains LCS subscription data and routing information. The HLR is accessible from the GMLC via the Lh interface. For a roaming UE, HLR may be in a different PLMN.

6.3.9 HSS

The HSS contains LCS subscription data and routing information. The HSS is accessible from the GMLC via the Lh interface. For roaming MSUEs, HSS may be in a different PLMN.

6.3.10 gsmSCF

The Lc interface supports CAMEL access to LCS and is applicable only in CAMEL [phase 3?]. The procedures and signaling associated with it are defined in TS 23.078 and TS 29.002, respectively.

6.3.11 CSCF

The role of CSCF is probably limited to handling of location information e.g. related to emergency calls. This is FFS.

6.4 Addressing the target UE for LCS purposes

It shall be possible to address and indicate the target UE using MSISDN. It may be possible in certain cases to address the target UE using IP address e.g. when a static IP address has been allocated for the MSUE. This is FFS.

7. Signaling and Interfaces

7.1 LCS signaling between Access and Core Networks

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

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

7.1.1 Core network Location Request

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

In UMTS the core network may also request in which Service Area the Target UE is located. The Service Area information may be used for routing of corresponding Emergency calls, or for CAMEL services. (The MSC Server or SGSN shall not send the Service Area Identity to GMLC).

In GSM this corresponds to the usage of Cell ID in the core network.

It should be noted that the Service Area concept is different from the Localized Service Area concept used for SoLSA services.

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

7.1.2 Location Report

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

- the geographical co-ordinates of the Target MSUE;

- the service area in which the Target UE is located;

- achieved quality level of the location estimate;

7.2 Um and Uu Interfaces

NOTE: This chapter may change depending on whether air interface LMU will exists in the logical architecture or not.

The Um and Uu interfaces are used to communicate among the LCS entities associated with the BSC and RNC, the UE and the stand-alone Location Measurement Units (LMU). The Um and Uuinterfaces are also used to communicate between the LCS entities in the core network and the MSUE.

The Um/Uu interfaces may pass measurement requests and results to and from UE or the stand-alone LMU.

The Um/Uu interfaces may also pass location requests from internal or external LCS Clients (Applications) at the MSUE. Note that these requests may require the services of the LCS entities associated with the core network to authenticate clients and subscriber subscriptions to aspects of the LCS.

The Um/Uu interfaces may also be used for broadcast of information that may be used by the UE or stand-alone LMU for their LCS operations. This may, for example, include timing information about nearby Node-B/BTS transmissions that may assist the UE or LMU in making their measurements. In UTRAN code information may be included.

The Um and Uu interfaces may also pass messages relating to changes or reporting of the data associated with the Location System Operations Function (LSOF) in the UE or the remote LMU.

UTRAN Stage 2 specification TS 25.305 [1] specifies LCS signaling over the Uu interface and GERAN Stage 2 specification TS 43.059 [16] over the Um interface correspondingly.

Message segmentation is specified in GERAN LCS Stage 2, TS 43.059 [16][16].

7.3 MAP Interfaces

The following interfaces are based on MAP in LCS.

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

The following MAP services are defined for LCS:

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

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

- MAP-PROVIDE-SUBSCRIBER-LOCATION Service.

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

- MAP-SUBSCRIBER-LOCATION-REPORT Service.

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

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

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 ~~MS~~UE.

8.1.1.3 LOCATION State

In this state, the GMLC has sent a location request to the VMSC, MSC Server, SGSN or serving the UE to be located and is awaiting a response containing a location estimate.

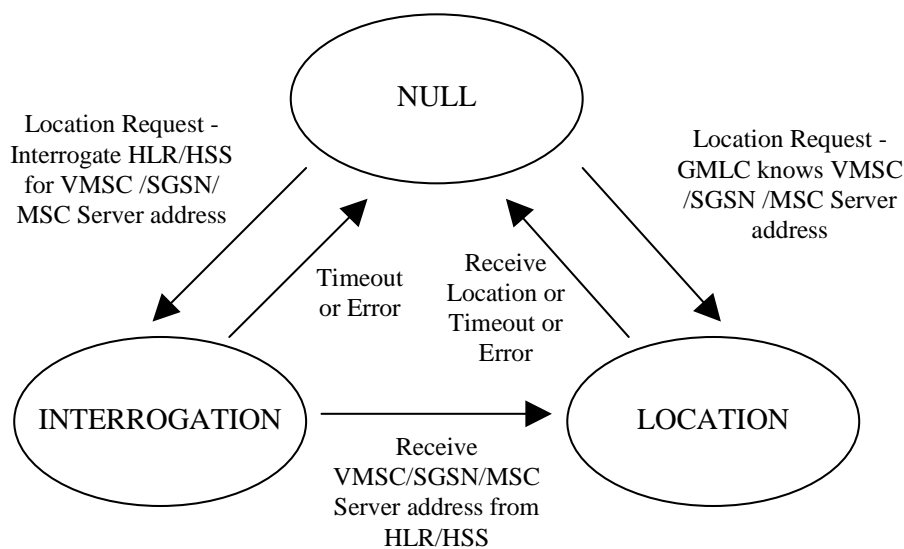# 8.1.2 State functionality

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 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 ~~MS~~UE's home HLR/HSS for the VMSC/ MSC Server/ SGSN 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.

[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, 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 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, it forwards the location estimate to the requesting LCS client and re-enters the NULL state.

8.1.2.2 INTERROGATION Timer Function

The GMLC runs a timer while in the INTERROGATION state to limit the amount of time waiting for an interrogation response from the HLR/HSS. If the timer expires before an interrogation response is received, the GMLC indicates a location failure to the LCS client and re-enters the NULL state.

8.1.2.3 LOCATION Timer Function

The GMLC runs a timer while in the LOCATION state to limit the amount of time waiting for a location estimate response from the VMSC/ MSC Server /SGSN. If the timer expires before a response is received, the GMLC indicates a location failure to the LCS client and re-enters the NULL state.

8.2 State description for VMSC and MSC Server

8.2.1 VMSC and MSC Server States

NOTE: Periodic location service may need to be covered in the state descriptions.

8.2.1.1 LCS IDLE State

In this state, the VMSC/MSC Server location service is inactive for a particular ~~MS~~UE. The UE may be known in the VMSC/MSC Server (except for a USIM less or SIM less Emergency call or where the UE information has been cancelled or lost in the VMSC/MSC Server), but there may not be an active Mobility Management to the ~~MS~~UE.

8.2.1.2 LOCATION State

In this state, the VMSC/MSC Server is awaiting a response from RAN after requesting the location for a particular ~~MS~~UE..

8.2.2 State Functionality
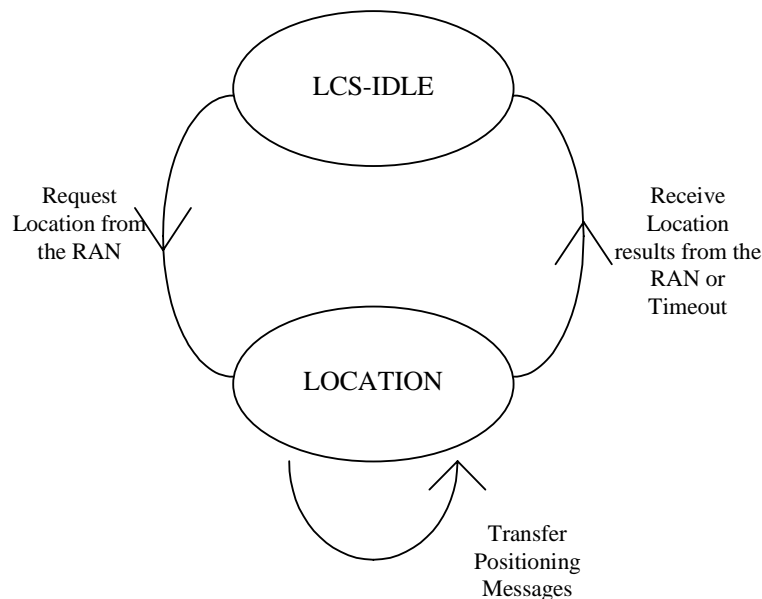
8.2.2.1 State Transitions

Figure 8.2: State Transitions in the VMSC/MSC Server

Moving from LCS IDLE to LOCATION state:

After a request has been received to locate a particular UE and the UE subscription options have been verified, a location request is sent to the RAN of the UE to be located: the VMSC/MSC Server then enters the LOCATION state. Before entering this state, the VMSC/MSC Server must have setup a Mobility Management connection to the UE if none was previously active. The mobile is paged and authenticated before positioning.

Moving from LOCATION to LCS IDLE state:

After the return of a location estimate result from RAN, the VMSC/MSC Server shall re-enter IDLE state.

8.2.2.2 LOCATION Timer Function

TheVMSC/MSC Server runs a timer while in the LOCATION state to limit the amount of time waiting for a location response from the RAN. If the timer expires before such information is received, the VMSC/MSC Server indicates a location failure to the original requesting entity and re-enters IDLE state.

8.3 LCS State description for SGSN

8.3.1 SGSN States

8.3.1.1 LCS IDLE State

In this state, the SGSN location service is inactive for a particular ~~MS~~UE. The UE is known in the SGSN except in case where the UE data has been cancelled or lost in the SGSN. There is not an active Mobility Management to the ~~MS~~UE.

8.3.1.2 LOCATION State

In this state, the SGSN is awaiting a response from the RAN after requesting the location for a particular ~~MS~~UE. In this state, a Mobility Management connection to the target UE will be active.

8.3.2 State Functionality
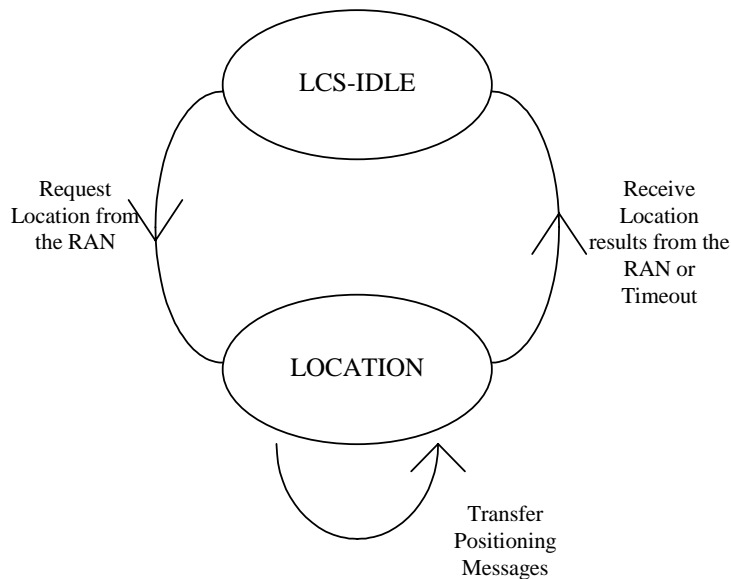
8.3.2.1 State Transitions

Figure 8.3: State Transitions in the SGSN

Moving from LCS-IDLE to LOCATION state:

After a request has been received to locate a particular UE and the UE subscription options have been verified to allow this, the SGSN sends a location request to the RAN. The SGSN then enters the LOCATION state. Before entering this state, the SGSN must have setup a Mobility Management connection to the UE if none was previously active. The mobile is paged and authenticated before positioning.

Moving from LOCATION to LCS IDLE state:

After the return of a location estimate result from RAN, or if the Location Timer described below expires, the SGSN shall re-enter IDLE state.

8.3.2.2 LOCATION Timer Function

The SGSN runs a timer while in the LOCATION state to limit the amount of time waiting for a location response from the RAN. If the timer expires before such information is received, the SGSN indicates a location failure to the original requesting entity and re-enters IDLE state.

8.4 Signaling connection for the Iu interface

When using the Iu interface, before SGSN/MSC server can request location information of a target UE from RAN, an Iu signaling connection must have been established between SGSN/MSC server and RAN. The SGSN/MSC server sends a location request message to RAN, which determines the location of the target UE related to this Iu signaling connection and sends a location report to SGSN/MSC server over the same Iu signaling connection.

8.5 Signaling connection for the A-interface

When using the A interface, before MSC can request location information of a target UE from RAN, an A interface signaling connection must have been established between MSC and RAN. The MSC sends a location request message

to RAN, which determines the location of the target UE related to this A interface signaling connection and sends a location report to MSC over the same A interface signaling connection.

8.6 Gb interface mapping of target UE

The pre-requisite for LCS procedures on the Gb interface is that UE is in "ready state".

9. General Network Positioning Procedures

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

Location Preparation Procedure

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

Positioning Measurement Establishment Procedure

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

Location Calculation and Release Procedure

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

9.1 Mobile Terminating Location Request

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

Figure 9.1 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.
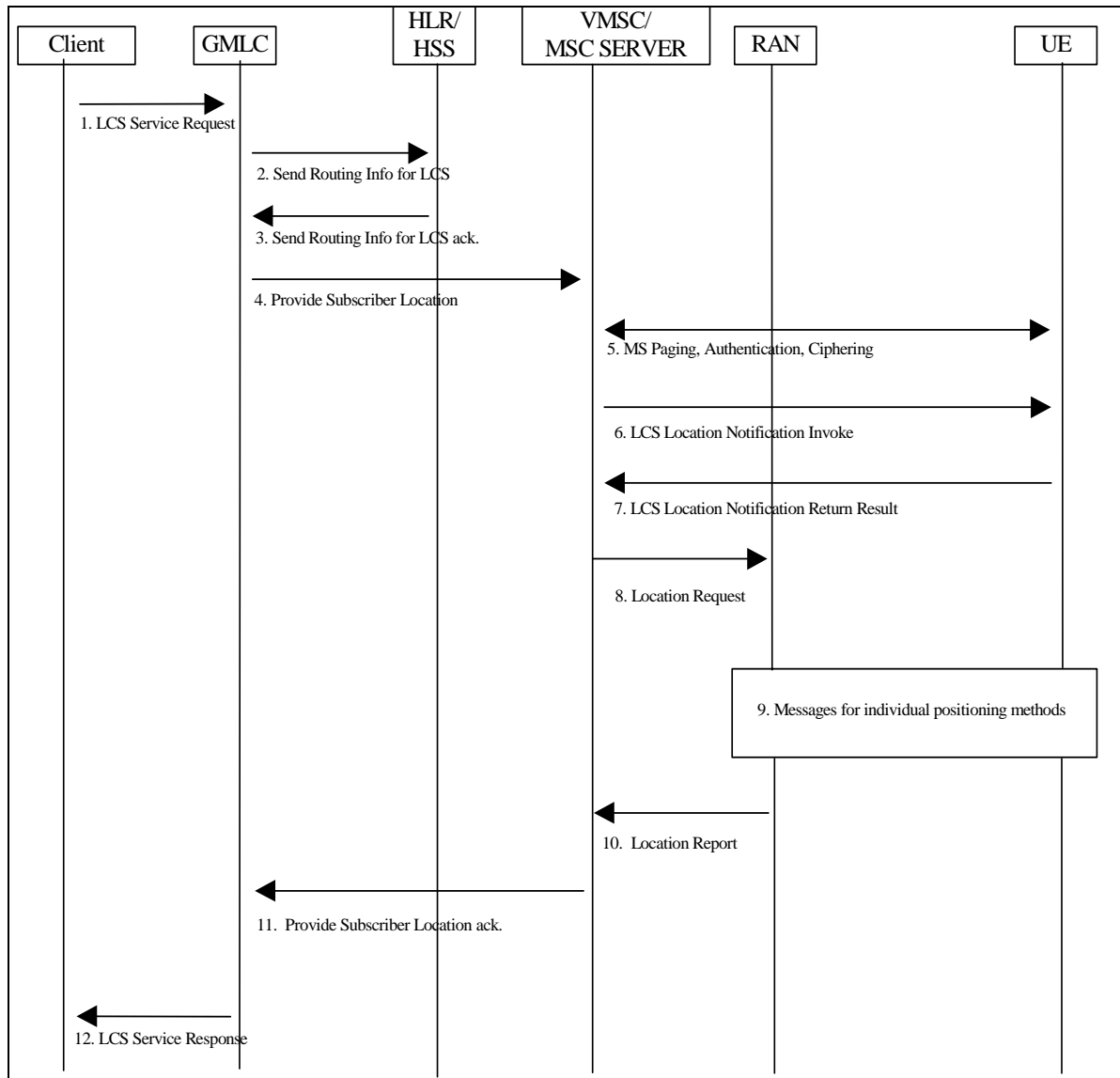
Figure 9.1: General Network Positioning for a CS-MT-LR

9.1.1.1 Location Preparation Procedure

(1) An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. For a call related location request, the GMLC obtains and authenticates the called party number of the LCS client [(refer to Annex A for further details)]. If location is required for more than one UE, or if periodic location is requested, steps 2 to 12 below may be repeated.

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

(3) The HLR/HSS verifies that the calling party SCCP address of the GMLC corresponds to a known GSM/UMTS network element that is authorized to request UE location information. The HLR/HSS then returns the current VMSC/MSC server address and whichever of the IMSI and MSISDN was not provided in step (2) for the particular ~~MS~~UE.

(4) 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. [FFS: For a value added LCS client, the message shall carry the client name and, for a call unrelated location request, the identity of the LCS client. In other cases, inclusion of the client name and/or identity is optional.]

[NOTE: This step is for further study, it should be investigated e.g. which client identities should be required as mandatory, also the impacts of the redefined call/session-related privacy class in the service description TS 22.071 [4] should be considered.]

(5) If the GMLC is located in another PLMN or another country, the VMSC/MSC server first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The VMSC/MSC server then verifies LCS barring restrictions in the UE user's subscription profile in the MSC server. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC. Otherwise, if the UE is in idle mode, the Core Network performs paging, authentication and ciphering. If the target UE supports any UE based or UE assisted positioning method(s), the UE will also provide RAN and MSC/MSC server with the positioning method(s) it supports via UE classmark or UE capability information. 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.

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

(6) If the location request comes from a value added LCS client and the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS (according to the UE Capability information), an LCS Location Notification Invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client and whether privacy verification is required. [FFS: For a call related location request, the LCS client identity shall be set to the LCS client's called party number if no separate LCS client identity was received from the GMLC.] Optionally, the VMSC/MSC server may after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 8 without waiting for a LCS Location Notification Return Result message in step 7.

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

(7) 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 6, but before step 11. 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.

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

9.1.1.2 Positioning Measurement Establishment Procedure

(9) 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]. UE UE

9.1.1.3 Location Calculation and Release Procedure

(10) 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. If a location estimate could not be obtained, RAN returns a Location Report message containing a failure cause and no location estimate.

(11) The MSC/MSC server returns the location information and its age to the GMLC, if the VMSC/MSC server has not initiated the Privacy Verification process in step 6. If step 6 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. If a LCS Location Notification Return Result message indicating that permission is not granted is received, or there is no response, with the UE subscription profile indicating barring of location in the absence of a response, the VMSC/MSC server shall return an error response to the GMLC. If RAN did not return a successful location estimate, but the privacy checks in steps 6-7 were successfully executed, the VMSC/MSC server may return the last known location of the target UE if this is known and the LCS client is requesting the current or last known location. The MSC server may then release the Mobility Management connection to the UE, if the UE was previously idle, and the MSC/MSC server may record billing information.

(12) The GMLC returns the UE location estimate to the requesting LCS client. If the LCS client requires it, the GMLC may first transform the universal location co-ordinates provided by the MSC/MSC server into some local geographic system. The GMLC may record billing for both the LCS client and inter-network revenue charges from the MSC/MSC server's network.

9.1.2 MT-LR without HLR Query - applicable to North America Emergency Calls only

Figure 9.2 illustrates location for a North American Emergency Services call, where an emergency services client identifies the target UE using an IMSI, MSISDN or NA-ESRK plus, possibly IMEI, that were previously provided to it by the VMSC. The emergency services client also identifies the VMSC to the GMLC by providing an NA-ESRD or NA-ESRK or by referring to information for the target UE already stored in the GMLC. This allows the GMLC to request location from the VMSC without first querying the home HLR of the target ~~MS~~UE. This is necessary when the home HLR either cannot be identified (e.g. client provides an NA-ESRK but not IMSI or MSISDN) or does not support the LCS query procedure.
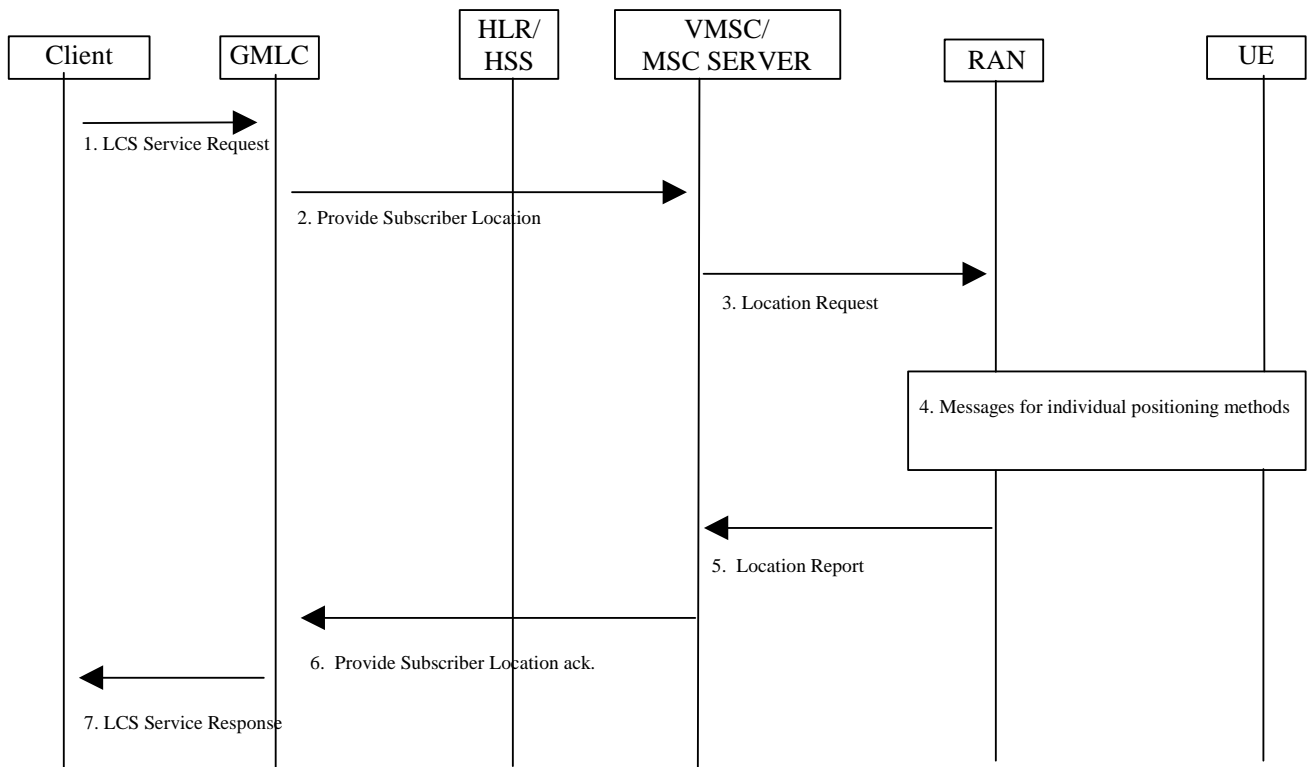
Figure 9.2: Positioning for a Emergency Services MT-LR without HLR Query

1) Same as step 1 in figure 9.1 but with the LCS client identifying first the target UE by an IMSI, MSISDN or NA-ESRK and possibly IMEI and, second, the VMSC by an NA-ESRK or NA-ESRD.

2) If the GMLC already has stored information for the target UE (e.g. from a prior location estimate delivery to the LCS client), the GMLC may determine the VMSC from this information. Otherwise, the GMLC determines the VMSC using the NA-ESRK or NA-ESRD – with use of the NA-ESRK taking priority over that of the NA-ESRD. The MAP_PROVIDE_SUBSCRIBER_LOCATION message sent to the VMSC carries the IMSI, MSISDN or NA-ESRK and, if provided, the IMEI for the target UE, as well as the required QoS and an indication of a location request from an emergency services client. The VMSC identifies the target UE using the IMSI, MSISDN or NA-ESRK and, if provided, the IMEI.

3) The MSC verifies that UE privacy is overridden by the emergency services provider and that positioning is not prevented for other reasons (e.g. unreachable UE, inapplicable call type to the UE). The VMSC then sends a L ocation Request to the RAN, as for a normal MT-LR.

4) RAN performs positioning as for a normal CS-MT-LR.

5) RAN returns a location estimate to the VMSC as for a normal CS-MT-LR.

6) Same as steps 11 for a normal CS-MT-LR.

7) Same as steps 12 for a normal CS-MT-LR.

9.1.3 MT-LR and PS-MT-LR for a previously obtained location estimate

Every time the location estimate of a target UE subscriber is returned by the RAN to the VMSC, MSC Server or SGSN, the corresponding entity may store the location estimate together with a time stamp. The MSC/MSC server may store this information in the subscriber's MSC server record.

The time stamp is the time at which the location estimate is stored at the corresponding entity i.e. after the RAN returns the location estimate to the VMSC, MSC Server or SGSN. The time stamp indicates the "age" of the location estimate.

9.1.3.1 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"*.

9.1.3.2 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.

9.1.3.3 Last known Location

The current location estimate and its associated time stamp are stored in MSC/VLR, MSC Server or SGSN and until replaced by a later location estimate and a new time stamp is referred to as the *"last known location"*. The last known location may be distinct from the initial location – i.e. more recent.

9.1.3.4 Security and Privacy

The handling of security and privacy of the target UE with regard to returning the last known or initial location estimate of the target UE shall be the same as when the target UE is reachable for positioning. (i.e. the requesting LCS client is authorized and the privacy of the target UE is secured before the VMSC/MSC server check the MSC server status of the target UE (i.e. whether the UE is marked as attached or detached in the MSC server). A similar status check apply for SGSN and MSC Server.

9.1.3.5 Failing to locate the target UE

In case of a "Detached" or "Not Reachable" target UE, the last known location and a time stamp stored at the VLR, MSC Server or SGSN, may be returned to a LCS client requesting location information if the LCS client specifically requested the current or last known location. This does not apply to a value added LCS client where the target UE subscribes to notification of the location request: if the notification cannot be performed, the VMSC, MSC Server or SGSN shall reject the location request.

>   NOTE: Due to CAMEL, the MSC/MSC server/VLR may already be storing other location information parameters like location number, service area identity and MSC server number in the subscriber's MSC server record.

When a request for location information is received at the VMSC, MSC Server or SGSN, the request shall indicate whether the "last known location of the target ~~MS~~UE" should be returned in case of a "detached" or "not reachable" target ~~MS~~UE.

If the VLR, MSC Server or SGSN has a valid copy of the subscriber's permanent data and the target ~~MS~~UE's privacy settings are such that positioning is allowed, then the following two cases can occur.

9.1.3.5.1 Target UE is "Not Reachable"

If the target UE is marked as "attached" in the VLR, MSC Server or SGSN, the corresponding entity orders paging of the target ~~MS~~UE. If paging fails, due to target UE being "not reachable" then the corresponding VMSC, MSC Server or SGSN shall check whether the LCS client has requested "last known location" in case of "not reachable" target ~~MS~~UE.

If such a request exists and notification to the target UE does not apply for a value added LCS client, the VMSC, MSC Server or SGSN shall include the last known location together with the time stamp available in its response to the request for location information.

An indicator of "last known location" returned shall be marked at the CDR at VMSC, MSC Server or SGSN correspondingly.

9.1.3.5.2 Target UE is "Detached"

If the target UE is marked as "detached" in the VLR, MSC Server or SGSN, the corresponding entity shall check whether the LCS client has requested "last known location" in case of "detached" target ~~MS~~UE.

If such a request exists and notification to the target UE does not apply for a value added LCS client, the VMSC, MSC Server or SGSN includes the "last known location" together with the time stamp available in its response to the request for location information.

An indicator of "last known location" returned shall be marked at the CDR at VMSC, MSC Server or SGSN.

9.1.3.5.3   Target UE is Reachable but Positioning Fails

If the target UE is reachable (e.g. paging succeeds), but the VMSC, MSC Server or SGSN is unable to obtain a current location estimate, then the corresponding entity shall check whether the LCS client has requested "last known location".

If such a request exists and notification to the target UE either does not apply or was successfully executed for a value added LCS client, the VMSC, MSC Server or SGSN includes the "last known location" together with the time stamp available in its response to the request for location information. An indicator of "last known location" returned shall be marked at the CDR at VMSC,

9.1.3.5.4   MSC Server or SGSN.Target UE is "Purged"

If the target UE is marked as "Purged" in HLR/HSS, then an indication "Absent Subscriber" is returned to the GMLC.

9.1.4 Network Induced Location Request (NI-LR)

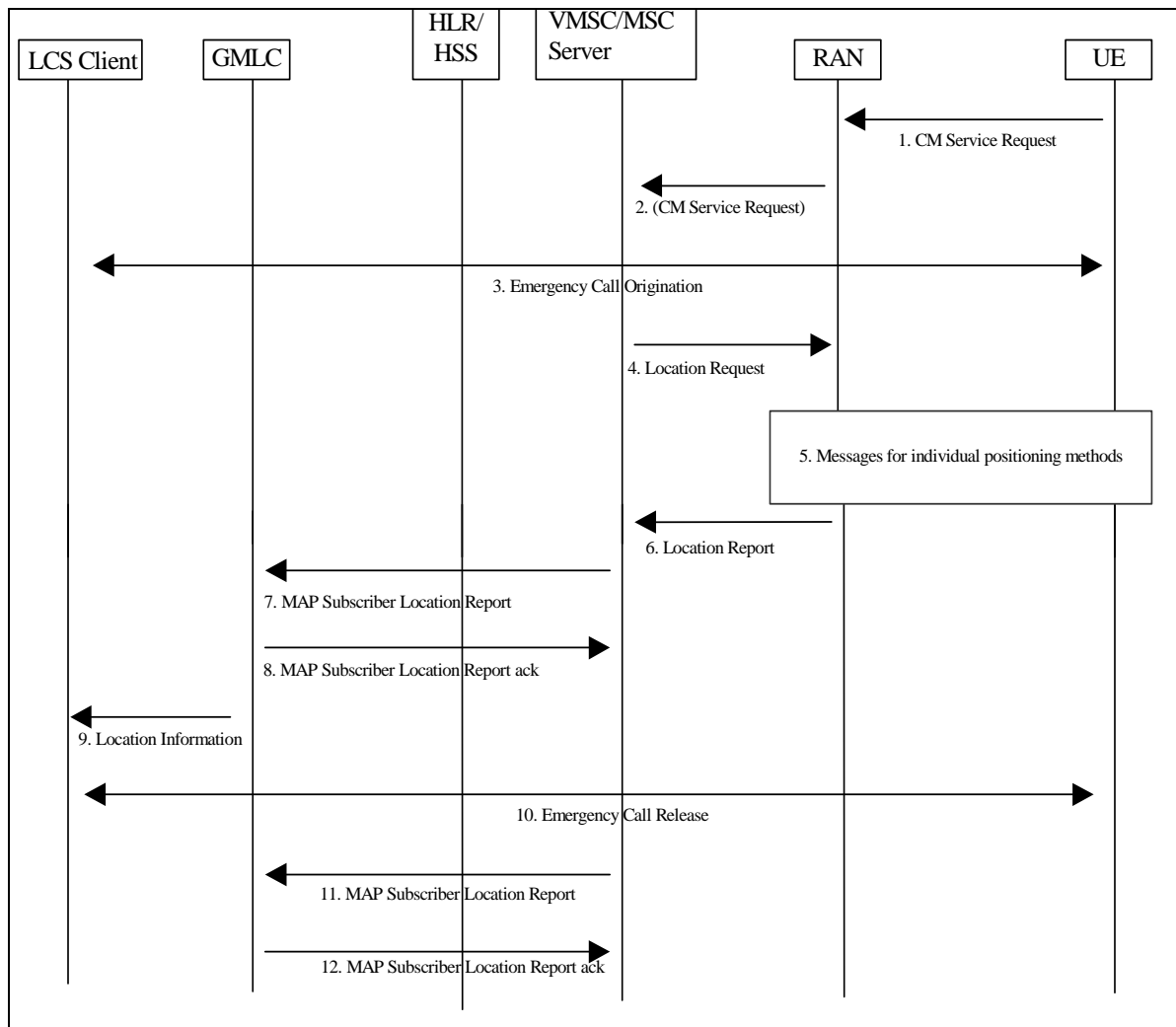Figure 9.3 illustrates positioning for an emergency service call.

Figure 9.3: Positioning for a NI-LR Emergency Service Call

9.1.4.1 Location Preparation Procedure

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

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

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

(4) At any time after step 1 ~~UE~~ ~~UE~~ UE , the VMSC/MSC server may initiate procedures to obtain the ~~MS~~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 ~~MS~~UE's current location area (see step 8 for a MT-LR). This message includes the QoS required for an emergency call.

9.1.4.2 Positioning Measurement Establishment Procedure

(5) When a location estimate best satisfying the requested QoS has been obtained, the RAN returns it to the MSCMSC server in a location response. If a location estimate could not be obtained, the RAN returns a location response containing a failure cause and no location estimate.

9.1.4.3 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.

(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 7, the age of this estimate and may carry the MSISDN, IMSI and IMEI of the calling ~~MS~~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 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) 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].

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

Figure 9.4 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, PDP address or IMSI.
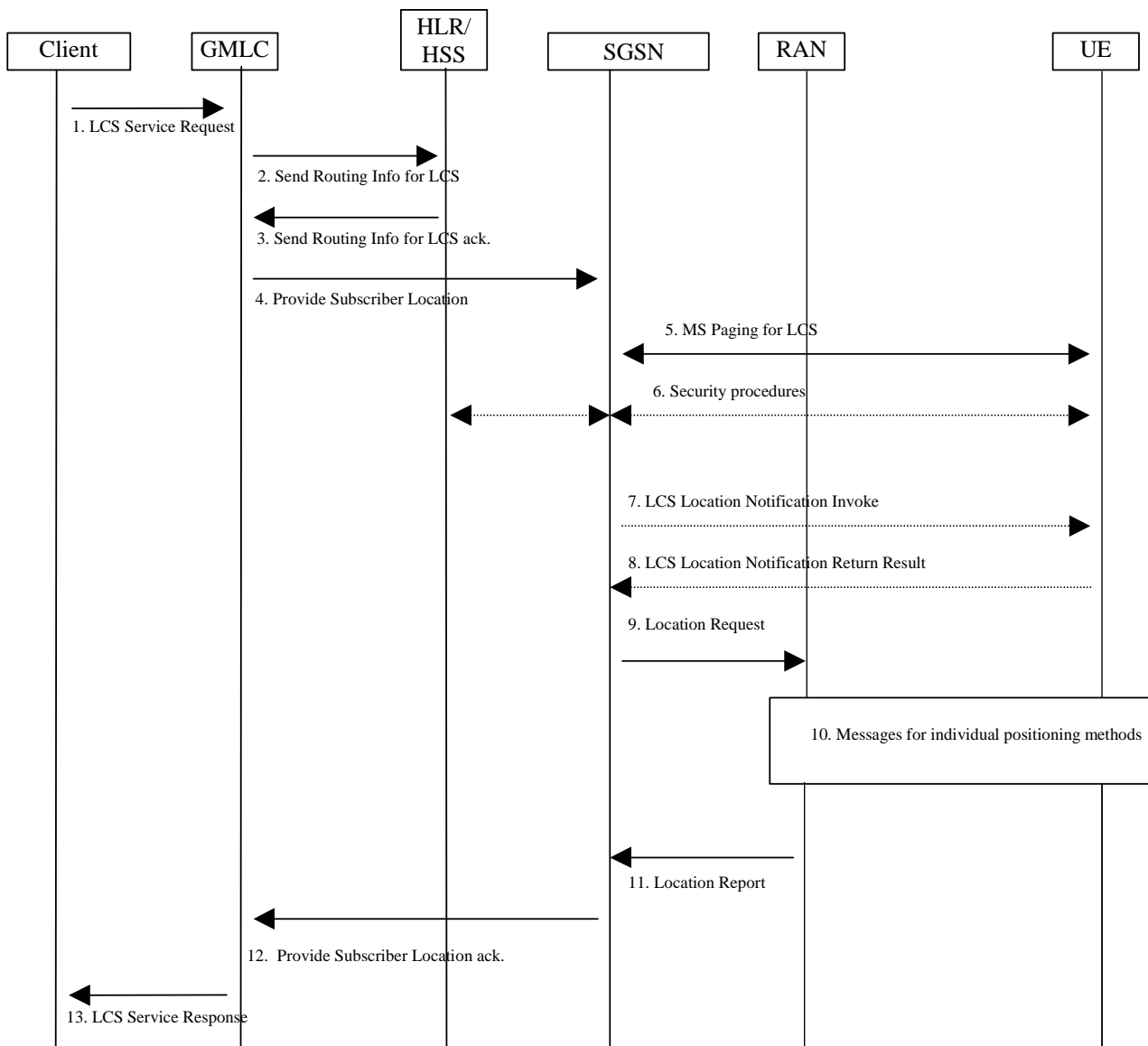
Figure 9.4: General Network Positioning for Packet Switched MT-LR

9.1.5.1 Location Preparation Procedure

(1) An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the PDP address, (NOTE: IP addressing in this context is FFS). MSISDN or IMSI of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. If location is required for more than one UE steps 2 to 13 above may be repeated.

(2) If the GMLC already knows both the SGSN location and IMSI for the particular PDP address or MSISDN (e.g. from a previous location request), this step and step 3 may be skipped. Otherwise, the GMLC sends a Send Routing Info for LCS message to the home HLR of the target UE to be located with the IMSI, PDP address or MSISDN of this MSUE.

(3) The HLR verifies that the SCCP calling party address of the GMLC, corresponds to a known GSM/UMTS network element that is authorized to request UE location information. The HLR then returns one or several of the addresses, the current SGSN, VMSC and/or MSC Server, conceivably prioritizing one of the addresses to be used for positioning the UE and whichever of the IMSI or MSISDN was not provided in step (2) for the particular MSUE.

(4) 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. In case SGSN is chosen then the 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. The message shall carry the identity of the LCS client. This identity is APN for session related privacy class. For a value added LCS client, the message shall carry the client name.

(5) If the GMLC is located in another PLMN or another country, the SGSN first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The SGSN then verifies LCS barring restrictions in the UE user's subscription profile in the SGSN. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC. Otherwise, the SGSN performs paging for location services. Paging is performed at the SGSN by sending a paging message indicating "Paging for LCS" to the RAN.

NOTE: "Paging for LCS" is for further study. In order to ease readibility within the figure the Paging is shown as an arrow from the SGSN towards the UE. However it is recognised that the RAN will send the relevant information over the Radio Interface corresponding to the Paging request from the SGSN.

The UE may be paged for location services even when in UMTS a signaling connection between mobile station and the network is established and in GSM when in Ready Mode. This makes it possible for the UE to start preparing an anticipated location service coming later by e.g. starting to measure GPS signals.
In GSM upon receipt of a Packet Paging Request message indicating paging for LCS, the UE shall respond with a layer 3 LCS Paging Response.
In UMTS upon receipt of a Packet Paging Request message indicating paging for LCS, the UE shall send a Service Request to establish PS signaling connection.

(6) Security functions may be executed. These procedures are defined in TS 23.060[19].

(7) If the location request comes from a value added LCS client and the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS, a notification invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client and whether privacy verification is required. Optionally, the SGSN may after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 9 without waiting for a LCS Location Notification Return Result message in step 8.

(8) 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 7, but before step 12. 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.

(9) The SGSN sends a Location Request message to the RAN. This message includes the type of location information requested, the ~~MS~~UE's location capabilities, the requested QoS and any other location information received in paging response.

9.1.5.2 Positioning Measurement Establishment Procedure

(10) 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 [1] and in GERAN Stage 2 TS 43.059 [16]. 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, TA or RTT 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 oar 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.

9.1.5.3 Location Calculation and Release Procedure

(11) 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. If a location estimate could not be obtained, the RAN returns a Location Report message containing a failure cause and no location estimate.

(12) The SGSN returns the location information and its age to the GMLC, if the SGSN has not initiated the Privacy Verification process in step 7. If step 7 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. If a LCS Location Notification Return Result message indicating that permission is not granted is received, or there is no response, with the UE subscription profile indicating barring of location, the SGSN shall return an error response to the GMLC. If the SGSN did not return a successful location estimate, but the privacy checks were successfully executed, the SGSN may return the last known location of the target UE if this is known and the LCS client is requesting the current or last known location. The SGSN may record billing information.

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

NOTE: Steps 9 – 13 may be repeated a number of times in case of periodic location request.

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

Figure 9.5 illustrates a network induced location request from the SGSN. This procedure may be used e.g. for positioning of an emergency call.
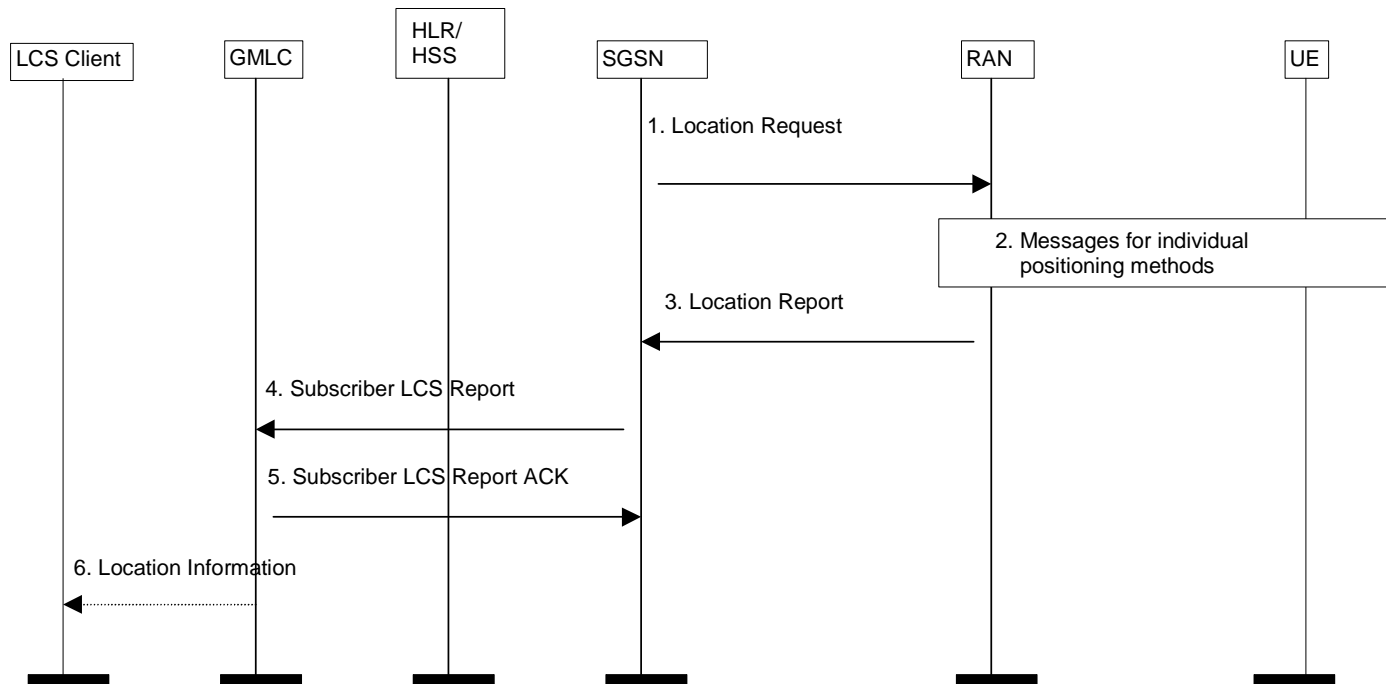
Figure 9.5: Network Induced Location Request

(1) The SGSN sends a Location Request message to the RAN. This message indicates the type of location information requested, the ~~MS~~UE's location capabilities and requested QoS.

9.1.6.1 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. TA or RTT), 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 GERAN Stage 2 [16]. 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, TA or RTT 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 oar 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.

9.1.6.2 Location Calculation and Release Procedure

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

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

(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.

9.2 Mobile Originating Location Request

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

The following procedure shown in Figure 9.6 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. The procedure may also be used to enable an UE to request that its own location be sent to another LCS client.
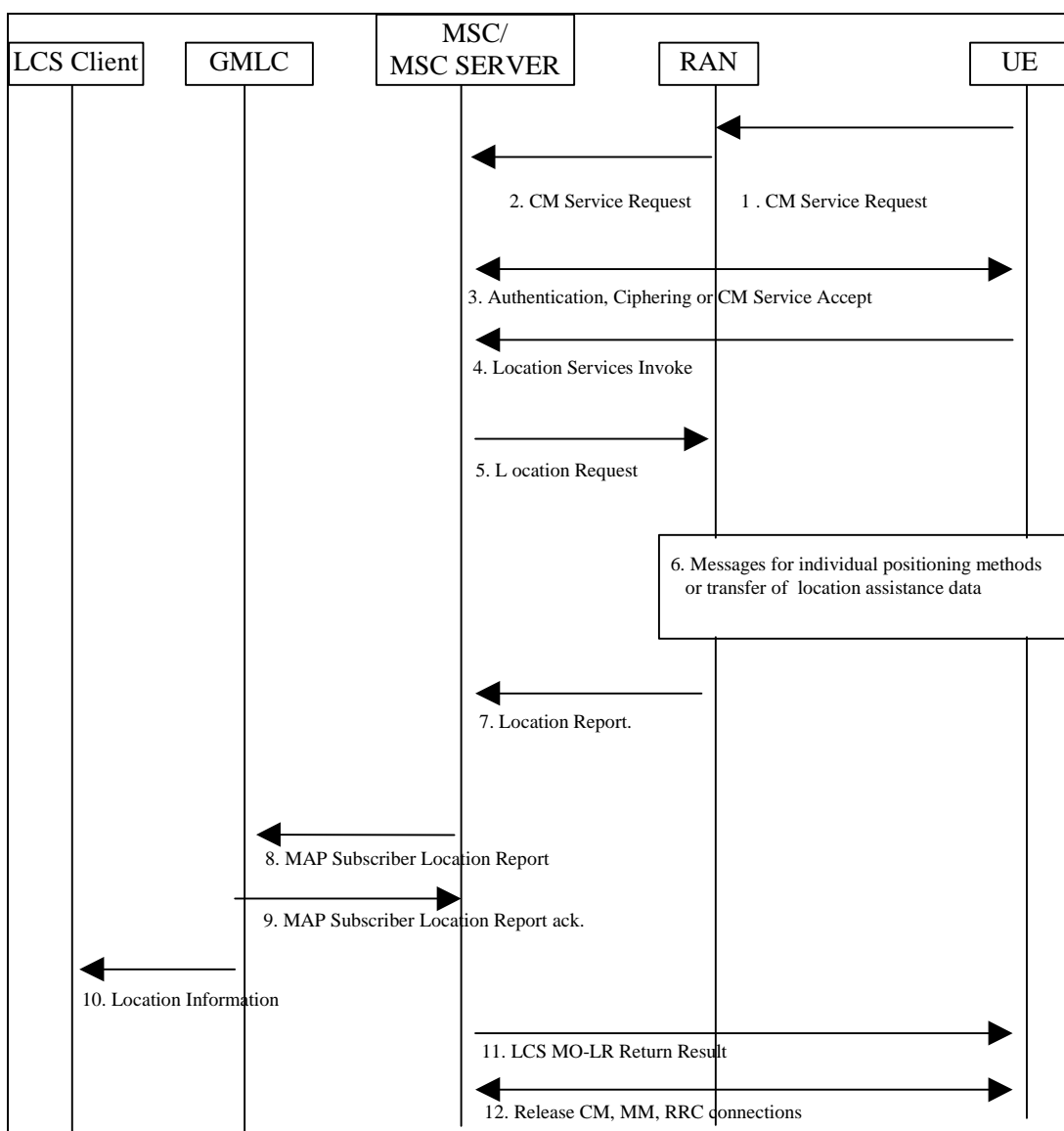

Figure 9.6: General Network Positioning for CS-MO-LR

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. If the target UE supports any UE based or UE assisted positioning method(s), the UE will provide RAN and MSC/MSC server with the positioning method(s) it supports via controlled early classmark sending in GSM or UE capability information in UMTS.

4) The UE sends a LCS CS-MO-LR Location Services invoke to the VMSC/MSC server. If the UE is requesting its own location or that its own location be sent to another LCS client, this message carries LCS requested QoS information (e.g. accuracy, response time). If the UE is requesting that its location be sent to another LCS client, the message shall include the identity of the LCS client and may include the address of the GMLC through which the LCS client should be accessed. If a GMLC address is not included, the VMSC/MSC server may assign its own GMLC address and may verify that the identified LCS client is supported by this GMLC. If a GMLC address is not available for this case, the VMSC/MSC server shall reject the location request. If the UE is instead requesting location assistance data or ciphering keys, the message specifies the type of assistance data or deciphering keys and the positioning method for which the assistance data or ciphering applies. The VMSC/MSC server verifies in the ~~MS~~UE's subscription profile that the UE has permission to request its own location, request that its location be sent to another 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) The VMSC/MSC server sends a Location Request message to RAN associated with the Target ~~MS~~UE. The message indicates whether a location estimate or location assistance data is requested and includes the ~~MS~~UE's location capabilities. If the ~~MS~~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, the actions described under step 9 for a CS-MT-LR are performed. If the UE is instead requesting location assistance data, RAN transfers this data to the UE as described in subsequent sections in TS 25.305 [1]and TS 43.059[16]. UE

9.2.1.3 Location Calculation and Release Procedure

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

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

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

10) The GMLC transfers the location information to the LCS client either immediately or upon request from the client.

11) The VMSC/MSC server returns an CS-MO-LR Return Result to the UE carrying any location estimate requested by the UE, ciphering keys or a confirmation that a location estimate was successfully transferred to the GMLC serving an LCS client.

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

NOTE: In case of positioning of emergency call stage 3 of the pervious sequence is naturally omitted.

9.2.2 Mobile Originating Location Request, Packet Switched (PS-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. 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 another LCS client.
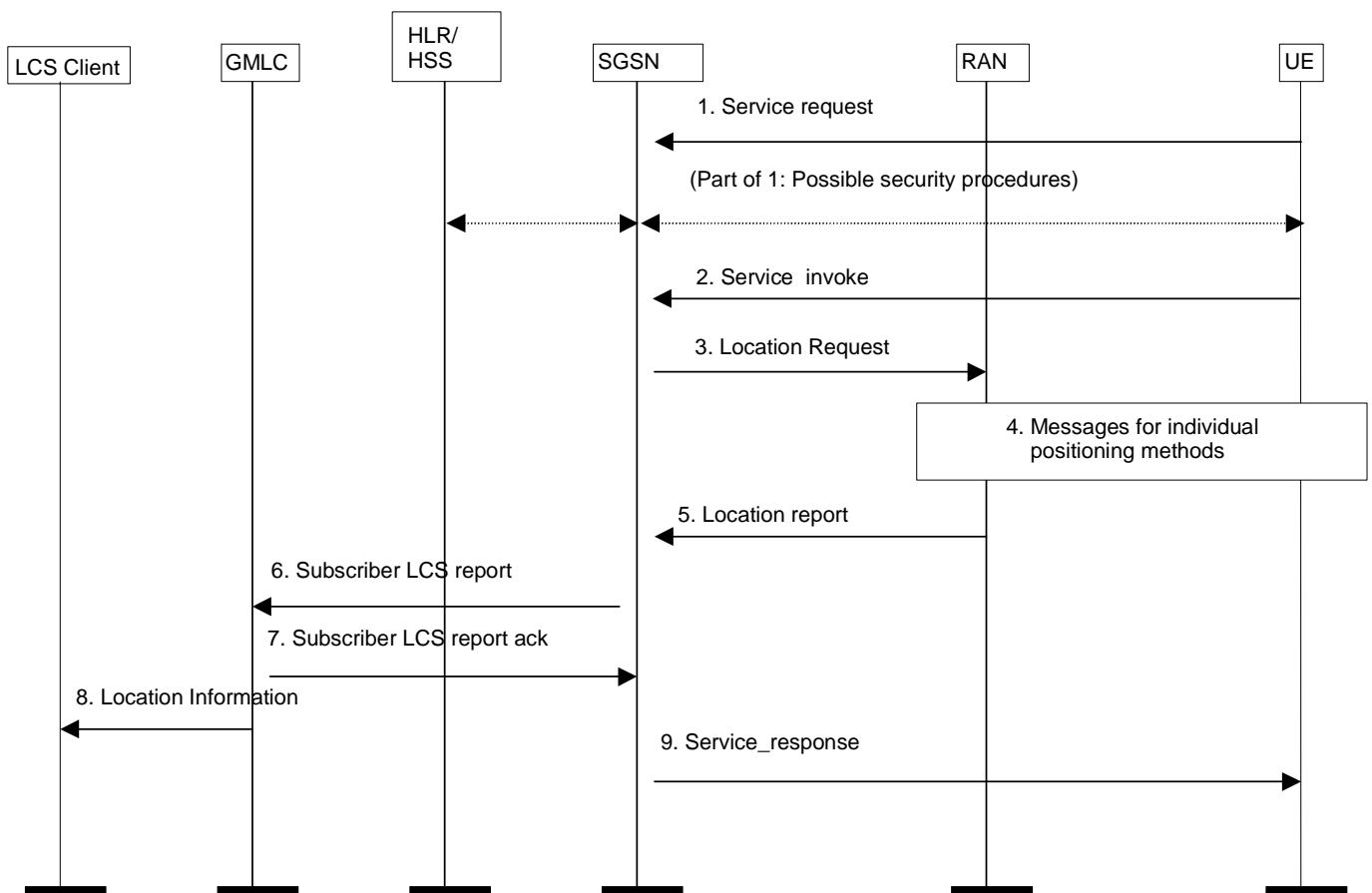

Figure 9.7: General Network Positioning for packet switched MO-LR

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[19].
In GSM this signaling step is not needed.

(2) The mobile station sends a service 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 another LCS client, location assistance data or ciphering keys. If the UE is requesting its own location or that its own location be sent to another LCS client, this message carries LCS requested QoS information (e.g. accuracy, response time). If the UE is requesting that its location be sent to another LCS client, the message shall include the identity of the LCS client and may include the address of the GMLC through which the LCS client should be accessed. If a GMLC address is not included, the SGSN may assign its own GMLC address and may verify that the identified LCS client is supported by this GMLC. If a GMLC address is not available for this case, the SGSN shall reject the location request. If the UE is instead requesting location assistance data or ciphering keys, the message specifies the type

of assistance data or deciphering keys and the positioning method for which the assistance data or ciphering applies. The SGSN verifies the subscription profile of the UE and decides if the requested service is allowed or not.

(3)   The SGSN sends a Location Request message to the RAN associated with the Target ~~MS~~UE's location. The message indicates whether a location estimate or location assistance data is requested and includes the ~~MS~~UE's location capabilities. If the ~~MS~~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 sections. The RAN determines the exact location assistance data to transfer according to the type of data specified by the UE, the UE location capabilities and the current cell.

9.2.2.3 Location Calculation and Release Procedure

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

(6)   If the UE requested transfer of its location to another LCS client and a location estimate was successfully obtained, the SGSN shall send a Subscriber Location Report to the GMLC obtained in step 1 carrying the MSISDN or PDP address of the UE, the identity of the LCS client, the event causing the location estimate (MO-LR-PS) and the location estimate and its age.

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

(8)   The GMLC transfers the location information to the LCS client either immediately or upon request from the client.

(9)   The SGSN returns a Service Response message to the UE carrying any location estimate requested by the UE, ciphering keys or a confirmation that a location estimate was successfully transferred to the GMLC serving an LCS client.

NOTE: Steps 3 – 9 may be repeated a number of times in case of periodic location request.

9.3 LCS signaling procedures specified in UTRAN and GERAN Stage 2

The signaling procedures in UTRAN and GERAN are defined in TS 25.305 [1] and TS 43.059 [16]respectively.

9.4 Exception Procedures

The procedures in this subclause apply to all variants of an MT-LR, NI-LR and MO-LR where a Location Request message has been sent to RAN requesting some location service (e.g. provision of a location estimate for a target UE or transfer of assistance data to a target UE).

9.4.1 Procedures in the VMSC

After the VMSC has requested a location service for a particular UE from RAN, certain events may occur that may temporarily or permanently interfere with the location service attempt. For each such event notified to the VMSC, the VMSC shall employ one of the following error recovery actions.

Restart the Location Service

This action shall be employed for any event that temporarily impedes a location service attempt and cannot be delayed until the location service attempt is complete. When such an event is notified to the VMSC, it shall immediately cancel the location service attempt and the associated signaling dialogue with RAN, if this still exists by sending a "stop reporting" message to RAN. The "stop reporting" message shall contain the reason for the location procedure cancellation.

After aborting the location request dialogue with RAN, the VMSC may queue the location service request until the event causing the restart has terminated (if not already terminated). The VMSC may optionally wait for an additional time period (e.g. if the queuing delay is minimal) to ensure that any resources allocated in and by RAN have time to be released. The VMSC may then send another location service request to RAN associated with the target ~~MS~~UE.

Abort the Location Service

This action shall be employed for any event that permanently impedes a location service attempt, such as loss of the dedicated signaling channel to the target ~~MS~~UE. When such an event is notified to the VMSC, it shall cancel the current location service attempt and the associated signaling dialogue with RAN, if still existing, by sending a "stop reporting" message to RAN. The "stop reporting" message shall contain the reason for the location procedure cancellation. The VMSC shall then return an error response to the client or network entity from which the location request was originally received. The VMSC shall also release all resources specifically allocated for the location attempt.

The following table indicates the appropriate error recovery procedure for certain events. For events not listed in the table, the VMSC need take no action.

Table 9.1: LCS Error Recovery Procedures in the VMSC for certain Events

Event	VMSC Error Recovery
Release of radio channel to the ~~MS~~UE	Abort
Any error response from RAN except for SRNC relocation or inter-MSC handover	Abort
In UMTS SRNC relocation	[Note: This is being discussed in in RAN WG2 and RAN WG3.]
In GSM inter-MSC Handover and inter-BSC handover	Restart after handover completed

If the RNC is in an overload condition, it may reject a location request by indicating congestion. The MSC may reduce the frequency of future location service requests until rejection due to overload has ceased.

9.4.2 Procedures in the MSC Server

9.4.3 Procedures in the SGSN

9.4.4 Procedures in the ~~MS~~UE

9.4.5 Further Procedures for Handover

[Editor's note: During soft and softer handovers in WCDMA (inter Node-B, inter RNC) the existing RRC connection can be used with no need for aborting the on-going positioning process. In case of hard handovers, e.g. inter RNC hard handover (or SRNC relocation) and inter CN (MSC, SGSN) handovers the same approach can be followed as for any service connection (e.g. call handover). Therefore, aborting the service requests, including LCS request, because of handovers is not needed.
The exception procedures and error cases in UMTS need to be further studied.
It is currently being discussed between RAN WG2 and WG3 how to handle the LCS request during SRNC relocation.]

9.4.5.1 MSC procedure for Inter-MSC Handover

[When a location estimate is required for a target UE with an established call in a state of inter-MSC handover, the serving location area ID shall be used by the visited MSC to identify the correct RAN to perform the location. All Location request related messages that are transferred over the Iu-interface shall now be sent via MAP/E interface piggy-backed in MAP_FORWARD_ACCESS_SIGNALLING and MAP PROCESS_ACCESS_SIGNALLING between the visited and serving MSCs. The handling of LCS request during Inter-MSC handover in UMTS is FFS.]

9.4.5.2 Handling of an ongoing handover while a request for positioning arrives at MSC/VLR

[If during an ongoing radio handover procedure a request for location information arrives at RAN, the request shall be suspended until the handover is completed. On completion of the handover, RAN shall continue with location preparation procedure.]

9.5 Privacy

9.5.1 Privacy Override Indicator (POI)

The POI is used to determine whether the privacy settings of the subscriber to be positioned shall be overridden by the request for location services. The assignment of a POI value with an "override" or "not override" value in the LCS client profile is done during the LCS client provisioning. The type of LCS client requesting location information (i.e. emergency, law-enforcement etc.) shall determine the value of the POI assigned to the LCS client profile.

There are two distinct cases regarding the handling of the privacy override indicator.

Procedure A: If the subscriber to be positioned is in the same PLMN or same country as the GMLC then the POI shall override the subscriber's privacy options.

Procedure B: Otherwise the POI shall not override the subscriber's privacy options.

9.5.2 Privacy Procedures

The SLPP shall contain the privacy options defined in the HLR of the UE subscriber.

The SLPP shall be downloaded to the VMSC, MSC Server and SGSN together with the rest of his subscription information in the existing operation INSERT_SUBSCRIBER_DATA. It will be deleted with the existing operation DELETE_SUBSCRIBER_DATA.

The POI is transferred from the GMLC to the VMSC/MSC Server/SGSN in the location request. Based on the location of the GMLC the VMSC/MSC Server/SGSN evaluates whether to accept or ignore the received POI according to the definition in subclause.

If the POI is accepted the location requested is unconditionally performed. Otherwise if the POI is ignored the VMSC/MSC Server/SGSN evaluates the privacy options in the UE subscriber's subscription profile (assuming this is held in the VLR/MSC Server/SGSN). If the corresponding register does not contain the UE subscription profile, LCS will rely on the existing GSM recovery mechanisms to obtain the profile.

If the location request is allowed by the privacy options the location request is performed. Otherwise, if the location request is barred by the privacy options, the location request is refused an error response is returned to the GMLC with a cause code indicating that the request was rejected by the subscriber.

9.5.3 ~~MS~~UE Privacy Options

The UE privacy options in the SLPP apply to an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR and either indicate that no CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR is allowed for the UE (except as may be overridden by the POI or local regulatory requirements) or define the particular classes of LCS client for which an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR for location are allowed, with the following classes being possible:

[Editor's note: The text in this chapter became rather complex when combining several input documents, so the chapter should be edited for clarity. An e-mail comment pointed out that there are different cases still to be covered in the description of the classes: 1. the LCS Client identity is included in SLPP or 2. the LCS Client identity is NOT included in SLPP. Also some GMLC restriction conditions need to be mentioned.]

a) Universal Class – allow positioning by all LCS clients

b) Call/Session related Class – allow positioning by specific identified LCS client or groups of LCS Client to which the UE originated a call in CS domain or an LCS client with which the UE has a session via an active PDP context in PS domain indicated by a specific APN. For all clients in the call related class, OR For each identified LCS client or group of LCS Clients, one of the following subscription options shall apply:

[NOTE: usage of APN is FFS in PS domain, e.g. using wild card APN as a global LCS client identity should be considered.]

- Location request allowed only from GMLCs identified in the SLPP

- Location request allowed only from a GMLC in the home country

- Location request allowed from any GMLC (default case)

For each identified value added LCS client or group of LCS Clients in the privacy exception list, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

NOTE: The usage of Call/Session related Class in the IM subsystem is FFS.

c) Call/Session-unrelated Class – allow positioning by specific identified LCS Clients or groups of LCS Client with the following restrictions allowed for each identified LCS Client or group of LCS Clients

- Location request allowed only from GMLCs identified in the SLPP

- Location request allowed only from a GMLC in the home country

- Location request allowed from any GMLC (default case)

For each identified value added LCS client in the privacy exception list, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a non-call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

d) PLMN operator Class – 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

All UE privacy options of above four classes are commonly used for both CS and PS domain.

Note: If a privacy option setting in a domain is updated, same modification will be applied to the other domain.

If the UE subscribes to the universal class, any CS-MT-LR or NI-LR shall be allowed by the VMSC/MSC Server and any PS-MT-LR or PS-NI-LR shall be allowed by the SGSN. If local regulatory requirements mandate it, any MT-LR for an emergency services LCS client and any NI-LR for an emergency services call origination shall be allowed by the VMSC/MSC Server.

If the UE subscribes to the call/session-related class, an CS-MT-LR may be allowed if both of following conditions are met:

- The UE previously originated a call in CS domain that is still established and the called party number either dialled by the UE or used by the VMSC/MSC Server for routing matches the called party number received from the GMLC.

- The identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the ~~MS's~~ UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met

If these conditions are satisfied, the CS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that

location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the CS-MT-LR shall be restricted.

If the UE subscribes to the call/session-related class, a PS-MT-LR may be allowed if both of the following conditions are met:

- The UE previously originated a PDP-context towards the network where the external client is located and that this context is still established

- The APN negotiated between the UE and SGSN matches the APN received from the GMLC.

If these conditions are satisfied, the PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the PS-MT-LR shall be restricted.

If the UE subscribes to the call/session related class, a CS-MT-LR or PS-MT-LR from an LCS client that is NOT contained in the SLPP of the target UE shall be allowed or restricted according to the following conditions:

- For any non-matched LCS client, the CS-MT-LR or PS-MT-LR shall be allowed, if the UE user subscribes to either location without notification or location with notification.

- If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR or PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR or PS-MT-LR shall be restricted.

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR may be allowed by the MSC/MSC server or SGSN if the identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the ~~MS~~UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met.

If the LCS client is correctly matched in this way and any GMLC restrictions are satisfied, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR from an LCS client that is not contained in the ~~MS~~UE's SLPP shall be allowed or restricted according to the following conditions. For any non-matched LCS client, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

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 ~~MS~~UE's SLPP or is otherwise authorized by local regulatory requirements to locate the ~~MS~~UE.

In evaluating privacy where any address "A" associated with the LCS client (e.g. LCS client ID, APN or GMLC address) needs to be compared with a corresponding address "B" in the target ~~MS~~UE's SLPP, a match shall be determined if a match is found for each of the following components of each address:

   a) Numbering Plan

   b) Nature of Address Indicator

   c) Corresponding address digits for all digits in "B" (the digits or initial digits in "A" must match all the digits in "B", but "A" may contain additional digits beyond those in "B")

All addresses shall be transferred to the MSC/VLR, MSC server or SGSN in international format.

9.6 Mobile Originating Location

An UE may subscribe to any of the following classes of mobile originating location:

  A) Basic Self Location

  B) Autonomous Self Location

  C) Transfer to Third Party

An MO-LR shall be allowed by the VMSC if the type of request is supported by the appropriate subscription according to the following table.

Table 9.2: Required UE Subscription Options for MO-LR Requests

Type of MO-LR Request	Required UE Subscription
~~MS~~UE requests own location	Basic Self Location
~~MS~~UE requests location assistance data	Autonomous Self Location
~~MS~~UE requests transfer of own location to another LCS Client	Transfer to Third Party

9.7 CM Procedures

9.7.1 Location request for a mobile in idle-mode

When a request for location information is received at the VMSC the LCS-layer shall order paging of the UE subscriber. In case of first unsuccessful paging, normal paging procedures should apply. After successful paging the LCS-layer shall invoke the location preparation procedure.

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.

10. Information storage

This clause describes information storage structures that are mandatory (M), conditional (C) or optional (O) for LCS, and the recovery and restoration procedures needed to maintain service if inconsistencies in databases occur and for lost or invalid database information. Information storage in RAN network elements is specified in UTRAN Stage 2 [1] and GERAN Stage 2 [16] specifications.

10.1 HLR and HSS

The HLR/HSS holds LCS data for both UE subscribers and LMUs.

10.1.1 LCS Data in the HLR/HSS for an UE Subscriber

The IMSI is the primary key for LCS UE subscription data in the HLR/HSS. This subscription data may be stored in a Multiple Subscriber Profile (MSP), with the HLR/HSS able to hold a number of MSPs per IMSI.

LCS UE subscription data includes a privacy exception list containing the privacy classes for which location of the target UE is permitted. Each privacy class is treated as a distinct supplementary service with its own supplementary service code. The following logical states are applicable to each privacy class (refer to GSM 23.011 for an explanation of the notation):

Table10.1: Logical States for each LCS Privacy Class

Provisioning State	Registration State	Activation State	HLR Induction State
(Not Provisioned,	Not Applicable,	Not Active,	Not Induced)
(Provisioned,	Not Applicable,	Active and Operative,	Not Induced)

For each LCS privacy class, the HLR/HSS shall store the logical state of the class on a per-subscriber (or per subscriber MSP) basis. In addition, the permanent data indicated below shall be stored on a per subscriber (or per subscriber MSP) basis when the logical provisioning state of the associated LCS privacy class is "provisioned". For the meaning of each LCS privacy class, refer to clause 9 and to TS 22.071.

Table 10.2: LCS data stored in the HLR privacy exception list for an UE Subscriber (or UE Subscriber MSP)

LCS Privacy Class	Status	Additional HLR Data when Class is provisioned
Universal Class	-	No additional data
Call/session Related Class	M	Indication of one of the following mutually exclusive options for any LCS client not in the external LCS client list: • Location not allowed • Location allowed without notification (default case) • 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
	[tbd] [tbd] [tbd]	External LCS client list: a list of zero or more LCS clients, with the following data stored for each LCS client in the list: • International E.164 address identifying a single LCS client or a single group of LCS clients that are permitted to locate this target ~~MS~~UE • Restriction on the GMLC. Possible values are: - Identified GMLCs only - Any GMLC in the home country
	[tbd]	• Indication of one of the following mutually exclusive options: - Location allowed without notification (default case) - 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
Call/session Unrelated Class	M	Indication of one of the following mutually exclusive options for any LCS client not in the external LCS client list: • Location not allowed (default case) • 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
	O C	External LCS client list: a list of zero or more LCS clients, with the following data stored for each LCS client in the list: • International E.164 address identifying a single LCS client or a single group of LCS clients that are permitted to locate this target ~~MS~~UE • Restriction on the GMLC. Possible values are: - Identified GMLCs only - Any GMLC in the home country
	O C	• Indication of one of the following mutually exclusive options: - Location allowed without notification (default case) - 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
PLMN Operator Class	O	LCS client list: a list of one or more generic classes of LCS client that are allowed to locate the particular ~~MS~~UE. 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 ~~MS~~UE

LCS UE subscription data may include a mobile originating list containing the LCS mobile originating classes that an UE is permitted to request. Each LCS mobile originating class is treated as a distinct supplementary service with its own supplementary service code. The following logical states are applicable to each mobile originating class (refer to TS 23.011 for an explanation of the notation):

Table 10.3: Logical States for each Mobile Originating LCS Class

Provisioning State	Registration State	Activation State	HLR Induction State
(Not Provisioned,	Not Applicable,	Not Active,	Not Induced)
(Provisioned,	Not Applicable,	Active and Operative,	Not Induced)

For each LCS Mobile Originating class, the HLR/HSS shall store the logical state of the class on a per-subscriber (or per subscriber MSP) basis. In this version of LCS, there is no additional permanent data in the HLR. The table below shows the defined mobile originating classes. For the meaning of each LCS mobile originating class, refer to clause 8 and to GSM 22.071.

Table 10.4: Data stored in the HLR for the LCS Mobile Originating List for an UE (or UE Subscriber MSP)

LCS Mobile Originating Class	Status	Additional HLR Data when Class is provisioned
Basic Self Location	-	No additional data
Autonomous Self Location	-	No additional data
Transfer to Third Party	-	No additional data

In addition to the privacy exception list, the following other data itemsmay be stored in the UE subscription profile in the HLR to support LCS:

Table 10.5: Temporary LCS data in the HLR

Other Data in the HLR	Status	Description
GMLC List	O	List of one or more E.164 addresses of the GMLCs from which a location request for an MT-LR is allowed, The addresses are only relevant to an LCS client that is restricted (in the UE privacy exception list) to making call/session related or call/session unrelated location requests.

10.2 VLR

The VLR contains the same LCS permanent data for each registered UE subscriber, as does the HLR/HSS. This data is downloaded to the VLR as part of the location update procedure between the VLR and HLR/HSS for an UE subscriber.

10.3 GMLC

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.

Table10.6: 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	M	A list of one or more identifiers used to identify an external LCS client when making an MT-LR – the nature and content of the identifier(s) is outside the scope of the present document
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 or APNs (see NOTE) to identify the client for a call related MT-LR Each call related identity may be associated with a specific external identity. Each session-related identity shall be associated with a logical client name.
Call/session-unrelated identity	O	A list of one ore more international E.164 addresses or APNs to identify the client for a non-call related CS-MT-LR/PS-MT-LR. NOTE: A list of IP addresses or other appropriate PS specific identities may be added here. Each non-call related identity may be associated with a specific external identity. Each session-related identity shall be associated with a logical client name.
Client name	O	An address string which is a logical name associated with LCS client's E.164 address.
Override capability	O	Indication of whether the LCS client possesses the override capability (not applicable to a value added client)
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 Separate default QoS parameters may be maintained for each distinct LCS client identity (external, non-call related, call related)
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 • 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

NOTE: The LCS Client is identified with E.164 number or APN. APN is specified in TS 23.003 [18].
The APN identity of the LCS Client should be further defined, e.g. if it is global or GMLC related.

10.4 Recovery and Restoration Procedures

The LCS recovery and restoration procedures allow temporary data to be recovered or reinitialized following loss or corruption of data, such that normal LCS service is rapidly restored and inconsistency between the data held by different LCS network elements is removed. For a full description, refer to TS 23.007.

10.5 Interworking with pre-Rel'4 LCS

This section describes possible scenarios for interworking with a node which support only pre-Rel'4 LCS features and functions.

10.5.1 Interworking with the VLR supporting only pre-Rel'4 LCS

The VLR that supports only pre-Rel'4 LCS cannot handle the extended privacy control for call-related class of the Rel'4 LCS. That is, the VLR cannot provide the call-related class service to the user who subscribes to the Rel'4 LCS. Therefore HLR does not send the subscriber data on call-related class for users who subscribe to the call-related class of Rel'4 LCS to the VLR that supports only pre-Rel'4 LCS. The HLR is notified whether the VLR supports Rel'4 LCS or not by an indication (e.g. Supported LCS phases indicator) from the VLR during location update procedure.

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 ~~MS~~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);

- State;

- 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 ~~MS~~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;

- 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;

- Event (applicable to LDR requests only).

Annex A (informative): Change history

Date	Version	Comment
September 2000	1.0.0	Presented for information to SA#9.
21.11.00	1.1.0	Changes and additions from LCS drafting group 16.11.00, sent out for S2 e-mail approval
4.12.00	1.2.0	S2 e-mail comments received before 4.12.00 included
10.12.00	2.0.0	For approval at SA#10. Same content as v.1.2.0
Editor: Jan Kåll		
Email: jan.kall@nokia.com Telephone: +358400 400056		

History

Document history		

<table>
<tr><td colspan="3" align="right">*CR-Form-v3*</td></tr>
<tr><td colspan="3" align="center">**CHANGE REQUEST**</td></tr>
</table>

| ⌘ | **23.271** CR **017** | ⌘ rev | ⌘ Current version: | **4.0.0** ⌘ |

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

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

Title: ⌘	Restructuring chapter 9.5.3 MS Privacy options	
Source: ⌘	Nokia	
Work item code: ⌘	LCS	***Date:*** ⌘ 20-02-01
Category: ⌘ **D**		***Release:*** ⌘ Rel4

Use one of the following categories:	*Use one of the following releases:*
F *(essential correction)*	*2 (GSM Phase 2)*
A *(corresponds to a correction in an earlier release)*	*R96 (Release 1996)*
B *(Addition of feature),*	*R97 (Release 1997)*
C *(Functional modification of feature)*	*R98 (Release 1998)*
D *(Editorial modification)*	*R99 (Release 1999)*
Detailed explanations of the above categories can	*REL-4 (Release 4)*
be found in 3GPP TR 21.900.	*REL-5 (Release 5)*

Reason for change: ⌘	Chapter 9.5.3 MS privacy options is restructured for increased readability
Summary of change: ⌘	The privacy classes are described in separate subchapters. Text describing how the different classes are to be interpreted is moved to the corresponding new subchapter describing the corresponding class
Consequences if not approved: ⌘	

Clauses affected: ⌘	9.5.3
Other specs Affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

3G TS 23.271 V 2.0.0 (2000-12)

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
Functional stage 2 description of LCS (Release 4)

9.5 Privacy

9.5.1 Privacy Override Indicator (POI)

< No change >

9.5.2 Privacy Procedures

< No change >

9.5.3 ~~MS~~UE Privacy Options

The UE privacy options in the SLPP apply to an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR and either indicate that no CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR is allowed for the UE (except as may be overridden by the POI or local regulatory requirements) or define the particular classes of LCS client for which an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR for location are allowed, with the following classes being possible:

> [Editor's note: ~~The text in this chapter became rather complex when combining several input documents, so the chapter should be edited for clarity.~~ An e-mail comment pointed out that there are different cases still to be covered in the description of the classes: 1. the LCS Client identity is included in SLPP or 2. the LCS Client identity is NOT included in SLPP. Also some GMLC restriction conditions need to be mentioned.]

a) Universal Class – allow positioning by all LCS clients

b) Call/Session related Class

c) Call/Session-unrelated Class

d) PLMN operator Class

[Editorial note, not part of CR: the text below was moved from the end of chapter 9.5.3. One proposed change is indicated with revision marks.]

All UE privacy options of above four classes are commonly used for both CS and PS domain.
Note: If a privacy option setting in a domain is updated, the same modification will ~~will shall~~ be applied to the other domain.
The classes and corresponding subscription options are described below.

9.5.3.1 Universal Class

When the user of the UE subscribes to the "Universal Class" the CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR positioning is allowed by all LCS clients.

[Editorial note, not part of CR: the text below was moved unchanged from the end of chapter 9.5.3.]

If the UE subscribes to the universal class, any CS-MT-LR or NI-LR shall be allowed by the VMSC/MSC Server and any PS-MT-LR or PS-NI-LR shall be allowed by the SGSN. If local regulatory requirements mandate it, any MT-LR for an emergency services LCS client and any NI-LR for an emergency services call origination shall be allowed by the VMSC/MSC Server.

9.5.3.2 Call/Session related Class

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

~~Call/Session related Class - a~~Allow positioning by specific identified LCS client or groups of LCS Client to which the UE originated a call in CS domain or an LCS client with which the UE has a session via an active PDP context in PS

domain indicated by a specific APN. For all clients in the call related class, OR For each identified LCS client or group of LCS Clients, one of the following subscription options shall apply:

> [NOTE: usage of APN is FFS in PS domain, e.g. using wild card APN as a global LCS client identity should be considered.]

- Location request allowed only from GMLCs identified in the SLPP

- Location request allowed only from a GMLC in the home country

- Location request allowed from any GMLC (default case)

For each identified value added LCS client or group of LCS Clients in the privacy exception list, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

> NOTE: The usage of Call/Session related Class in the IM subsystem is FFS.

9.5.3.2.1   Call/session-related class in the CS-domain

[Editorial note, not part of CR: the text below was moved unchanged from the end of chapter 9.5.3, only headline added.]

If the UE subscribes to the call/session-related class, an CS-MT-LR may be allowed if both of following conditions are met:

- The UE previously originated a call in CS domain that is still established and the called party number either dialled by the UE or used by the VMSC/MSC Server for routing matches the called party number received from the GMLC.

- The identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the ~~MS's~~UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met

 If these conditions are satisfied, the CS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the CS-MT-LR shall be restricted.

9.5.3.2.2   Call/session-related class in the PS-domain

[Editorial note, not part of CR: the text below was moved unchanged from the end of chapter 9.5.3, only headline added.]

If the UE subscribes to the call/session-related class, a PS-MT-LR may be allowed if both of the following conditions are met:

-    The UE previously originated a PDP-context towards the network where the external client is located and that this context is still established

-    The APN negotiated between the UE and SGSN matches the APN received from the GMLC.

If these conditions are satisfied, the PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the PS-MT-LR shall be restricted.

9.5.3.2.3   Call/session-related class when LCS client not in SLPP

[Editorial note, not part of CR: the text below was moved unchanged from the end of chapter 9.5.3, only headline added.]

If the UE subscribes to the call/session related class, a CS-MT-LR or PS-MT-LR from an LCS client that is NOT contained in the SLPP of the target UE shall be allowed or restricted according to the following conditions:

-    For any non-matched LCS client, the CS-MT-LR or PS-MT-LR shall be allowed, if the UE user subscribes to either location without notification or location with notification.

-    If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR or PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR or PS-MT-LR shall be restricted.

9.5.3.3   Call/Session-unrelated Class

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

e) Call/Session-unrelated Class   aAllow positioning by specific identified LCS Clients or groups of LCS Client with the following restrictions allowed for each identified LCS Client or group of LCS Clients:

   ▪   Location request allowed only from GMLCs identified in the SLPP

   ▪   Location request allowed only from a GMLC in the home country

   ▪   Location request allowed from any GMLC (default case)

For each identified value added LCS client in the privacy exception list, one of the following subscription options shall apply:

   ▪   positioning allowed without notifying the UE user (default case)

   ▪   positioning allowed with notification to the UE user

   ▪   positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

   ▪   positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a non-call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

9.5.3.3.1   Call/session-unrelated class when LCS client identities match

[Editorial note, not part of CR: the text below was moved unchanged from the end of chapter 9.5.3, only headline added.]

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR may be allowed by the MSC/MSC server or SGSN if the identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the ~~MS~~UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met.

If the LCS client is correctly matched in this way and any GMLC restrictions are satisfied, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

9.5.3.3.2   Call/session-unrelated class when LCS client identities do not match

[Editorial note, not part of CR: the text below was moved unchanged from the end of chapter 9.5.3, only headline added.]

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR from an LCS client that is not contained in the ~~MS~~UE's SLPP shall be allowed or restricted according to the following conditions. For any non-matched LCS client, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to location with notification, ~~but not allowed if the UE user subscribes to location without notification[?]~~. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

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:

d) PLMN operator Class   a~~A~~llow 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

[Editorial note, not part of CR: the text below was moved unchanged from the end of chapter 9.5.3]

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 ~~MS~~UE's SLPP or is otherwise authorized by local regulatory requirements to locate the ~~MS~~UE.

[Editorial note, not part of CR: the text deleted below was moved to previous chapters in this document.]

~~All UE privacy options of above four classes are commonly used for both CS and PS domain.~~

~~Note: If a privacy option setting in a domain is updated, same modification will be applied to the other domain.~~

~~If the UE subscribes to the universal class, any CS-MT-LR or NI-LR shall be allowed by the VMSC/MSC Server and any PS-MT-LR or PS-NI-LR shall be allowed by the SGSN. If local regulatory requirements mandate it, any MT-LR for an emergency services LCS client and any NI-LR for an emergency services call origination shall be allowed by the VMSC/MSC Server.~~

~~If the UE subscribes to the call/session-related class, an CS-MT-LR may be allowed if both of following conditions are met:~~

~~- The UE previously originated a call in CS domain that is still established and the called party number either dialled by the UE or used by the VMSC/MSC Server for routing matches the called party number received from the GMLC.~~

~~- The identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's/UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met~~

~~If these conditions are satisfied, the CS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the CS-MT-LR shall be restricted.~~

~~If the UE subscribes to the call/session-related class, a PS-MT-LR may be allowed if both of the following conditions are met:~~

~~- The UE previously originated a PDP-context towards the network where the external client is located and that this context is still established~~

~~- The APN negotiated between the UE and SGSN matches the APN received from the GMLC.~~

~~If these conditions are satisfied, the PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the PS-MT-LR shall be restricted.~~

~~If the UE subscribes to the call/session-related class, a CS-MT-LR or PS-MT-LR from an LCS client that is NOT contained in the SLPP of the target UE shall be allowed or restricted according to the following conditions:~~

~~- For any non-matched LCS client, the CS-MT-LR or PS-MT-LR shall be allowed, if the UE user subscribes to either location without notification or location with notification.~~

~~- If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR or PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR or PS-MT-LR shall be restricted.~~

~~If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR may be allowed by the MSC/MSC server or SGSN if the identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met.~~

~~If the LCS client is correctly matched in this way and any GMLC restrictions are satisfied, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no~~

~~response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.~~

~~If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR from an LCS client that is not contained in the MS's SLPP shall be allowed or restricted according to the following conditions. For any non-matched LCS client, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.~~

~~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 MS's SLPP or is otherwise authorized by local regulatory requirements to locate the MS.~~

9.5.3.5 Matching of LCS client identities

In evaluating privacy where any address "A" associated with the LCS client (e.g. LCS client ID, APN or GMLC address) needs to be compared with a corresponding address "B" in the target ~~MS~~UE's SLPP, a match shall be determined if a match is found for each of the following components of each address:

a) Numbering Plan

b) Nature of Address Indicator

c) Corresponding address digits for all digits in "B" (the digits or initial digits in "A" must match all the digits in "B", but "A" may contain additional digits beyond those in "B")

All addresses shall be transferred to the MSC/VLR, MSC server or SGSN in international format.

CR-Form-v3

CHANGE REQUEST

⌘ **23.271** CR **018** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

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

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

Title: ⌘	Correction on the privacy check for session related class	
Source: ⌘	Fujitsu Limited	
Work item code: ⌘	LCS1	*Date:* ⌘ 26/02/2001
Category: ⌘	**F**	*Release:* ⌘ REL-4

Use <u>one</u> of the following categories:
F *(essential 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: ⌘	For session related class service in PS domain, the handling of External LCS Client list and GMLC number in SLPP for privacy checking is the same as CS domain. However in section 9.5.3 the handling of them is missing for session related class service.
Summary of change: ⌘	The handling of External LCS Client list and GMLC number in SLPP for privacy checking was added to session related class in PS domain.
Consequences if not approved: ⌘	PS-MT-LR may be allowed for the LCS Client to which user doesn't give any permission.

Clauses affected: ⌘	9.5.3
Other specs affected: ⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

9.5.3   MS Privacy Options

The UE privacy options in the SLPP apply to an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR and either indicate that no CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR is allowed for the UE (except as may be overridden by the POI or local regulatory requirements) or define the particular classes of LCS client for which an CS-MT-LR/PS-MT-LR or NI-LR/PS-NI-LR for location are allowed, with the following classes being possible:

[Editor's note: The text in this chapter became rather complex when combining several input documents, so the chapter should be edited for clarity. An e-mail comment pointed out that there are different cases still to be covered in the description of the classes: 1. the LCS Client identity is included in SLPP or 2. the LCS Client identity is NOT included in SLPP. Also some GMLC restriction conditions need to be mentioned.]

a) Universal Class – allow positioning by all LCS clients

b) Call/Session related Class – allow positioning by specific identified LCS client or groups of LCS Client to which the UE originated a call in CS domain or an LCS client with which the UE has a session via an active PDP context in PS domain indicated by a specific APN. For all clients in the call related class, OR For each identified LCS client or group of LCS Clients, one of the following subscription options shall apply:

[NOTE: usage of APN is FFS in PS domain, e.g. using wild card APN as a global LCS client identity should be considered.]

- Location request allowed only from GMLCs identified in the SLPP

- Location request allowed only from a GMLC in the home country

- Location request allowed from any GMLC (default case)

For each identified value added LCS client or group of LCS Clients in the privacy exception list, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

NOTE: The usage of Call/Session related Class in the IM subsystem is FFS.

c) Call/Session-unrelated Class – allow positioning by specific identified LCS Clients or groups of LCS Client with the following restrictions allowed for each identified LCS Client or group of LCS Clients

- Location request allowed only from GMLCs identified in the SLPP

- Location request allowed only from a GMLC in the home country

- Location request allowed from any GMLC (default case)

For each identified value added LCS client in the privacy exception list, one of the following subscription options shall apply:

- positioning allowed without notifying the UE user (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

For all value added LCS clients sending a non-call related CS-MT-LR/PS-MT-LR that are not identified in the privacy exception list, one of the following subscription option shall apply:

- positioning not allowed (default case)

- positioning allowed with notification to the UE user

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user or if there is no response to the notification

- positioning requires notification and verification by the UE user; positioning is allowed only if granted by the UE user

d) PLMN operator Class – 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

All UE privacy options of above four classes are commonly used for both CS and PS domain.

Note: If a privacy option setting in a domain is updated, same modification will be applied to the other domain.

If the UE subscribes to the universal class, any CS-MT-LR or NI-LR shall be allowed by the VMSC/MSC Server and any PS-MT-LR or PS-NI-LR shall be allowed by the SGSN. If local regulatory requirements mandate it, any MT-LR for an emergency services LCS client and any NI-LR for an emergency services call origination shall be allowed by the VMSC/MSC Server.

If the UE subscribes to the call/session-related class, an CS-MT-LR may be allowed if both of following conditions are met:

- The UE previously originated a call in CS domain that is still established and the called party number either dialled by the UE or used by the VMSC/MSC Server for routing matches the called party number received from the GMLC.

- The identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's/UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met

 If these conditions are satisfied, the CS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the CS-MT-LR shall be restricted.

If the UE subscribes to the call/session-related class, a PS-MT-LR may be allowed if ~~both~~ all of the following conditions are met:

- The UE previously originated a PDP-context towards the network where the external client is located and that this context is still established

- The APN negotiated between the UE and SGSN matches the APN received from the GMLC.

- The identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the UE's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met

If these conditions are satisfied, the PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to allowing location in the absence of a response. In all other cases, the PS-MT-LR shall be restricted.

If the UE subscribes to the call/session related class, a CS-MT-LR or PS-MT-LR from an LCS client that is NOT contained in the SLPP of the target UE shall be allowed or restricted according to the following conditions:

- For any non-matched LCS client, the CS-MT-LR or PS-MT-LR shall be allowed, if the UE user subscribes to either location without notification or location with notification.

- If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR or PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR or PS-MT-LR shall be restricted.

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR may be allowed by the MSC/MSC server or SGSN if the identity of the LCS client or LCS client group supplied by the GMLC matches the identity of any LCS Client or LCS Client group contained in the MS's SLPP and any other GMLC restrictions associated with this LCS Client identity in the SLPP are also met.

If the LCS client is correctly matched in this way and any GMLC restrictions are satisfied, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to either location without notification or location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

If the UE subscribes to the call/session-unrelated class, an CS-MT-LR/PS-MT-LR from an LCS client that is not contained in the MS's SLPP shall be allowed or restricted according to the following conditions. For any non-matched LCS client, the CS-MT-LR/PS-MT-LR shall be allowed if the UE user subscribes to location with notification. If the UE user subscribes to location with notification and privacy verification, the CS-MT-LR/PS-MT-LR shall be allowed following notification to the UE if the UE user either returns a response indicating that location is allowed or returns no response but subscribes to location in the absence of a response. In all other cases, the CS-MT-LR/PS-MT-LR shall be restricted.

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 MS's SLPP or is otherwise authorized by local regulatory requirements to locate the MS.

In evaluating privacy where any address "A" associated with the LCS client (e.g. LCS client ID, APN or GMLC address) needs to be compared with a corresponding address "B" in the target MS's SLPP, a match shall be determined if a match is found for each of the following components of each address:

a) Numbering Plan

b) Nature of Address Indicator

c) Corresponding address digits for all digits in "B" (the digits or initial digits in "A" must match all the digits in "B", but "A" may contain additional digits beyond those in "B")

All addresses shall be transferred to the MSC/VLR, MSC server or SGSN in international format.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **23.271** CR **021** | ⌘ | rev | **1** | ⌘ | Current version: | **4.0.0** | ⌘ |

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

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

Title: ⌘	Paging Procedure in PS-MT-LR	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 2001-02-19
Category: ⌘ **F**		***Release:*** ⌘ Rel4

Use one of the following categories:	*Use one of the following releases:*
F *(essential correction)*	*2 (GSM Phase 2)*
A *(corresponds to a correction in an earlier release)*	*R96 (Release 1996)*
B *(Addition of feature),*	*R97 (Release 1997)*
C *(Functional modification of feature)*	*R98 (Release 1998)*
D *(Editorial modification)*	*R99 (Release 1999)*
Detailed explanations of the above categories can	*REL-4 (Release 4)*
be found in 3GPP TR 21.900.	*REL-5 (Release 5)*

Reason for change: ⌘	Due to inconsistency and open issues in the paging handling for PS, compared to CS, there is a need to perform some alignments in the text for PS.
Summary of change: ⌘	The unclear issues related to the paging procedure in PS-MT-LR are removed by the following motivations: ⇨ The paging procedures for CS and PS in UMTS should be aligned, i.e. the paging procedures for Iu-cs and Iu-ps should be the same. ⇨ The paging procedures for PS are already described in TS 23.060, the general GPRS stage 2 specification, and there should be no reason to have duplicated information that only might lead to inconsistency.
Consequences if not approved: ⌘	It will not be clear how to handle the paging procedures on the Iu interface.

Clauses affected: ⌘	9.1.5

Other specs Affected: ⌘	☐ Other core specifications	⌘	
	☐ Test specifications		
	☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

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

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

Figure 9.4 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, PDP address or IMSI.
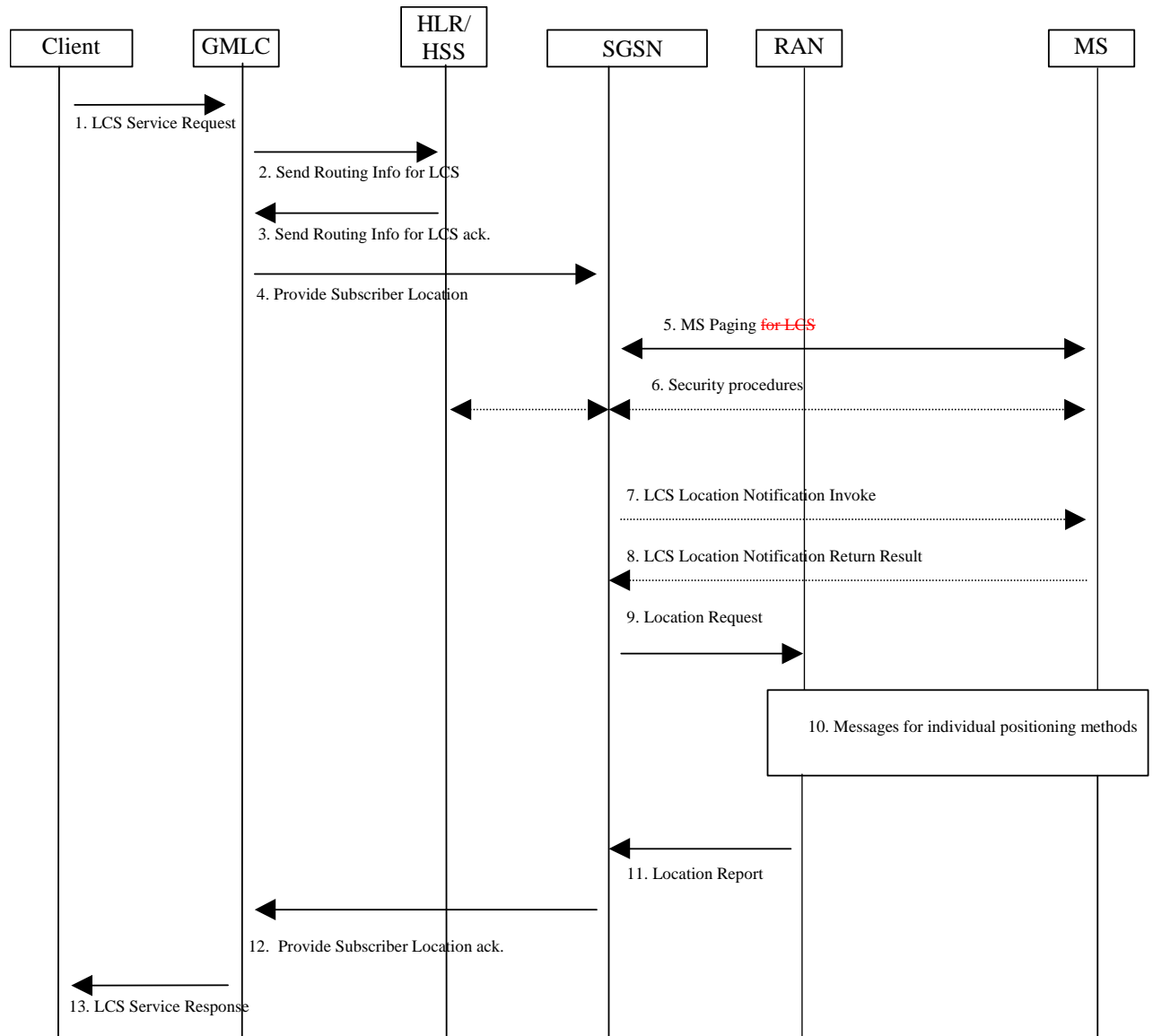

Figure 9.4: General Network Positioning for Packet Switched MT-LR

Location Preparation Procedure

(1) An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the PDP address, (NOTE: IP addressing in this context is FFS). MSISDN or IMSI of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. If location is required for more than one UE steps 2 to 13 above may be repeated.

(2) If the GMLC already knows both the SGSN location and IMSI for the particular PDP address or MSISDN (e.g. from a previous location request), this step and step 3 may be skipped. Otherwise, the GMLC sends a Send Routing Info for LCS message to the home HLR of the target UE to be located with the IMSI, PDP address or MSISDN of this MS.

(3) The HLR verifies that the SCCP calling party address of the GMLC, corresponds to a known GSM/UMTS network element that is authorized to request UE location information. The HLR then returns one or several of the addresses, the current SGSN, VMSC and/or MSC Server, conceivably prioritizing one of the addresses to be used for positioning the UE and whichever of the IMSI or MSISDN was not provided in step (2) for the particular MS.

(4) 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. In case SGSN is chosen then the 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. The message shall carry the identity of the LCS client. This identity is APN for session related privacy class. For a value added LCS client, the message shall carry the client name.

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

Otherwise, if the UE is in idle mode, the SGSN performs paging. for location services. Paging is performed at the SGSN by sending a paging message indicating "Paging for LCS" to the RAN. The paging procedure is defined in TS 23.060[19].

NOTE: "Paging for LCS" is for further study. In order to ease readibility within the figure the Paging is shown as an arrow from the SGSN towards the UE. However it is recognised that the RAN will send the relevant information over the Radio Interface corresponding to the Paging request from the SGSN.

FFS: "*The UE may be paged for location services even when in UMTS a signaling connection between mobile station and the network is established and in GSM when in Ready Mode. This makes it possible for the UE to start preparing an anticipated location service coming later by e.g. starting to measure GPS signals.*"
In GSM upon receipt of a Packet Paging Request message indicating paging for LCS, the UE shall respond with a layer 3 LCS Paging Response.
In UMTS upon receipt of a Packet Paging Request message indicating paging for LCS, the UE shall send a Service Request to establish PS signaling connection.

(6) Security functions may be executed. These procedures are defined in TS 23.060[19].

(7) If the location request comes from a value added LCS client and the UE subscription profile indicates that the UE must either be notified or notified with privacy verification and the UE supports notification of LCS, a notification invoke message is sent to the target UE indicating the type of location request (e.g. current location) and the identity of the LCS client and whether privacy verification is required. Optionally, the SGSN may after sending the LCS Location Notification Invoke message continue in parallel the location process, i.e. continue to step 9 without waiting for a LCS Location Notification Return Result message in step 8.

8.2.4 Paging Initiated by CN

A CN node requests paging only for MSs in CMM-IDLE state or PMM-IDLE state. In the separate CN architecture, paging from a CN node is done independently from the state of the MS in the other CN service domain.

In this alternative with paging co-ordination in the UTRAN, the MS does not need to listen to the PCH (Paging Channel) in the RRC Connected mode, at least not when MS is allocated a dedicated channel.

For each paging request received from a CN node, the RNC determines whether the MS has an established RRC connection or not. In order to achieve this, the context that is prepared within the SRNC for MS in RRC Connected mode must contain the IMSI, which is the common MS identity for the two CN domains.

If no context is found for the MS, "normal PCH paging" is performed. The paging message is transferred on the paging channel, and it includes the MS paging identity received from the CN and a CN service domain type indication.

If a context is found, a "CN paging message" is transferred using the existing RRC connection. This message includes a CN service domain type indication.

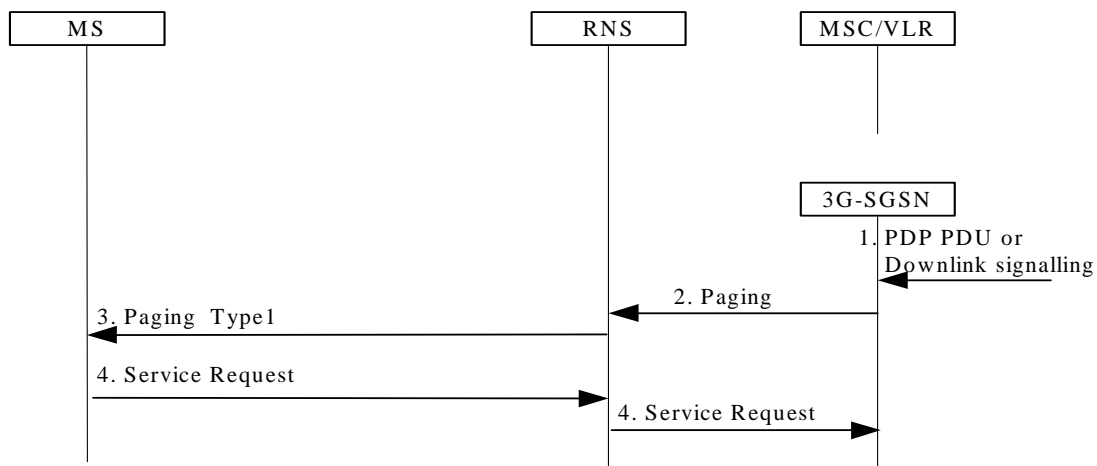### 8.2.4.1 PS Paging Initiated by 3G-SGSN without RRC Connection for CS

Figure 1: PS Paging Without RRC Connection for CS

1) The 3G-SGSN receives a PDP PDU or downlink signalling for an MS in PMM Idle state.

2) The 3G-SGSN sends a RANAP Paging (IMSI, P-TMSI, Area, CN Domain Indicator, DRX parameters) message to each RNS belonging to the routeing area in which the MS located. IMSI is needed by the RNS in order to calculate the MS paging group, and to identify the paged MS. If 3G-SGSN assigned the P-TMSI to the MS, P-TMSI is also included. Area indicates the routeing area in which the MS is paged. CN Domain Indicator indicates which domain (MSC or 3G-SGSN) initiated the paging message, and it represents "SGSN" in this case. DRX Parameters indicates whether or not the MS uses discontinuous reception and the DRX cycle length.

3) The RNS controls whether the MS has an established RRC connection or not. In this case, MS has no RRC connection, so a "normal PCH paging" is performed. Paging Type 1(IMSI or P-TMSI, Paging originator, CN domain ID) is transferred on the Paging channel, IMSI or

P-TMSI identifies the MS. Paging originator indicates whether this is core network originated paging or UTRAN originated paging, so it represents "CN" in this case. And CN domain ID indicates whether this paging message is for CS service or PS service, so it represents "PS" in this case.

4) The paging request triggers the Service Request procedures in the MS. The service request procedures are described in subclause "Service Request Procedure (UMTS Only)".

Optionally, 3G-SGSN may include "Non Searching Indication" in RANAP Paging message in this case. If a "Non Searching Indication" parameter is present, the RNC will not search the established RRC connection, and just initiate "normal PCH paging".

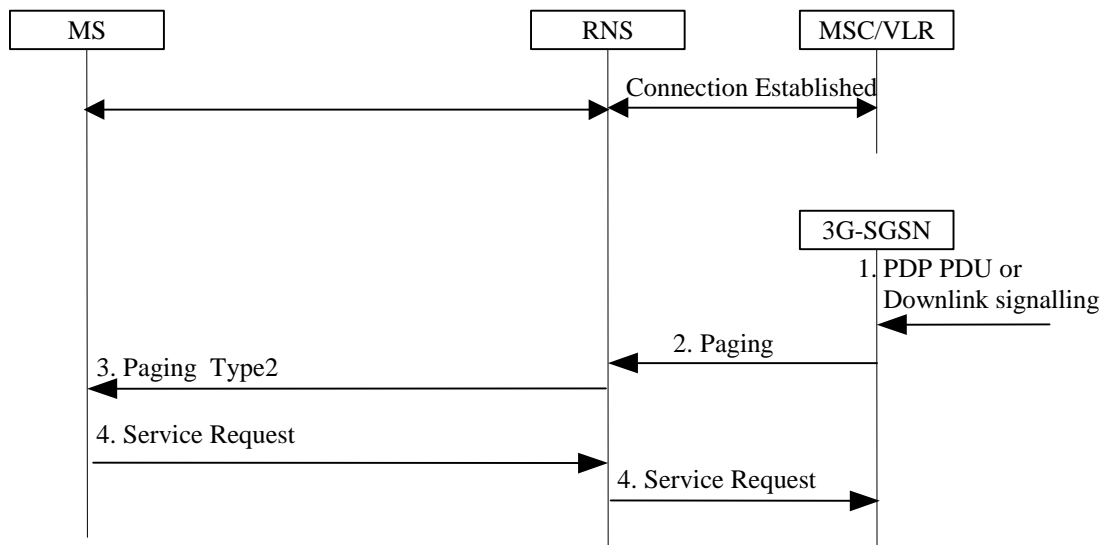## 8.2.4.2 PS Paging Initiated by 3G-SGSN With RRC Connection for CS

Figure 2: PS Paging With RRC Connection for CS

1) The 3G-SGSN receives a PDP PDU or downlink signalling for an MS in PMM Idle state.

2) The 3G-SGSN sends a RANAP Paging (IMSI, P-TMSI, Area, CN Domain Indicator, DRX parameters) message to each RNS belonging to the routeing area in which the MS is located. IMSI is needed by the RNS in order to calculate the MS paging group. If 3G-SGSN assigned the P-TMSI to the MS, P-TMSI is included, and it identifies the MS is paged. Area indicates the routeing area in which the MS is paged. CN Domain Indicator indicates to which domain (MSC or 3G-SGSN) the paging was initiated, and it represents "3G-SGSN" in this case. DRX Parameters indicates whether or not the MS uses discontinuous reception and the DRX cycle length.

3) The RNS controls whether the MS has an established RRC connection or not. In this case, MS has an established RRC connection for CS service, so RNS sends a RRC Paging Type 2(CN domain ID) message to the MS on established RRC connection. CN Domain ID indicates to which domain (CS or PS) the paging shall be directed, so it represents "PS" in this case.

4) The paging request triggers the Service Request procedures in the MS. The service request procedures are described in subclause "Service Request Procedure (UMTS Only)".

CR-Form-v3

CHANGE REQUEST

⌘ **03.71** CR **A020** ⌘ rev **A** ⌘ Current version: **7.4.0** ⌘

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

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

Title: ⌘	Geographic Shape restriction in LCS	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 08-Mar-2001
Category: ⌘	F	***Release:*** ⌘ R98

Use one of the following categories:
F (essential 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)

Reason for change: ⌘	In the US, national interim standard TIA/EIA/IS-J-STD-036 restricts the geographic shape for an emergency service LCS client to minimally either an "ellipsoid point" or an "ellipsoid point with uncertainty circle and confidence" as defined in GSM TS 03.32.
Summary of change: ⌘	For certain LCS Clients, the geographic shape returned by an SMLC may be restricted in GSM or in national specific standards.
Consequences if not approved: ⌘	In the US, emergency location services will not work in case geographical shapes other than "ellipsoid point" and "ellipsoid point with uncertainty circle and confidence" are returned by the SMLC.

Clauses affected: ⌘	2, 7.6.1.2, 7.6.6.3

Other specs affected: ⌘	☐ Other core specifications ⌘		
	☐ Test specifications		
	☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1]   GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2]   GSM 02.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Service description; Stage 1".

[3]   GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration Procedures".

[3a]   GSM 03.32: "Universal Geographical Area Description (GAD)"

[4]   GSM 03.41: "Digital cellular telecommunication system (Phase 2+); Technical realization of Short Message Service Cell Broadcast (SMSCB)".

[5]   GSM 03.49: "Digital cellular telecommunication system (Phase 2+); Example protocol stacks for interconnecting Cell Broadcast Centre (CBC) and Mobile-services Switching Centre (MSC)".

[6]   GSM 03.78:   "Digital cellular telecommunications system (Phase 2+); Customized Application for Mobile network Enhanced Logic (CAMEL) Phase 3; Stage 3".

[6a]   GSM 04.06: "Digital cellular telecommunications system (Phase 2+); Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".

[7]   GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[8]   GSM 04.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Mobile Station (MS) – Serving Mobile Location Center (SMLC); Radio Resource LCS Protocol (RRLP)".

[9]   GSM 04.71: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 Location Services (LCS) specification".

[10]   GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile-services Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification".

[11]   GSM 08.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Center (SMLC) – Serving Mobile Location Center (SMLC); SMLC Peer Protocol (SMLCPP)".

[11a]   GSM 08.58: "Digital cellular telecommunications system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 3 specification".

[12]   GSM 08.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Center – Base Station Subsystem (SMLC-BSS) interface Layer 3 specification".

[13]   GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[14]   GSM 09.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Base Station System Application Part LCS Extension (BSSAP-LE)".

[15]   CCITT Recommendations I.130: "General modelling methods – Method for the characterisation of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[16]   CCITT Recommendation Q.65: "Methodology – Stage 2 of the method for the characterization of services supported by an ISDN".

[17]   TIA/EIA/IS-J-STD-036 – Enhanced Wireless 9-1-1 Phase II, August 2000.

*** NEXT MODIFIED SECTION ***

7.6.1.2   Positioning Measurement Establishment Procedure

11) If the requested location information and the location accuracy within the QoS can be satisfied by the reported cell ID and, if available, TA value, the SMLC may send a MAP_PERFORM_LOCATION ack. immediately. Otherwise, the SMLC determines the positioning method and instigates the particular message sequence for this method defined in subsequent sections. If the position method returns position measurements, the SMLC uses them to compute a location estimate. If there has been a failure to obtain position measurements, the SMLC may use the current cell ID and, if available, TA value to derive an approximate location estimate. If an already computed location estimate is returned for an MS based position method, the SMLC may verify consistency with the current cell ID and, if available, TA value. If the location estimate so obtained does not satisfy the requested accuracy or the location attempt failed, e.g. due to missing data,and sufficient response time still remains, the SMLC may instigate a further location attempt using the same (e.g. providing more assistance data to MS) or a different position method. If a vertical location coordinate is requested but the SMLC can only obtain horizontal coordinates, these may be returned.

Restrictions on the geographic shape encoded within the "position information" parameter may exist for certain LCS client types. The SMLC shall comply with any restrictions defined in GSM and, in a particular country, with any restrictions defined for a specific LCS client type in relevant national standards. For example, in the US, national interim standard TIA/EIA/IS-J-STD-036 restricts the geographic shape for an emergency services LCS client to minimally either an "ellipsoid point" or an "ellipsoid point with uncertainty circle and confidence" as defined in GSM TS 03.32.

*** NEXT MODIFIED SECTION ***

7.6.6.3   Location Calculation and Release Procedure

9)   When a location estimate best satisfying the requested QoS has been obtained or when the requested location assistance data has been transferred to the MS, the SMLC returns a BSSMAP-LE Perform Location response to the VMSC if the SMLC is NSS based. 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 MS, a failure cause is included in the Perform Location response.

Restrictions on the geographic shape encoded within the "position information" parameter may exist for certain LCS client types. The SMLC shall comply with any restrictions defined in GSM and, in a particular country, with any restrictions defined for a specific LCS client type in relevant national standards. For example, in the US, national interim standard TIA/EIA/IS-J-STD-036 restricts the geographic shape for an emergency services LCS client to minimally either an "ellipsoid point" or an "ellipsoid point with uncertainty circle and confidence" as defined in GSM TS 03.32.

10) For a BSS based SMLC, the BSSMAP-LE Perform Location response is instead returned to the serving BSC.

11) In the case of a BSS based SMLC, the BSC forwards the BSSMAP PERFORM LOCATION response received in step 10 to the VMSC.

12) If the MS requested transfer of its location to another LCS client and a location estimate was successfully obtained, the VMSC shall send a MAP Subscriber Location Report to the GMLC obtained in step 4 carrying the MSISDN of the MS, the identity of the LCS client, the event causing the location estimate (MO-LR) and the location estimate and its age.

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

14) The GMLC transfers the location information to the LCS client either immediately or upon request from the client.

15) The VMSC returns a DTAP LCS MO-LR Return Result to the MS carrying any location estimate requested by the MS, ciphering keys or a confirmation that a location estimate was successfully transferred to the GMLC serving an LCS client.

16) The VMSC may release the CM, MM and RR connections to the MS, if the MS was previously idle, and the VMSC may record billing information.

CR-Form-v3

CHANGE REQUEST

| ⌘ | **03.71** CR **A021** | ⌘ rev **A** ⌘ | Current version: | **8.0.0** | ⌘ |

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

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

Title: ⌘	Geographic Shape restriction in LCS	
Source: ⌘	Ericsson	
Work item code: ⌘	LCS	***Date:*** ⌘ 08-Mar-2001
Category: ⌘	**A**	***Release:*** ⌘ R99

Use <u>one</u> of the following categories:
    F *(essential 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: ⌘	In the US, national interim standard TIA/EIA/IS-J-STD-036 restricts the geographic shape for an emergency service LCS client to minimally either an "ellipsoid point" or an "ellipsoid point with uncertainty circle and confidence" as defined in 3GPP TS 23.032.
Summary of change: ⌘	For certain LCS Clients, the geographic shape returned by an SMLC may be restricted in GSM or in national specific standards.
Consequences if not approved: ⌘	In the US, emergency location services will not work in case geographical shapes other than "ellipsoid point" and "ellipsoid point with uncertainty circle and confidence" are returned by the SMLC.

Clauses affected: ⌘	2, 7.6.1.2, 7.6.6.3
Other specs affected: ⌘	☐ Other core specifications ⌘
	☐ Test specifications
	☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

2   References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1]   GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2]   GSM 02.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Service description; Stage 1".

[3]   GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration Procedures".

[4]   GSM 03.41: "Digital cellular telecommunication system (Phase 2+); Technical realization of Short Message Service Cell Broadcast (SMSCB)".

[5]   GSM 03.49: "Digital cellular telecommunication system (Phase 2+); Example protocol stacks for interconnecting Cell Broadcast Centre (CBC) and Mobile-services Switching Centre (MSC)".

[6]   GSM 03.78:   "Digital cellular telecommunications system (Phase 2+); Customized Application for Mobile network Enhanced Logic (CAMEL) Phase 3; Stage 3".

[6a]   GSM 04.06: "Digital cellular telecommunications system (Phase 2+); Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".

[7]   GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[8]   GSM 04.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Mobile Station (MS) – Serving Mobile Location Center (SMLC); Radio Resource LCS Protocol (RRLP)".

[9]   GSM 04.71: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 Location Services (LCS) specification".

[10]   GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile-services Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification".

[11]   GSM 08.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Center (SMLC) – Serving Mobile Location Center (SMLC); SMLC Peer Protocol (SMLCPP)".

[11a]   GSM 08.58: "Digital cellular telecommunications system (Phase 2+); Base Station Controller - Base Transceiver Station (BSC - BTS) interface; Layer 3 specification".

[12]   GSM 08.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Center – Base Station Subsystem (SMLC-BSS) interface Layer 3 specification".

[13]   GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[14]   GSM 09.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Base Station System Application Part LCS Extension (BSSAP-LE)".

[15]   CCITT Recommendations I.130: "General modelling methods – Method for the characterisation of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[16]   CCITT Recommendation Q.65: "Methodology – Stage 2 of the method for the characterization of services supported by an ISDN".

[17]   TIA/EIA/IS-J-STD-036 – Enhanced Wireless 9-1-1 Phase II, August 2000.

[18]   3GPP TS 23.032: "Universal Geographical Area Description (GAD)"

*** NEXT MODIFIED SECTION ***

7.6.1.2   Positioning Measurement Establishment Procedure

11) If the requested location information and the location accuracy within the QoS can be satisfied by the reported cell ID and, if available, TA value, the SMLC may send a MAP_PERFORM_LOCATION ack. immediately. Otherwise, the SMLC determines the positioning method and instigates the particular message sequence for this method defined in subsequent sections. If the position method returns position measurements, the SMLC uses them to compute a location estimate. If there has been a failure to obtain position measurements, the SMLC may use the current cell ID and, if available, TA value to derive an approximate location estimate. If an already computed location estimate is returned for an MS based position method, the SMLC may verify consistency with the current cell ID and, if available, TA value. If the location estimate so obtained does not satisfy the requested accuracy or the location attempt failed, e.g. due to missing data,and sufficient response time still remains, the SMLC may instigate a further location attempt using the same (e.g. providing more assistance data to MS) or a different position method. If a vertical location coordinate is requested but the SMLC can only obtain horizontal coordinates, these may be returned.

Restrictions on the geographic shape encoded within the "position information" parameter may exist for certain LCS client types. The SMLC shall comply with any restrictions defined in GSM and, in a particular country, with any restrictions defined for a specific LCS client type in relevant national standards. For example, in the US, national interim standard TIA/EIA/IS-J-STD-036 restricts the geographic shape for an emergency services LCS client to minimally either an "ellipsoid point" or an "ellipsoid point with uncertainty circle and confidence" as defined in 3GPP TS 23.032.

*** NEXT MODIFIED SECTION ***

7.6.6.3   Location Calculation and Release Procedure

9) When a location estimate best satisfying the requested QoS has been obtained or when the requested location assistance data has been transferred to the MS, the SMLC returns a BSSMAP-LE Perform Location response to the VMSC if the SMLC is NSS based. 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 MS, a failure cause is included in the Perform Location response.

    Restrictions on the geographic shape encoded within the "position information" parameter may exist for certain LCS client types. The SMLC shall comply with any restrictions defined in GSM and, in a particular country, with any restrictions defined for a specific LCS client type in relevant national standards. For example, in the US, national interim standard TIA/EIA/IS-J-STD-036 restricts the geographic shape for an emergency services LCS client to minimally either an "ellipsoid point" or an "ellipsoid point with uncertainty circle and confidence" as defined in 3GPP TS 23.032.

10) For a BSS based SMLC, the BSSMAP-LE Perform Location response is instead returned to the serving BSC.

11) In the case of a BSS based SMLC, the BSC forwards the BSSMAP PERFORM LOCATION response received in step 10 to the VMSC.

12) If the MS requested transfer of its location to another LCS client and a location estimate was successfully obtained, the VMSC shall send a MAP Subscriber Location Report to the GMLC obtained in step 4 carrying the MSISDN of the MS, the identity of the LCS client, the event causing the location estimate (MO-LR) and the location estimate and its age.

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

14) The GMLC transfers the location information to the LCS client either immediately or upon request from the client.

15) The VMSC returns a DTAP LCS MO-LR Return Result to the MS carrying any location estimate requested by the MS, ciphering keys or a confirmation that a location estimate was successfully transferred to the GMLC serving an LCS client.

16) The VMSC may release the CM, MM and RR connections to the MS, if the MS was previously idle, and the VMSC may record billing information.

3GPP TSG-SA2 Meeting #17   *Tdoc S2-010816*
Gothenburg, Sweden, 26.2-2.3.2001   *(Revised doc S2-010544)*

CR-Form-v3

CHANGE REQUEST

⌘   **23.271** CR **016**   ⌘   rev **1**   ⌘   Current version: **4.0.0**   ⌘

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

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

Title:	⌘	Clarification of CN and RAN classmarks for LCS purposes
Source:	⌘	Nokia
Work item code: ⌘	LCS	***Date:*** ⌘ 20th February 2001

Work item code: ⌘   LCS   ***Date:*** ⌘   20th February 2001

Category: ⌘   D   ***Release:*** ⌘   Release 4

Use one of the following categories:	*Use one of the following releases:*
F *(essential correction)*	*2* *(GSM Phase 2)*
A *(corresponds to a correction in an earlier release)*	*R96* *(Release 1996)*
B *(Addition of feature),*	*R97* *(Release 1997)*
C *(Functional modification of feature)*	*R98* *(Release 1998)*
D *(Editorial modification)*	*R99* *(Release 1999)*
Detailed explanations of the above categories can	*REL-4* *(Release 4)*
be found in 3GPP TR 21.900.	*REL-5* *(Release 5)*

Reason for change:	⌘	Addition of reference related to classmark and UE capability information and a few words about using this information.
Summary of change:	⌘	
Consequences if not approved:	⌘	

Clauses affected:	⌘	Chapters 2.1 4 5.4.2 6.3.4 9.1.1.1 9.2.1.1

Other specs Affected:	⌘	☐ Other core specifications ⌘
		☐ Test specifications
		☐ 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/3G_Specs/CRs.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://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 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.

2. References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

2.1   Normative references

[1]   3G TR 25.305: "Functional stage 2 specification of location services in UTRAN".

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

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

[4]   TS 22.071: "Location Services (LCS); Service description, Stage 1".

[5]   GSM 03.71: "Location Services (LCS); (Functional description) - Stage 2".

[6]   GSM 08.08: "Mobile-services Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification"

[7]   3G TS 22.100: "UMTS phase 1 Release 99".

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

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

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

[11]   TS 23.032 (&GSM03.32): "Universal Geographical Area Description (GAD)"

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

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

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

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

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

[17]   [More references to GSM specifications should be added.]

[18]   3G TS 23.003: "Numbering, addressing and identification"

[19]   3G TS 23.060: "General Packet Radio Service (GPRS);Service description Stage 2"

[20]   3G TS 29.002: "Mobile Application Part (MAP) specification"

[21]   3G TS 24.008: " Mobile radio interface layer 3 specification"

[22]   3G TS 25.331: " RRC Protocol Specification"

2.2   Informative references

[21][23]   Third generation (3G) mobile communication system; Technical study report on the location
                services and technologies, ARIB ST9 December 1998.

[23][24]   The North American Interest Group of the GSM MoU ASSOCIATION: Location Based Services,
                Service Requirements Document of the Services Working Group.

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).

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 [21] and TS 25.331[22].

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 2.1[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.

5.4.2 System handling component

5.4.2.1   Location System Control Function(LSCF)

The Location System Control Function (LSCF) is responsible for co-ordinating location requests. This function manages call-related and non-call-related positioning requests of LCS and allocates network resources for handling them. The LSCF retrieves UE classmark information for the purpose of determining the LCS capabilities of UE.a positioning method. [NOTE: UMTS UE capabilities to be added here.] The LSCF performs call setup if required as part of a LCS e.g., putting the MEUE on dedicated radio resources. It also caters for co-ordinating resources and activities with regard to requests related to providing assistance data needed for positioning. This function interfaces with the LCCF, LSPF, LSBF and PRCF. Using these interfaces, it conveys positioning requests to the PRCF, relays positioning data to the LCCF and passes charging related data to the LSBF.

 The U-LSCF for UTRAN is further described in TS 25.305 [1]2.1, LSCF for GERAN is described in TS 43.059 [16].

6.3 Functional description of LCS per network element

6.3.1 Access Network

< no change >

6.3.2 LCS Clients and LCS applications

< no change >

6.3.3 Gateway Mobile Location Center, GMLC

< no change >

6.3.4 LCS support in the UE

The UE may be involved in the various positioning procedures. Specific UE involvement is specified in each of the positioning procedures specified in TS 25.305 [1] for UTRAN and TS 43.059 [16] for GERAN.

The UE interacts with the measurement co-ordination functions to transmit the needed signals for uplink based LCS measurements and to make measurements of downlink signals. The measurements to be made will be determined by the chosen location method.

The UE may also contain LCS applications, or access a LCS application through communication with a network accessed by the UE or an application residing in the ~~MS~~UE. This application may include the needed measurement and calculation functions to determine the ~~MS~~UE's location with or without assistance of the GSM/UMTS LCS entities.

The UE may also, for example, contain an independent location function (e.g. Global Satellite Positioning Service GPS) and thus be able to report its location, independent of the RAN transmissions. The UE with an independent location function may also make use of information broadcast by the RAN that assists the function.

In GSM the positioning methods supported by the UE are signalled by the UE to the core network and radio access network using Classmark3 in CS mode, as specified in TS 24.008 [21].

In UMTS the UE capability to support different positioning methods is only communicated within UTRAN, as specified in TS 25.331 [22].

The UE informs the core network about its capability to support privacy invocation request and response using Classmark2 in CS mode and MS Network Capability in PS mode, as specified in TS 24.008 [21].

9.1 Mobile Terminating Location Request

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

Figure 9.1 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.
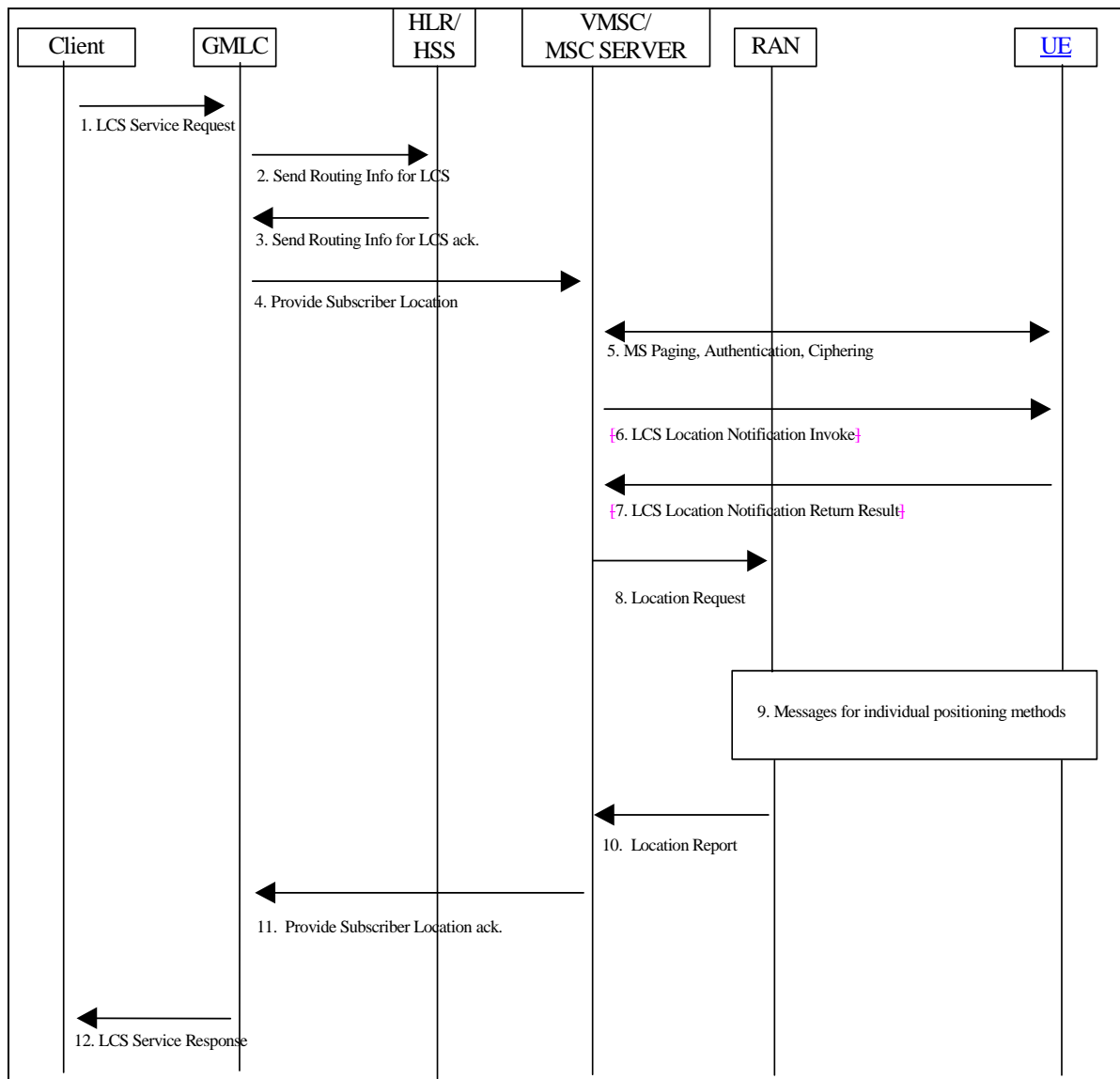

Figure 9.1: General Network Positioning for a CS-MT-LR

9.1.1.1   Location Preparation Procedure

(1)   An external LCS client requests the current location of a target UE from a GMLC. The GMLC verifies the identity of the LCS client and its subscription to the LCS service requested and derives the MSISDN or IMSI of the target UE to be located and the LCS QoS from either subscription data or data supplied by the LCS client. For a call related location request, the GMLC obtains and authenticates the called party number of the LCS client [(refer to Annex A for further details)]. If location is required for more than one UE, or if periodic location is requested, steps 2 to 12 below may be repeated.

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

(3) The HLR/HSS verifies that the calling party SCCP address of the GMLC corresponds to a known GSM/UMTS network element that is authorized to request UE location information. The HLR/HSS then returns the current VMSC/MSC server address and whichever of the IMSI and MSISDN was not provided in step (2) for the particular ~~MS~~UE.

(4) 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. [FFS: For a value added LCS client, the message shall carry the client name and, for a call unrelated location request, the identity of the LCS client. In other cases, inclusion of the client name and/or identity is optional.]

[NOTE: This step is for further study, it should be investigated e.g. which client identities should be required as mandatory, also the impacts of the redefined call/session-related privacy class in the service description TS 22.071 [4] should be considered.]

(5) If the GMLC is located in another PLMN or another country, the VMSC/MSC server first authenticates that a location request is allowed from this PLMN or from this country. If not, an error response is returned. The VMSC/MSC server then verifies LCS barring restrictions in the UE user's subscription profile in the MSC server. In verifying the barring restrictions, barring of the whole location request is assumed if any part of it is barred or any requisite condition is not satisfied. If LCS is to be barred without notifying the target UE and a LCS client accessing a GMLC in the same country does not have the override capability, an error response is returned to the GMLC. Otherwise, if the UE is in idle mode, the Core Network performs paging, authentication and ciphering. ~~If the target UE supports any UE based or UE assisted positioning method(s), t~~The UE will ~~also inform~~provide ~~RAN and MSC/MSC server~~ the network about its LCS capabilities, as described in chapter 6.3.4.~~with the positioning method(s) it supports via UE classmark or UE capability information~~. 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.

~~UE LCS capabilities and classmarks are described in chapter 6.3.4.~~

9.2 Mobile Originating Location Request

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

The following procedure shown in Figure 9.6 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. The procedure may also be used to enable an UE to request that its own location be sent to another LCS client.
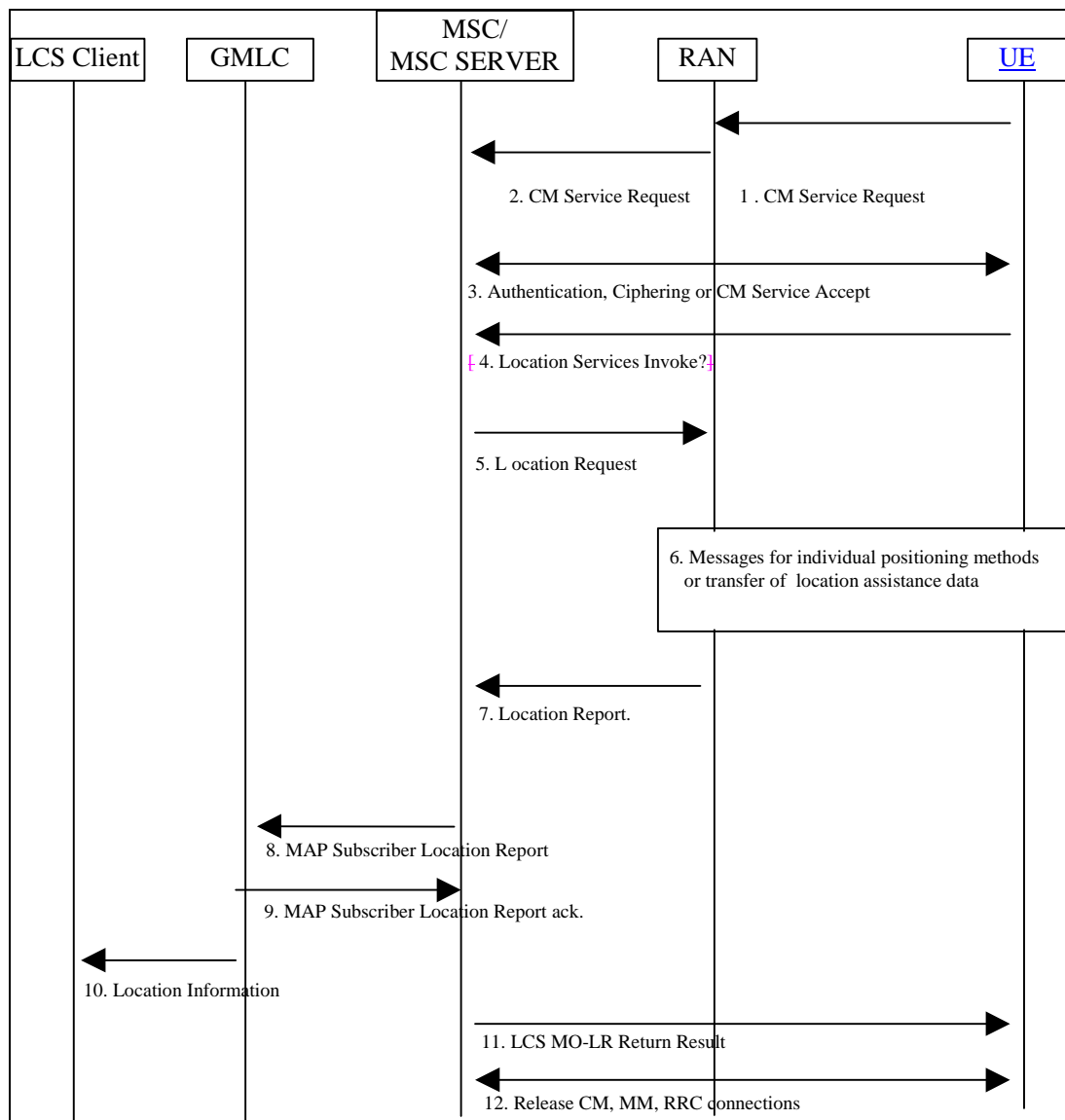

Figure 9.6: General Network Positioning for CS-MO-LR

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. ~~If the target UE supports any UE based or UE assisted positioning method(s), the UE will~~ ~~inform~~ provide ~~RAN and MSC/MSC~~ ~~about its LCS capabilities server with the positioning method(s) it supports via controlled early classmark sending in GSM or UE capability information in UMTS.~~
The UE will inform the network about its LCS capabilities, as described in chapter 6.3.4.
~~UE LCS capabilities and classmarks are described in chapter 6.3.4.~~

. . .

ANNEX

CR to TS 24.008, "Update to Classmark 3 IE to support LCS".

Microsoft Word
Document