Source: **TSG SA WG2**
Title: **CRs on 03.02 and 03.71**
Agenda Item: **5.2.3**

The following CRs have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #6.

On 03.02 R98

TDoc #	CR #	Title	cat
S2-99D86	temp1	Add LCS enhancements	C

On 03.71 R98

TDoc #	CR #	Title
S2-99E41	A003r1	Addition of further LCS functionality in GSM Release 98

3GPP TSG SA WG2/SMG12
Abiko, Japan, 29 Nov-3 Dec 1999

***Document* S2-D86**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

03.02	CR	Atemp	Current Version:	7.0.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	SA2/SMG12	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		For information		non-strategic	X	

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME		UTRAN / Radio		Core Network	X

Source: T1P1.5 **Date:** 18 Nov 1999

Subject: Add LCS enhancements

Work item: Location Services (LCS)

PT SMG CR cover form is available from: http://docbox.etsi.org/tech-org/smg/Document/smg/tools/CR_form/crf28_1.zip

Category: *(one category and one release only shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature	X		Release 98	X
D	Editorial modification			Release 99	
				UMTS	

Reason for change: Add and modify definitions for the new nodes and interfaces introduced by the Location Services (LCS).

Clauses affected:

Other specs affected:

Other releases of same spec		→ List of CRs:
Other core specifications		→ List of CRs:
MS test specifications / TBRs		→ List of CRs:
BSS test specifications		→ List of CRs:
O&M specifications		→ List of CRs:

Other comments:

Introduction

The present document includes references to features which are not part of the Phase 2+ Release 96 of the GSM Technical specifications. All subclauses which were changed as a result of these features contain a marker (see table below) relevant to the particular feature.

The following table lists all features that were introduced after Release 96.

Feature	Designator
Shared Inter-Working Function	$(SIWF)$
General Packet Radio Services	$(GPRS)$
Location Services	(LCS)

2 Definitions and abbreviations

In addition to the abbreviations given in the remainder of this clause others are listed in GSM 01.04.

2.1 Location register

To enable communication to a mobile station the network must know where this mobile station is located. This information is stored in a function named location register.

2.1.1 Home Location Register (HLR)

The Home Location Register (HLR)is the location register to which a mobile subscriber is assigned for record purposes such as subscriber information.

2.1.2 Visitor Location Register (VLR)

The Visitor Location Register (VLR) is the location register, other than the HLR, used by an MSC to retrieve information for, e.g. handling of calls to or from a roaming mobile station currently located in its area.

2.1.3 Serving GPRS Support Node (SGSN) $(GPRS)$

The location register function in the SGSN stores subscription information and location information for each subscriber registered in the SGSN.

The SGSN is needed only in a PLMN which supports GPRS.

2.1.4 Gateway GPRS Support Node (GGSN) $(GPRS)$

The location register function in the GGSN stores subscription information and routeing information (needed to tunnel packet data traffic destined for a GPRS MS to the SGSN where the MS is registered) for each subscriber for which the GGSN has at least one PDP context active.

The GGSN is needed only in a PLMN which supports GPRS.

2.2 Authentication Centre (AuC)

The Authentication Centre (AuC) is an entity which stores data for each mobile subscriber to allow the International Mobile Subscriber Identity (IMSI) to be authenticated and to allow communication over the radio path between the mobile station and the network to be ciphered. The AuC transmits the data needed for authentication and ciphering via the HLR to the VLR, MSC and SGSN which need to authenticate a mobile station.

The procedures used for authentication and ciphering are described more fully in GSM 03.20.

2.3 Equipment Identity Register (EIR)

The Equipment Identity Register (EIR) in the GSM system is the logical entity which is responsible for storing in the network the International Mobile Equipment Identities (IMEIs), used in the GSM system.

The equipment is classified as "white listed", "grey listed", "black listed" or it may be unknown as specified in GSM 02.16 and GSM 09.02.

2.4 Mobile-services Switching Centre (MSC)

The Mobile-services Switching Centre (MSC) constitutes the interface between the radio system and the fixed networks. The MSC performs all necessary functions in order to handle the calls to and from the mobile stations.

In order to obtain radio coverage of a given geographical area a number of base stations are normally required; i.e. each MSC would thus have to interface several base stations. In addition several MSCs may be required to cover a country.

2.5 Border Gateway (BG) $(GPRS)$

The Border Gateway (BG) is a gateway between a PLMN supporting GPRS and an external inter-PLMN backbone network used to interconnect with other PLMNs also supporting GPRS. The role of the BG is to provide the appropriate level of security to protect the PLMN and its subscribers.

The BG is only needed in PLMNs supporting GPRS.

2.6 Public Land Mobile Network (PLMN)

A Public Land Mobile Network (PLMN) is established and operated by an administration or Recognized Private Operating Agency (RPOA) for the specific purpose of providing land mobile telecommunications service services to the public. A PLMN may be regarded as an extension of a network (e.g. ISDN); it is a collection of MSCs areas within a common numbering plan (e.g. same National Destination Code) and a common routing plan. The MSCs are the functional interfaces between the fixed networks and a PLMN for call set-up.

Functionally the PLMNs may be regarded as independent telecommunications entities even though different PLMNs may be interconnected through the ISDN/PSTN and PDNs for forwarding of calls or network information. A similar type of interconnection may exist for the interaction between the MSCs of one PLMN.

2.7 Cell

The cell is an area of radio coverage identified by a Base station identification as defined in GSM 03.03.

2.8 Base Station Controller (BSC) area

The Base Station Controller (BSC) area is an area of radio coverage consisting of one or more cells controlled by one BSC. The boundaries of a BSC area and a location area are independent; a location area may span the boundary between BSC area and a BSC area may span the boundary between location areas.

2.9 Location Area (LA)

The Location Area (LA) is defined as an area in which a mobile station may move freely without updating the VLR. A location area may include one or several cells.

2.10 Routing Area (RA) $(GPRS)$

The Routing Area (RA) is defined as an area in which a mobile station, in certain operation modes, may move freely without updating the SGSN. A routing area may include one or several cells. A RA is always contained within a location area.

2.11 MSC area

The MSC area is the part of the network covered by an MSC. An MSC area may consist of one or several location areas. An MSC area may also consist of one or several BSC areas.

2.12 GPRS Support Nodes (GSN) $(GPRS)$

The GPRS support nodes, Gateway GSN (GGSN) and Serving GSN (SGSN) constitutes the interface between the radio system and the fixed networks for packet switched services. The GSN performs all necessary functions in order to handle the packet transmission to and from the mobile stations.

2.13 VLR area

The VLR area is the part of the network controlled by a VLR. A VLR area may consist of one or several MSC areas.

2.14 SGSN area $(GPRS)$

The SGSN area is the part of the network served by an SGSN. An SGSN area may consist of one or several routing areas. An SGSN area may also consist of one or several BSC areas. There need not be a one to one relationship between SGSN area and MSC/VLR area.

2.15 Zones for Regional Subscription

A PLMN operator may define a number of regional subscription areas, each of which is a subset of the service area for an unrestricted mobile subscriber. A regional subscription area may be contained within the service area of a single PLMN, or may lie within the service areas of two or more PLMNs. Each regional subscription area consists of one or more zones; each zone is contained within the service area of a PLMN.

The definition of a mobile subscriber's regional subscription area is stored within the HLR per National Destination Code(s) (NDC) of a PLMN and is transferred to the VLRs and/or SGSNs of that PLMN. The VLR and/or SGSN evaluates this information to extract the restricted or accessible MSC and/or SGNS areas and location areas to which the mobile subscriber is allowed to roam. The VLR and/or SGNS informs the HLR if an entire MSC and/or SGNS area is restricted.

Zones for Regional Subscription and their handling are defined in GSM 03.03, GSM 03.08 and GSM 09.02.

2.16 Service area

The service area is defined as an area in which a mobile subscriber can be reached by another (mobile or fixed) subscriber without the subscriber's knowledge of the actual location of the mobile station within the area. A service area may consist of several PLMNs. One service area may consist of one country, be a part of a country or include several countries. The location registration system associated with each service area must thus contain a list of all mobile stations located within that service area.

2.17 Group call area

The group call area is a predefined area composed of one or a number of cells to which a particular Voice Group Call Service (VGCS) or Voice Broadcast Service (VBS) call is distributed. The composition of a group call area is

predefined in the network. The group call area may include cells of more than one MSC area and cells of more than one PLMN.

2.18 Group Call Register (GCR)

The Group Call Register (GCR) is a register holding information about VGCS or VBS calls, the voice group or broadcast call attributes, respectively.

Voice group or broadcast call attributes are defined for a specific voice group or broadcast call reference and include the data required to configure the conference bridge for a VGCS or VBS call and other call related attributes.

2.19 Serving Mobile Location Center (SMLC) (LCS)

The Serving Mobile Location Center (SMLC) node is responsible for managing the overall co-ordination and scheduling of resources required to perform positioning of a mobile, and calculating the final location estimate and accuracy. There may be more than one SMLC in a PLMN.

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.

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].

2.20 Gateway Mobile Location Center (GMLC) (LCS)

The Gateway Mobile Location Center (GMLC) is the first node an external Location Application accesses in the GSM PLMN. The GMLC performs registration authorization and requests routing information from the HLR. There may be more than one GMLC in a PLMN.

2.21 Location Measurement Unit (LMU) (LCS)

An LMU makes radio measurements to support one or more positioning methods.

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.

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 Location Measurement Unit (LMU) gathers radio signal measurements and supplies them over the GSM air interface, via the MSC/VLR, to a particular SMLC associated with the LMU. An LMU interacts with its HLR, serving BSS and MSC/VLR like a normal GSM MS, i.e. it has its own IMSI and subscription profile, and supports radio resources and mobility management functions.~~

3 The entities of the mobile system

To provide the mobile service as it is defined, it is necessary to introduce some specific functions. These functional entities can be implemented in different equipments or gathered. In any case, exchanges of data occur between these entities.

3.1 The Home Location Register (HLR)

This functional entity is a data base in charge of the management of mobile subscribers. A PLMN may contain one or several HLRs: it depends on the number of mobile subscribers, on the capacity of the equipment and on the organisation of the network. The following kinds of information are stored there:

- the subscription information;
- some location information enabling the charging and routing of calls towards the MSC where the MS is registered(e.g. the MS Roaming Number, the VLR Number, the MSC Number, the Local MS Identity).

and, if GPRS is supported, also $(GPRS)$:

- - location information enabling the charging and routing of messages in the SGSN where the MS is currently registered (e.g. the SGSN Number);

and, if LCS is supported, also (LCS):

- a LCS privacy exception list, which indicates the privacy class of the MS subscriber;
- a ~~HPLMN~~ GMLC list;
- a MO-LR list.

Different types of identity are attached to each mobile subscription and are stored in the HLR. If GPRS is *not* supported the following identities are stored:

- the International Mobile Station Identity (IMSI);
- one or more Mobile Station International ISDN number(s) (MSISDN);

and, if LCS is supported, also (LCS):

- the LMU indicator;while, if GPRS *is* supported, the following identities are stored $(GPRS)$:
  - the International Mobile Station Identity (IMSI);
  - one or more Mobile Station International ISDN number(s) (MSISDN);
  - zero or more Packet Data Protocol (PDP) address(es).

There is always at least one identity, apart from the IMSI, attached to each mobile subscription and stored in the HLR.

The IMSI or, the MSISDN may be used as a key to access the information in the database for a mobile subscription.

The data base contains other information such as:

- teleservices and bearer services subscription information;
- service restrictions (e.g. roaming limitation);• a list of all the group IDs a service subscriber is entitled to use to establish voice group or broadcast calls;
- supplementary services; the HLR contains the parameters attached to these services;

and, if GPRS is supported, also $(GPRS)$:

- information about if a GGSN is allowed to dynamically allocate PDP addresses for a subscriber.

NOTE: Supplementary services parameters need not all be stored in the HLR. However, it seems safer to store all subscription parameters in the HLR even when some are stored in a subscriber card.

The organisation of the subscriber data is outlined in GSM 03.08.

3.2 The Visitor Location Register (VLR)

A mobile station roaming in an MSC area is controlled by the Visitor Location Register in charge of this area. When a Mobile Station (MS) enters a new location area it starts a registration procedure. The MSC in charge of that area notices this registration and transfers to the Visitor Location Register the identity of the location area where the MS is situated. If this MS is no yet registered, the VLR and the HLR exchange information to allow the proper handling of calls involving the MS.

A VLR may be in charge of one or several MSC areas.

The VLR contains also the information needed to handle the calls set-up or received by the MSs registered in its data base (for some supplementary services the VLR may have to obtain additional information from the HLR) the following elements are included:

- the International Mobile Subscriber Identity (IMSI);
- the Mobile Station International ISDN number (MSISDN);
- the Mobile Station Roaming Number (MSRN), see GSM 03.03 for allocation principles;
- the Temporary Mobile Station Identity (TMSI), if applicable;
- the Local Mobile Station Identity (LMSI), if used;
- the location area where the mobile station has been registered.
- the identity of the SGSN where the MS has been registered. Only applicable to PLMNs supporting GPRS and which have a Gs interface between MSC/VLR and SGSN: $(GPRS)$
- the last known location and the initial location of the MS; (LCS)

~~and, if LCS is supported, the following elements for the LMUs registered in its database: (LCS)~~

~~- an indication of whether the LMU was successfully registered in an associated SMLC;~~

~~- the SMLC address.~~ The information is passed between VLR and HLR by the procedures described in GSM 03.12.

The VLR also contains supplementary service parameters attached to the mobile subscriber and received from the HLR. The organisation of the subscriber data is outlined in GSM 03.08.

3.3 The Authentication Centre (AuC)

The Authentication Centre (AuC) is associated with an HLR, and stores an identity key for each mobile subscriber registered with the associated HLR. This key is used to generate:

- data which are used to authenticate the International Mobile Subscriber Identity (IMSI);
- a key used to cipher communication over the radio path between the mobile station and the network.

The procedures used for authentication and ciphering are described more fully in GSM 03.20.

The AuC communicates only with its associated HLR over an interface denoted the H-interface (see clause 5).

3.4 The Equipment Identity Register (EIR)

This functional entity contains one or several databases which store(s) the IMEIs used in the GSM system.

The mobile equipment may be classified as "white listed", "grey listed" and "black listed" and therefore may be stored in three separate lists.

An IMEI may also be unknown to the EIR.

An EIR shall as a minimum contain a "white list" (Equipment classified as "white listed").

3.5 The Mobile-services Switching Centre (MSC)

The Mobile-services Switching Centre is an exchange which performs all the switching and signalling functions for mobile stations located in a geographical area designated as the MSC area. The main difference between a MSC and an exchange in a fixed network is that the MSC has to take into account the impact of the allocation of radio resources and the mobile nature of the subscribers and has to perform in addition, at least the following procedures:

- procedures required for the location registration (see GSM 03.12);
- procedures required for handover (see GSM 03.09).

3.6 The Gateway MSC (GMSC)

If a network, delivering a call to the PLMN cannot interrogate the HLR, the call is routed to an MSC. This MSC will interrogate the appropriate HLR and then route the call to the MSC where the mobile station is located. The MSC which performs the routing function to the actual location of the MS is called the Gateway MSC (GMSC).

The acceptance of an interrogation to an HLR is the decision of the operator.

The choice of which MSCs can act as Gateway MSCs is for the operator to decide (i.e. all MSCs or some designated MSCs).

See also GSM 03.04.

3.7 SMS Gateway MSC (SMS-GMSC)

The SMS Gateway MSC (SMS-GMSC) acts as an interface between a Short Message Service Centre an the PLMN, to allow short messages to be delivered to mobile stations from the Service Centre (SC).

3.8 SMS Interworking MSC

The SMS Interworking MSC acts as an interface between the PLMN and a Short Message Service Centre (SC) to allow short messages to be submitted from Mobile Stations to the SC.

3.9 The Interworking Function (IWF)

The Interworking Function (IWF) is a functional entity associated with the MSC. The IWF provides the functionality necessary to allow interworking between a PLMN and the fixed networks (ISDN, PSTN and PDNs). The functions of the IWF depend on the services and the type of fixed network. The IWF is required to convert the protocols used in the PLMN to those used in the appropriate fixed network. The IWF may have no functionality where the service implementation in the PLMN is directly compatible with that at the fixed network. The interworking functions are described in GSM Technical Specifications 09.04, 09.05, 09.07 and 09.09.

3.10 The Base Station System (BSS)

The Base Station System (BSS) is the system of base station equipments (transceivers, controllers, etc...) which is viewed by the MSC through a single A-interface as being the entity responsible for communicating with Mobile Stations in a certain area. Similarly, in PLMNs supporting GPRS, the BSS also has an interface to an SGSN. The radio equipment of a BSS may support one or more cells. A BSS may consist of one or more base stations. Where an Abis-interface is implemented. The BSS consists of one Base Station Controller (BSC) and one or more Base Transceiver Station (BTS). The functionality is described in GSM 08.02.

A Base Station Controller (BSC) is a network component in the PLMN with the functions for control of one or more BTS.

A Base Transceiver Station (BTS) is a network component which serves one cell.

The split of functions between BSS and MSC is described in the 08-series of GSM Technical Specifications.

3.11 The Mobile Station (MS)

The mobile station consists of the physical equipment used by a PLMN subscriber; it comprises the Mobile Equipment (ME) and the Subscriber Identity Module (SIM). The ME comprises the Mobile Termination (MT) which, depending on the application and services, may support various combinations of Terminal Adapter (TA) and Terminal Equipment (TE) functional groups. These functional groups are described in GSM 04.02.

3.12 The Group Call Register (GCR)

The Group Call Register (GCR) shall hold for a related MSC area for each group ID and cell from which Voice Group Call Service (VGCS) or Voice Broadcast Service (VBS) calls can be established by mobile stations the voice group call reference or voice broadcast call reference to be used for a VGCS or VBS call to be established and an indication whether the originating MSC is the MSC responsible for that call.

If the originating MSC is not responsible for that call, the GCR shall hold the routing information identifying the MSC responsible for that call.

A GCR may be in charge of one or several MSC. Each MSC involved in a voice group or broadcast call requests its proper voice group or broadcast call attributes from its related GCR by use of the voice group or broadcast call reference.

The contents of each list related to requests of the MSC responsible for a voice group or broadcast call is as follows:

- a list of cells inside the MSC area of the requesting MSC into which the call is to be sent (part of the group call area);
- a list of other MSCs into which the call is to be sent;
- a list of identities of dispatchers to which a dedicated link is to be established;
- a list of identities of dispatchers which are allowed to initiate the voice group or broadcast call;
- a list of identities of dispatchers which are allowed to terminate the voice group or broadcast call;
- the length of time over which no activity is detected before the voice group call is automatically terminated;
- the default priority level related to the voice group or broadcast call if the eMLPP supplementary service applies;
- a flag indicating if acknowledgements are required for this voice group or broadcast call.

The contents of each list related to requests of an MSC not responsible for a voice group or broadcast call is as follows:

- a list of cells inside the MSC area of the requesting MSC into which the call is to be sent (part of the group call area).

More information is provided in GSM 03.68 and 03.69.

3.13 Shared InterWorking Function (SIWF) $(SIWF)$

Shared InterWorking Function (SIWF) is a network function that provides interworking for data/fax calls. SIWF consists of a SIWF Controller (SIWFC) functionality located in MSCs and SIWF Server(s) (SIWFS) located in the PLMN. An SIWFS contains IWF capabilities as described in subclause 3.9. An SIWFS can be accessed by several other network nodes e. g. any MSC in the same PLMN.

More information is provided in GSM 03.54.

3.14 Serving GPRS Support Node (SGSN) $(GPRS)$

The location register function in the SGSN stores two types of subscriber data needed to handle originating and terminating packet data transfer:

- Subscription information:
  - The IMSI;
  - One or more temporary identities;
  - Zero or more PDP addresses.
- Location information:
  - Depending on the operating mode of the MS, the cell or the routeing area where the MS is registered;
  - The VLR number of the associated VLR (if the Gs interface is implemented);
  - The GGSN address of each GGSN for which an active PDP context exists.

The organisation of the subscriber data in the SGSN is defined in GSM 03.08 and GSM 03.60.

The procedures for information transfer between the SGSN, the GGSN, the VLR and the HLR are defined in GSM 03.16 and GSM 03.60.

3.15 Gateway GPRS Support Node (GGSN) $(GPRS)$

The location register function in the GGSN stores subscriber data received from the HLR and the SGSN. There are two types of subscriber data needed to handle originating and terminating packet data transfer:

- Subscription information:
  - The IMSI;
  - Zero or more PDP addresses.
- Location information:
  - The SGSN address for the SGSN where the MS is registered;

The organisation of the subscriber data in the GGSN is defined in GSM 03.08 and GSM 03.60.

The procedures for information transfer between the GGSN, the SGSN and the HLR are defined in GSM 03.16 and GSM 03.60.

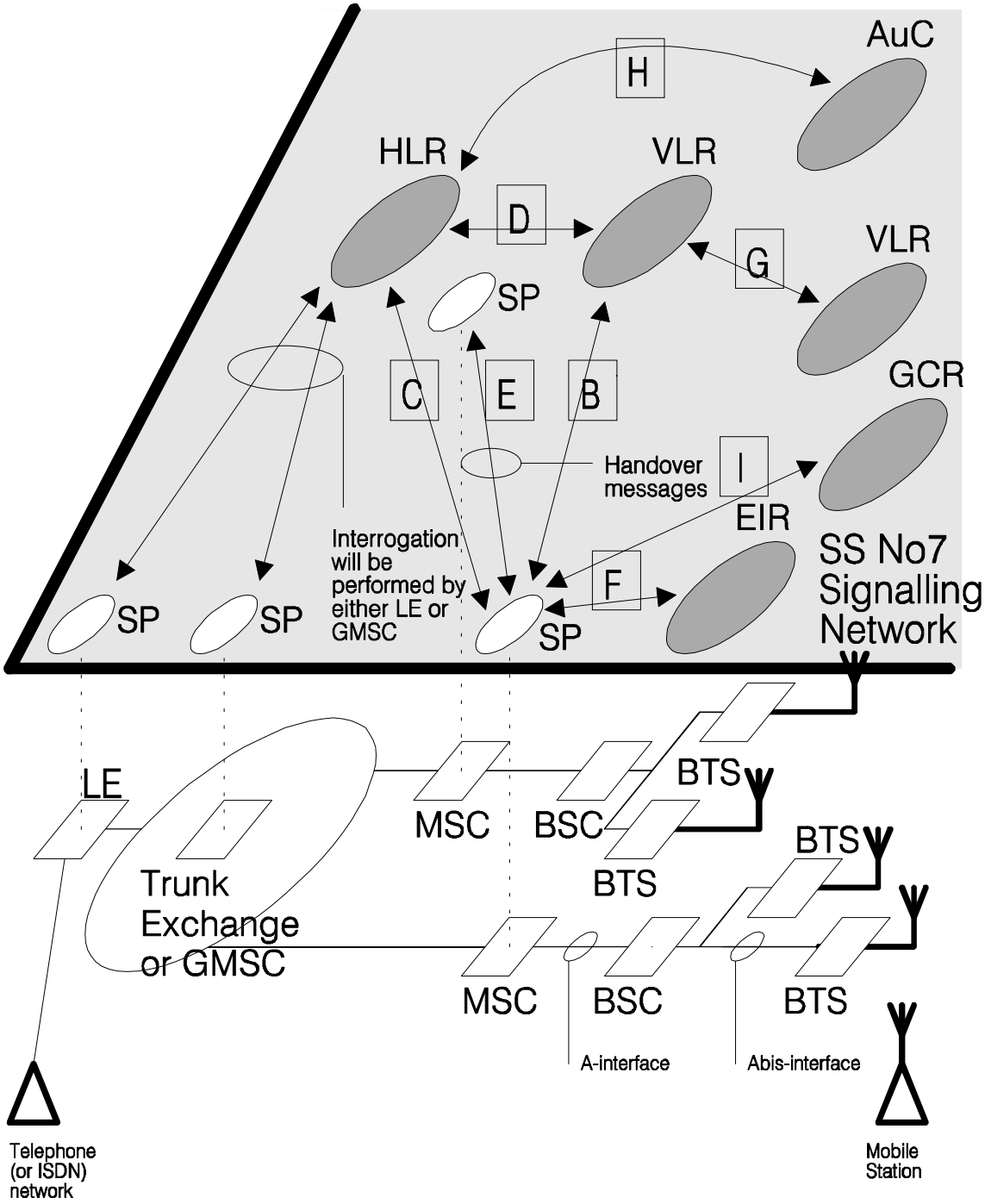
4 Configuration of a Public Land Mobile Network

4.1 General

The basic configuration of a Public Land Mobile Network (PLMN) and the interconnection to the PSTN/ISDN is presented in figure 1. The basic configuration of a PLMN supporting GPRS and the interconnection to external PDN is presented in figures 2 and 3. This configuration presents signalling interfaces which can be found in a PLMN. Implementations may be different: some particular functions may be gathered in the same equipment and then some interfaces may become internal interfaces.

4.2 Basic configuration (not supporting GPRS)

In the basic configuration presented in figure 1, all the functions are considered implemented in different equipments. Therefore, all the interfaces within PLMN are external. Interfaces A and Abis are defined in the GSM 08-series of Technical Specifications. Interfaces B, C, D, E, F and G need the support of the Mobile Application Part of the signalling system No. 7 to exchange the data necessary to provide the mobile service. No protocols for the H-interface and for the I-interface are standardized. From this configuration, all the possible PLMN organisations can be deduced. In the case when some functions are contained in the same equipment, the relevant interfaces become internal to that equipment.



BSS - Base Station System
BSC - Base Station Controller
BTS - Base Transceiver Station

Figure 1: Configuration of a PLMN (not supporting GPRS) and interfaces

4.3 Basic configuration with support for GPRS$(GPRS)$

In the basic configuration presented in figure 2, all the functions are considered implemented in different logical nodes. If two logical nodes are implemented in the same physical equipment, the relevant interfaces may become internal to that equipment.

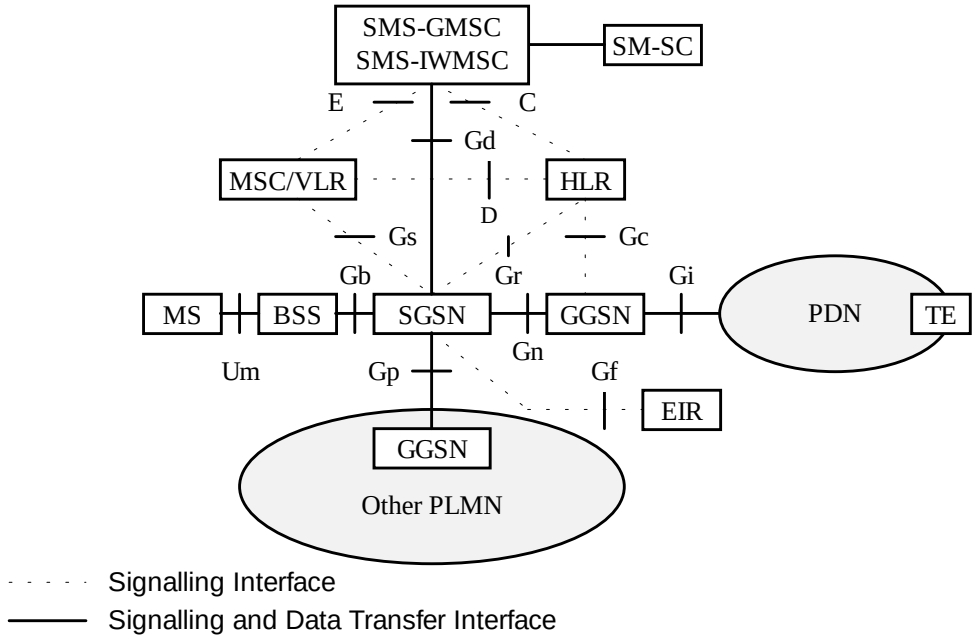


Figure 2: Configuration of a PLMN supporting GPRS

4.4 Packet Data Backbone Networks in PLMNs supporting GPRS $(GPRS)$

There are two kinds of GSM packet data backbone networks, the intra-PLMN backbone network and the inter-PLMN backbone network.

The intra-PLMN backbone network is the IP network interconnecting GSNs within the same PLMN.

The inter-PLMN backbone network is the IP network interconnecting GSNs and intra-PLMN backbone networks in different PLMNs.

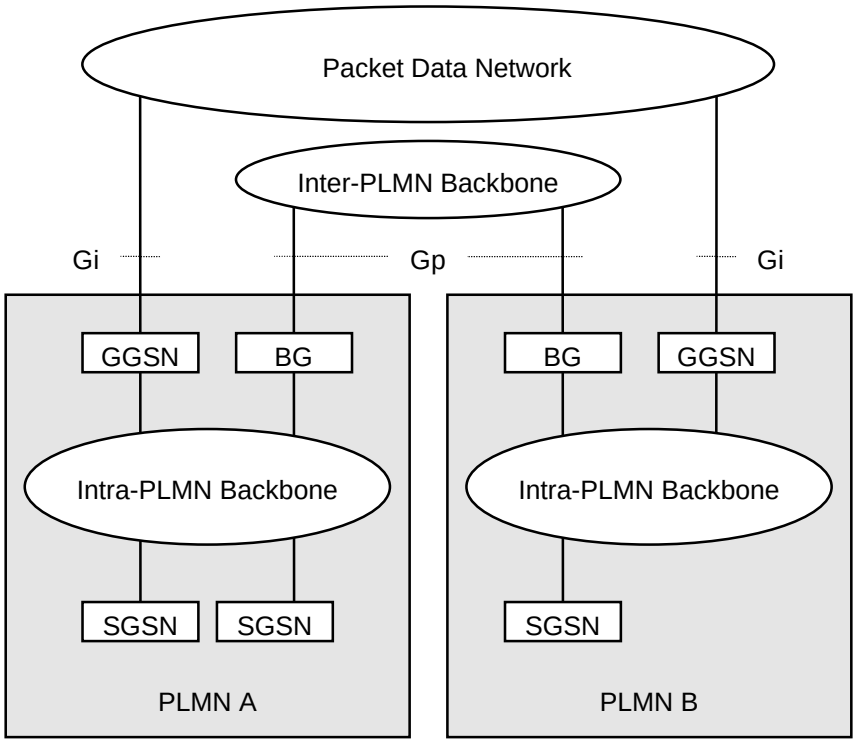


Figure 3: Intra- and Inter-PLMN Backbone Networks

Two intra-PLMN backbone networks are connected via the Gp interface using Border Gateways (BGs) and an inter-PLMN backbone network. The inter-PLMN backbone network is selected by a roaming agreement that includes the BG security functionality. The BG and the required security level is not defined within the scope of GSM TS's.

4.5 Basic configuration with support for LCS (LCS)

In the basic configuration presented in figure 3, all the functions are considered implemented in different logical nodes. If two logical nodes are implemented in the same physical equipment, the relevant interfaces may become internal to that equipment.

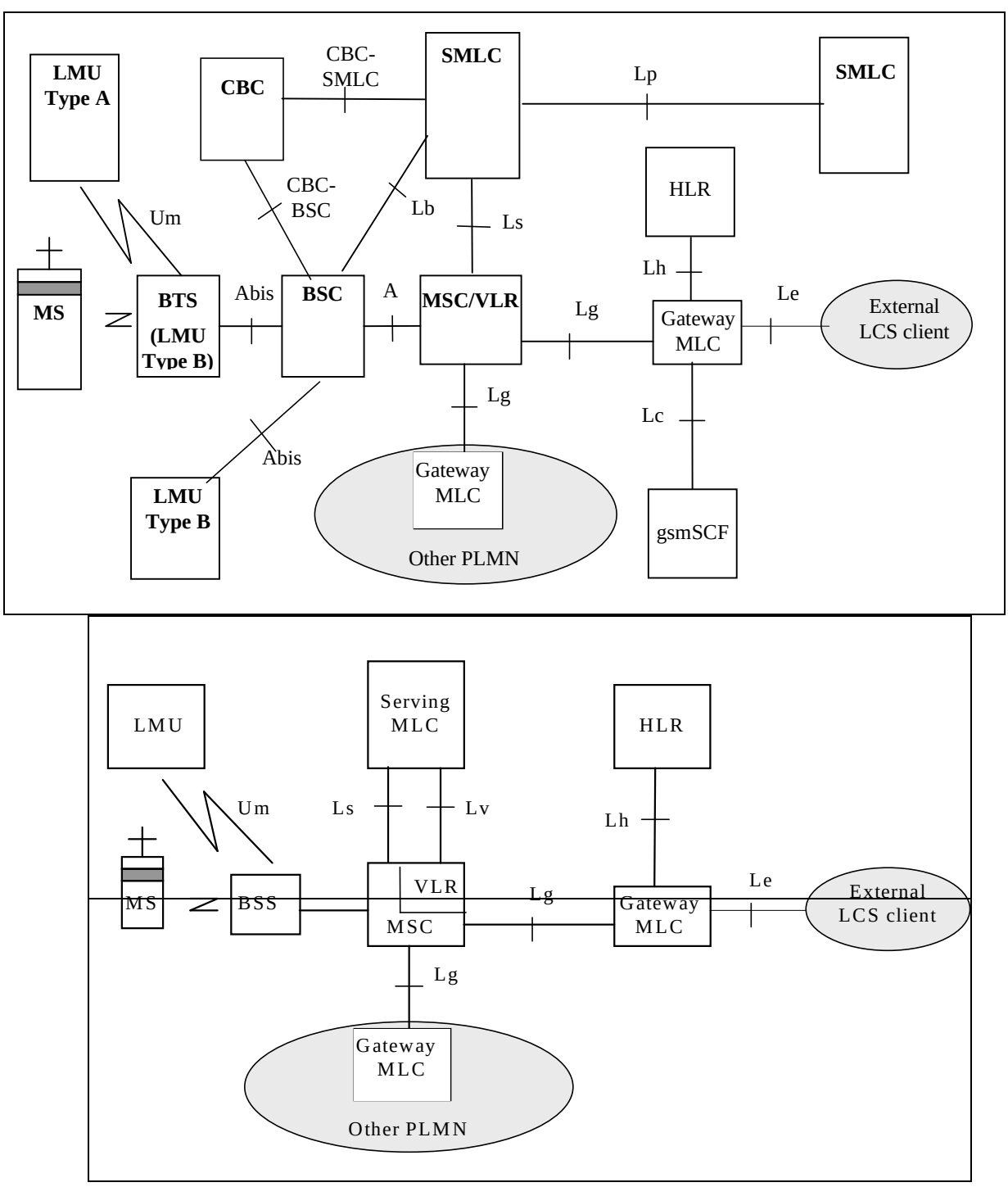


Figure 4: Configuration of a PLMN supporting LCS

5 PLMN interfaces

5.1 General

The implementation of the mobile service with international roaming implies the exchange of data between the equipment involved in the service. The same No.7 signalling network should be used to transfer these data and the call-related signalling information.

5.2 Interface between the MSC and Base Station System (A-interface)

The interface between the MSC and its BSS is specified in the 08-series of GSM Technical Specifications.

The BSS-MSC interface is used to carry information concerning:

- BSS management;
- call handling;
- mobility management.

5.3 Interface between BSC and BTS (Abis-interface)

When the BSS consists of a Base Station Controller (BSC) and one or more Base Transceiver Stations (BTS), this interface is used between the BSC and BTS to support the services offered to the GSM users and subscribers.

The interface also allows control of the radio equipment and radio frequency allocation in the BTS.

The interface is specified in the 08.5x-series of GSM Technical Specifications.

5.4 Interface between the MSC and its associated VLR (B-interface)

The VLR is the location and management data base for the mobile subscribers roaming in the area controlled by the associated MSC(s). Whenever the MSC needs data related to a given mobile station currently located in its area, it interrogates the VLR. When a mobile station initiates a location updating procedure with an MSC, the MSC informs its VLR which stores the relevant information. This procedure occurs whenever an MS roams to another location area. Also, when a subscriber activates a specific supplementary service or modifies some data attached to a service, the MSC informs (via the VLR) the HLR which stores these modifications and updates the VLR if required.

This interface is internal to the MSC/VLR; signalling on it is not standardised.

5.5 Interface between the HLR and the MSC (C-interface)

The Gateway MSC must interrogate the HLR of the required subscriber to obtain routing information for a call or a short message directed to that subscriber.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities. See GSM 09.02.

5.6 Interface between the HLR and the VLR (D-interface)

This interface is used to exchange the data related to the location of the mobile station and to the management of the subscriber. The main service provided to the mobile subscriber is the capability to set up or to receive calls within the whole service area. To support this, the location registers have to exchange data. The VLR informs the HLR of the

location of a mobile station managed by the latter and provides it (either at location updating or at call set-up) with the roaming number of that station. The HLR sends to the VLR all the data needed to support the service to the mobile subscriber. The HLR then instructs the previous VLR to cancel the location registration of this subscriber. Exchanges of data may occur when the mobile subscriber requires a particular service, when he wants to change some data attached to his subscription or when some parameters of the subscription are modified by administrative means.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities. See GSM 09.02.

5.7 Interface between MSCs (E-interface)

When a mobile station moves from one MSC area to another during a call, a handover procedure has to be performed in order to continue the communication. For that purpose the MSCs have to exchange data to initiate and then to realise the operation.

After the handover operation has been completed, the MSCs will exchange information to transfer A-interface signalling as necessary.

When a short message is to be transferred between a Mobile Station and Short Message Service Centre (SC), in either direction, this interface is used to transfer the message between the MSC serving the Mobile Station and the MSC which acts as the interface to the SC.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities. See GSM 09.02.

5.8 Interface between MSC and EIR (F-interface)

This interface is used between MSC and EIR to exchange data, in order that the EIR can verify the status of the IMEI retrieved from the Mobile Station.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities. See GSM 09.02.

5.9 Interface between VLRs (G-interface)

When a mobile subscriber moves from a VLR area to another Location Registration procedure will happen. This procedure may include the retrieval of the IMSI and authentication parameters from the old VLR.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities. See GSM 09.02.

5.10 Interface between HLR and AuC (H-Interface)

When an HLR receives a request for authentication and ciphering data for a Mobile Subscriber and it does not hold the requested data, the HLR requests the data from the AuC. The protocol used to transfer the data over this interface is not standardised.

5.11 Interface between Mobile Station and Base Station System (Um-interface)

The interface between the MS and the BSS is specified in the 04- and 05-series of GSM Technical Specifications.

5.12 Interface between the MSC and its associated GCR (I-interface)

The GCR is the management data base for the voice group or broadcast calls in the area controlled by the associated MSC(s). Whenever the MSC needs data related to a requested voice group or broadcast call it interrogates the GCR to obtain the respective voice group or broadcast call attributes. The protocol used to transfer the data over this interface is not standardized.

5.13 Interface between MSC/VLR and SGSN (Gs-interface) $(GPRS)$

The SGSN may send location information to the MSC/VLR via the optional Gs interface. The SGSN may receive paging requests from the MSC/VLR via the Gs interface. The MSC/VLR may indicate to an SGSN, via the Gs interface, that an MS is engaged in a service handled by the MSC.

Signalling on this interface uses connectionless SCCP (without TCAP). SCCP Global Title (GT) is used for addressing. The Gs-interface is defined in GSM 09.16 & 09.18.

5.14 Interface between SGSN and HLR (Gr-interface) $(GPRS)$

This interface is used to exchange the data related to the location of the mobile station and to the management of the subscriber. The main service provided to the mobile subscriber is the capability to transfer packet data within the whole service area. The SGSN informs the HLR of the location of a mobile station managed by the latter. The HLR sends to the SGSN all the data needed to support the service to the mobile subscriber. Exchanges of data may occur when the mobile subscriber requires a particular service, when he wants to change some data attached to his subscription or when some parameters of the subscription are modified by administrative means.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities (TCAP). See GSM 09.02.

5.15 Interface between SGSN and GGSN (Gn- and Gp-interface) $(GPRS)$

These interfaces are used to support mobility between the SGSN and GGSN. The Gn interface is used when GGSN and SGSN are located inside one PLMN. The Gp-interface is used if GGSN and SGSN are located in different PLMNs. The Gn/Gp interface also includes a part which allows SGSNs to communicate subscriber and user data, when changing SGSN.

Signalling on this interface uses the User Datagram Protocol, UDP/IP. The Gn/Gp interface is defined in GSM 09.60.

5.16 Interface between SGSN and BSS (Gb-interface) $(GPRS)$

The BSS-SGSN interface is used to carry information concerning:

- packet data transmission;
- mobility management.

The Gb interface is defined in GSM 08.14, 08.16 & 08.18.

5.17 Signalling Path between GGSN and HLR (Gc-interface) $(GPRS)$

This optional signalling path may be used by the GGSN to retrieve information about the location and supported services for the mobile subscriber, to be able to activate a packet data network address.

There are two alternative ways to implement this signalling path:

- if an SS7 interface is implemented in the GGSN, signalling between the GGSN and the HLR uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities (TCAP). See GSM 09.02;
- if there is *no* SS7 interface in the GGSN, any GSN in the same PLMN and which has an SS7 interface installed can be used as a GTP to MAP protocol converter, thus forming a signalling path between the GGSN and the HLR.

5.18 Interface between SGSN and EIR (Gf-interface) $(GPRS)$

This interface is used between SGSN and EIR to exchange data, in order that the EIR can verify the status of the IMEI retrieved from the Mobile Station.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities (TCAP). See GSM 09.02.

5.19 Interface between MSC and SIWFS (K-Interface) - $(SIWF)$

The K interface is used between MSC and SIWFS and is specified in GSM Technical specification 03.54.

5.20 Interface between MSC and GMLC (Lg-interface) (LCS)

The MSC -GMLC interface is used to exchange data needed by the MSC to perform subscriber authorization and allocate network resources. The GMLC provides the IMSI and requested Quality of Service information.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities (TCAP). See GSM 09.02.

5.21 Interface between MSC and SMLC (Ls-interface) (LCS)

The MSC -SMLC interface is used to exchange data needed by the SMLC to select a positioning method and compute a location estimate. The MSC provides the MS's location capabilities and requested Quality of Service information.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities (TCAP). See GSM 09.02.

~~5.22Interface between VLR and SMLC (Lv-interface) (LCS)~~

~~The VLR-SMLC interface is used to support transferring of registration and deregistration information between the VLR and SMLC.~~

~~Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities (TCAP). See GSM 09.02.~~

~~5.23~~5.22 Interface between GMLC and HLR (Lh-interface) (LCS)

This interface is used by the GMLC to retrieve the VMSC location and IMSI for a particular mobile.

Signalling on this interface uses the Mobile Application Part (MAP), which in turn uses the services of Transaction Capabilities (TCAP). See GSM 09.02.

5.23 Interface between SMLC and MSC/VLR (Ls-interface) (LCS)

An NSS based SMLC supports positioning of a target MS via signaling on the Ls interface to the visited MSC.

Signalling on this interface uses BSSAP-LE, which is specified in 09.31.

5.24 Interface between BSC and SMLC (Lb-interface) (LCS)

A BSS based SMLC supports positioning via signaling on the Lb interface to the BSC serving the target MS.

Signalling on this interface uses BSSAP-LE, which is specified in GSM 09.31.

5.25 Interface between Peer SMLCs (Lp-interface) (LCS)

Both NSS and BSS-based SMLCs may support the Lp interface to enable access to information and resources owned by another SMLC.

Signalling on this interface uses BSSAPP-LE, which is defined in GSM 09.31, and SMLCPP, which is specified in GSM 08.31.

~~5.24~~5.26 Interface between BTS and LMU (Um-interface) (LCS)

The Um interface specific to LCS is defined in 04.71.

6 Interface to external networks

The interfaces with fixed networks, including dedicated networks, are described in the 09-series of GSM Technical Specifications

6.1 Interface between the fixed networks and the MSC

The MSC is based on a normal ISDN exchange. It has, for call control, the same interface as the fixed network exchanges. The signalling interface considered in the GSM Technical Specifications is related to the signalling system No. 7 User Parts TUP and ISUP associated to the circuits used for incoming and outgoing calls.

6.2 Interface between GGSN and external data networks (Gi-interface) $(GPRS)$

This interface connects the PLMN to external public or private packet data networks.

6.3 Interface between GMLC and external LCS Client (Le-interface) (LCS)

This interface connects the PLMN to the external LCS Client.

Annex A (informative): Document change history

Status of GSM 03.02		
Date	**Version**	**Information about changes**
April 1992	version 4.0.0	Approved at SMG #2 CRs included: CR 03.02-001 CR 03.02-002 CR 03.02-003r1 CR 03.02-004
June 1992	version 4.0.1	Approved at SMG #3 CRs included: CR 03.02-005
February 1996	version 4.1.0	Approved at SMG #17 CR included: CR 03.02-A002 rev 1 (category F)
February 1996	version 5.0.0	Approved at SMG #17 CR included: CR 03.02-A001 rev 3 (category B) (Phase 2+)
April 1996	version 5.1.0	Approved at SMG #18 CR included: CR 03.02-A004 (category A) (Phase 2+)
October 1997	version 5.2.0	Included CRs approved at SMG#23: CR 03.02-A006 Clarification on the nature of the B-interface (category F, Release 96) CR 03.02-A007 Support of SIWF (category B, Release 97)
January 1998	version 5.3.0	CR included approved at SMG#24: CR 03.02 A005r4 Changes needed for GPRS regarding Network Architecture (category B, release 97)
July 1998	version 6.0.0	Inclusion of CR approved at SMG#26: A008
August 1999	version 7.0.0	Inclusion of CR approved SMG#29 A009

History

Document history		
V7.0.0	August 1999	Publication

3GPP TSG SA WG2/SMG12
Abiko, Japan, 29 Nov-3 Dec, 1999

Document S2-99E41
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

03.71	CR	003r1	Current Version:	7.1.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to: SA2/SMG12 *list expected approval meeting # here ↑*	for approval	X	strategic	X	*(for SMG use only)*
	for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*

(U)SIM	X	ME	X	UTRAN / Radio	X	Core Network	X

Source: T1P1.5 **Date:** 30 Nov 1999

Subject: Addition of further LCS functionality in GSM Release 98

Work item: Location Services (LCS)

Category: *(only one category shall be marked with an X)*

		Release:	
Correction		Phase 2	
Corresponds to a correction in an earlier release		Release 96	
Addition of feature		Release 97	
Functional modification of feature	X	Release 98	X
Editorial modification		Release 99	
		Release 00	

Reason for change: Information related to segmentation is added.

Clauses affected:

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments: Changes made since the initial CR distributed from the October 15 meeting of T1P1.5 are shown with yellow highlighting.

*** MODIFIED SECTION ***

6.1 Generic Signaling Model for LCS

6.1.1 Protocol layering

Figure ~~4~~ 7 shows the generic signaling model applicable to LCS for any signaling interaction in which an SMLC forms at least one of the signaling end points.

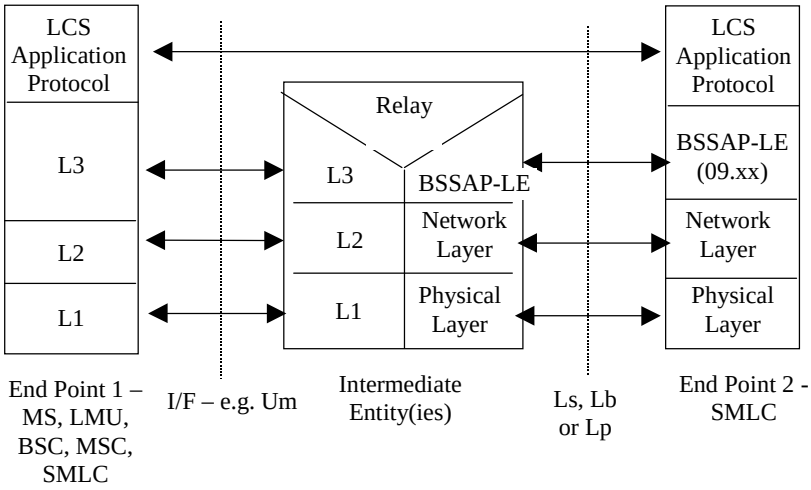


Figure 1 – Generic Model for LCS Signaling to an SMLC

The functions performed by each protocol layer are as follows.

(a) LCS application protocol – this depends on the other signaling end point (e.g. whether a target MS or LMU) and may be absent if supported in the BSSAP-LE layer. The application protocol supports specific LCS functions (e.g. positioning measurements, assistance measurements) and is independent of lower protocol layers.

(b) BSSAP-LE – this is an extension of BSSAP and carries the LCS application protocol signaling units. Necessary functions include identification of the LCS application protocol and identification, where not provided by the network layer, of the two end points. This layer can be relayed by an intermediate entity or mapped into an equivalent layer 3 protocol used by the other signaling end point. This layer supports segmentation of LCS application layer protocols.

(c) Network Layer – provides signaling transport between the SMLC and either the other end point or some intermediate entity at which the BSSAP-LE layer is relayed or mapped. The network layer may support connection oriented or connectionless signaling. For second generation circuit oriented applications, the network layer is provided using MTP and SCCP. For third generation and packet oriented applications, other protocols may be used.

(d) Physical Layer – for second generation circuit oriented applications, SS7 signaling links are supported by the physical layer.

(e) L3 – a protocol layer compatible with or the same as BSSAP-LE.

(f) L2 – logical link layer for the other endpoint

(g) L1 – physical layer for the other end point.

6.1.2 Message Segmentation

Message segmentation is needed to transport any large LCS message that exceeds the message size limitation supported by any GSM interface over which transport is needed.

6.1.2.1 ~~Application~~ Intermediate Level Segmentation

The segmentation of SMLCPP (GSM 08.31) and BSSLAP (GSM 08.71) messages is supported by segmentation mechanisms defined in GSM 08.08 and GSM 09.31. The sending, receiving and all intermediate entities supporting segmentation shall ensure reliable and sequenced delivery of the message segments by appropriate use of the capabilities supported by lower transport and network level protocols.

~~Segmentation and reassembly of large RRLP, LLP and SMLCPP messages at the application level (i.e. in the endpoint sender or receiver application for RRLP, LLP or SMLCPP) shall be supported. The associated procedures are defined in GSM 04.31, 04.71 and 08.31. The sending application shall use a segment size that when expanded with additional lower level protocol headers does not exceed the maximum supported message size on any intervening interface between the sender and receiver. The sending, receiving and all intermediate entities supporting message transfer at the BSSAP-LE level shall ensure reliable and sequenced delivery of the message segments by appropriate use of the capabilities supported by lower transport and network level protocols (e.g. use of SCCP class 1 for connectionless transfer).~~

6.1.2.2 Network Level Segmentation

Segmentation and reassembly of large RRLP, LLP and SMLCPP messages at the network (e.g. SCCP) level may be supported. For message transfer over any interface where network level segmentation is not supported (e.g. Abis interface, Um interface), segmentation at the application level shall be used. This implies support of both network and application level segmentation by certain intermediate entities.

*** NEXT MODIFIED SECTION ***

7.7.2 Information Transfer between a BSS based SMLC and a Target MS

A BSS based SMLC uses the procedure shown in Figure 34 in order to obtain positioning measurements from a target MS after a positioning request has been received from the BSC serving the target MS.

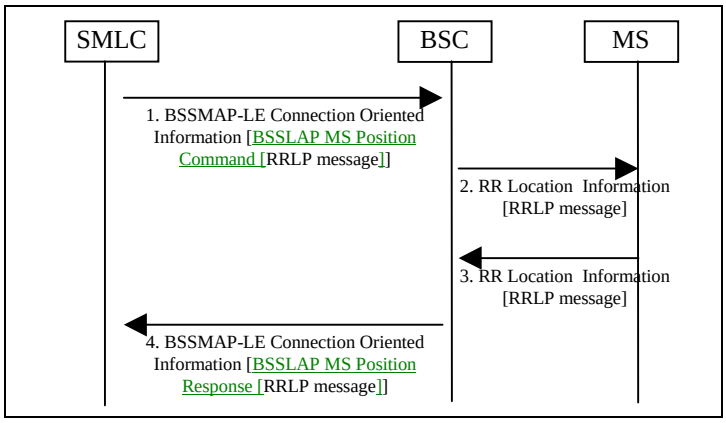


Figure 34 - Information Transfer between a BSS based SMLC and a Target MS

1. The SMLC passes a BSSMAP-LE Connection Oriented Information message to the serving BSC containing an embedded BSSLAP MS Position Command with an RRLP message parameter. The message is transferred using the SCCP connection established between the SMLC and BSC for positioning the target MS If an RRLP message is too large to fit in a single BSSMLAP-LE Connection Oriented Information message, it may be segmented and transferred inside a sequence of BSSMLAP-LE messages with the last BSSMLAP-LE message containing a BSSLAP MS Position command containing a last segment indication and the last RRLP segment. The SMLC shall indicate in the first BSSLAP MS Position Command whether the RRLP message contains a positioning command. versus positioning assistance data.
2. The BSC transfers the embedded RRLP message to the target MS inside an RR LCS Information message. If the RRLP message was segmented by the SMLC, each RRLP segment is transferred in a separate RR LCS Information message with the last message indicating the last RRLP segment. When the last RR LCS Information message has been transferred, the BSC starts or restarts a positioning supervision timer if none is already in progress or if an RRLP positioning command was indicated. If the timer expires before the final response in step 3 is received, the BSC shall return a BSSMAP-LE Connection oriented Information message to the SMLC containing a BSSLAP Abort with a cause of BSC timeout.
3. When the target MS has positioning information to return to the SMLC, it sends an RR LCS Information message to the BSC containing an embedded RRLP message. If the RRLP message is too large to fit in a single RR LCS Information message, it may be segmented and carried in a sequence of RR LCS Information messages with the last message indicating the last RRLP segment. The first RR LCS Information message shall indicate if this is the final response from the MS.
4. If the timer started in step 2 has already expired, the BSC discards the RRLP message received in step 3. Otherwise, the BSC forwards the RRLP message to the SMLC inside a BSSLAP MS Positioning Response message contained in a BSSMAP-LE Connection Oriented Information message. If the RRLP message was segmented, each segment is transferred in a separate BSSMAP-LE message with the last message carrying a BSSLAP MS Positioning Response indicating and containing the last RRLP segment. If the SMLC indicated a positioning command in step 1 and the MS has indicated a final response, the BSC may add additional measurement information to the BSSLAP MS Position Response in the last BSSMAP-LE message – if necessary, creating a new BSSMAP-LE message if message size limitations would be exceeded. The BSC shall stop the supervision timer started in step 2 when the final segment of the final response from the MS has been transferred. If the MS did not indicate a final response in step 2, the SMLC may transfer a further RRLP message to the MS (e.g. containing assistance data) according to steps 1 and 2 and the MS may return a subsequent response according to steps 3 and 4,

*** NEXT MODIFIED SECTION ***

7.8.1 Information Transfer between an NSS based SMLC and a Type A LMU

7.8.1.1 Information Transfer using an SDCCH

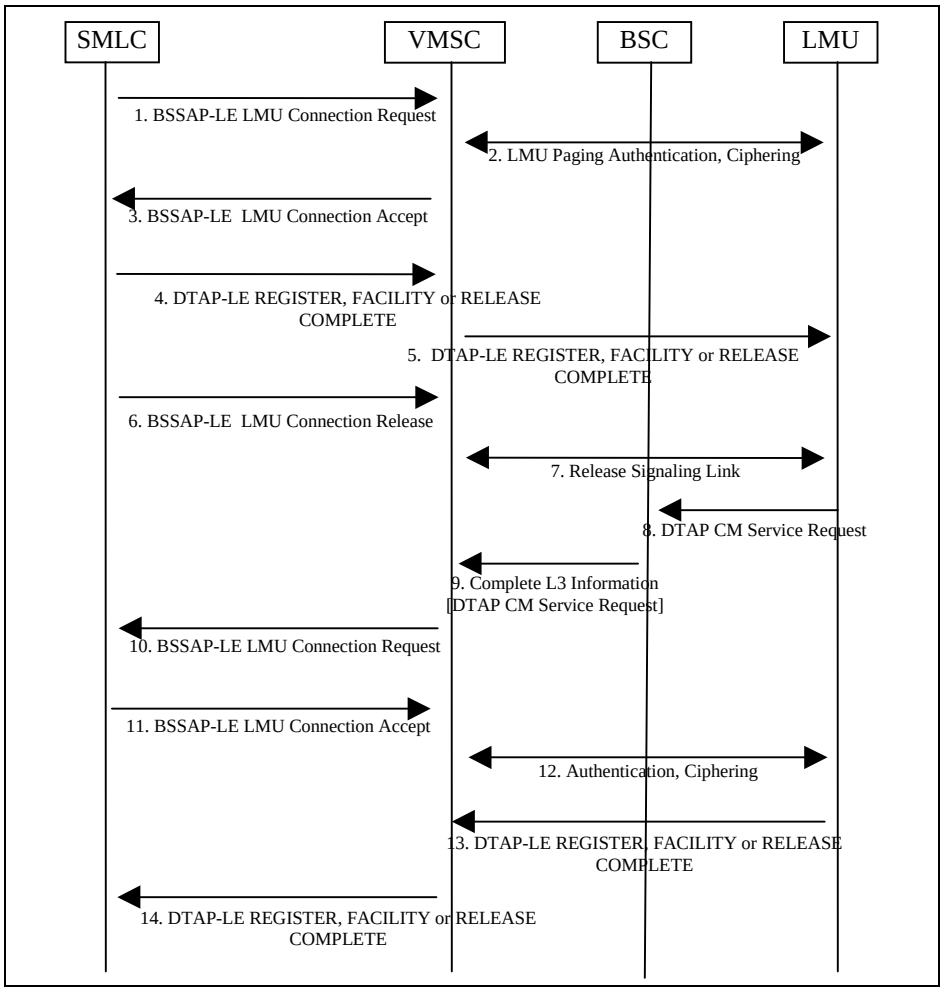


Figure 26 Information Transfer between an NSS based SMLC and a Type A LMU using an SDCCH

1. If there is no SCCP connection yet for an LMU between the SMLC and the MSC serving the LMU, the SMLC sends a BSSMAP-LE LMU connection request message to the MSC contained in an SCCP Connection Request. The BSSMAP-LE message shall contain the IMSI of the LMU and shall indicate whether authentication of the LMU is needed and/or ciphering.
2. For an LMU that has no main signaling link to the MSC (e.g. LMU uses a temporary SDCCH), the serving MSC performs paging to assign an SDCCH. The MSC/VLR also performs authentication and/or ciphering if requested by the SMLC.
3. The serving MSC returns a BSSMAP-LE LMU Connection Accept to the SMLC. If the paging or authentication in step 2 failed, the MSC returns a BSSMAP-LE LMU Connection Reject message.
4. If the SMLC needs to send data to the LMU, it may send one or more DTAP-LE REGISTER, FACILITY and RELEASE COMPLETE messages to the serving MSC using the SCCP connection established in steps 1 to 3. Each DTAP-LE

message may carry and embedded LLP message ~~or message segment~~ and an indication of whether release of the SDCCH by the LMU is forbidden.

5. The serving MSC passes each DTAP-LE message received from the SMLC in step 4 to the LMU.
6. The SMLC may initiate release of the SDCCH to the LMU and the associated SCCP connection to the MSC by sending a BSSMAP-LE LMU Connection Release message.
7. For an LMU that has no other active MM and CM connections, the MSC initiates release of the SDCCH.
8. When the LMU has LCS data to send and does not currently have a signaling link, it sends an RR Channel request to the serving BTS to request an SDCCH. The RR Channel Request contains an establishment cause identifying an LMU. After assignment of the SDCCH, the LMU sends a DTAP CM Service request to the serving BSC to request an MM connection for location services.
9. The serving BSC passes the CM Service Request to the VMSC with an indication that this came from an LMU inside a Complete layer 3 Information message.
10. The serving MSC sends a BSSMAP-LE LMU Connection Request message to the SMLC associated with the LMU inside an SCCP connection request (e.g. use IMSI or LAC association to determine the SMLC). The BSSMAP-LE message shall contain the IMSI of the LMU and the address of the MSC.
11. The SMLC returns a BSSMAP-LE LMU Connection Accept. to the MSC indicating if authentication or ciphering are required.
12. The serving MSC performs authentication and ciphering if requested by the SMLC. Otherwise, a CM Service Accept is returned.
13. The LMU sends one or more DTAP-LE REGISTER, FACILITY and RELEASE COMPLETE messages to the serving MSC each containing an embedded LLP message ~~or message segment~~.
14. The serving MSC passes each DTAP-LE message to the SMLC using the SCCP connection established in steps 10 to 11

*** NEXT MODIFIED SECTION ***

7.8.4 LCS Information Transfer between a BSS based SMLC and a Type A LMU

7.8.4.1 Information Transfer using an SDCCH

The following procedure supports information transfer between a BSS based SMLC and a type A LMU.

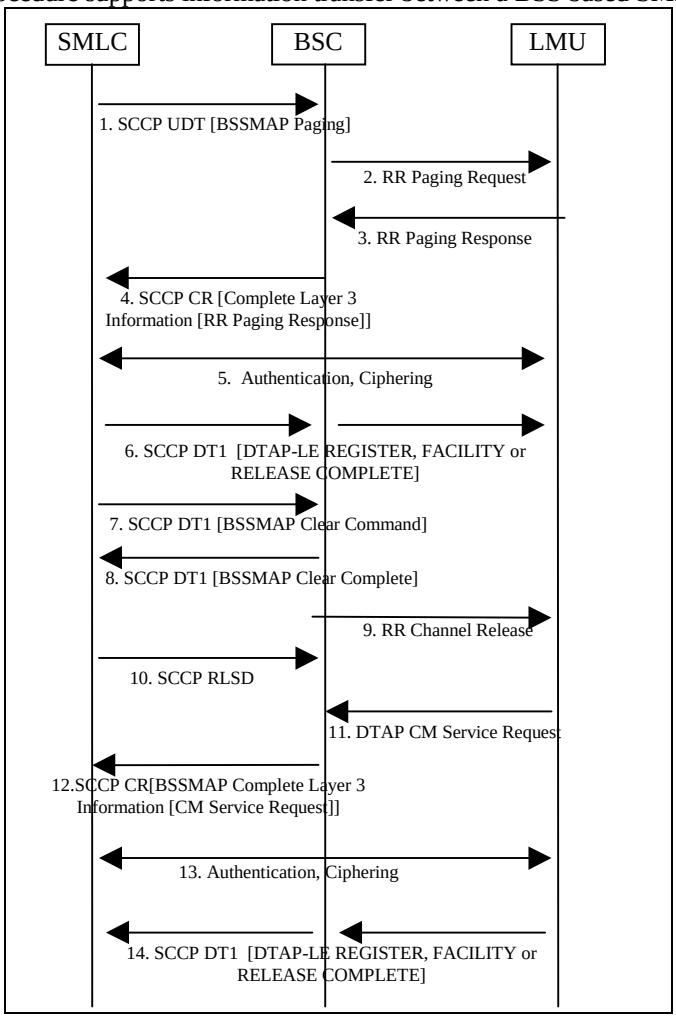


Figure 31 Information Transfer between a BSS based SMLC and a Type A LMU

1. If there is no signaling link yet for an LMU between the SMLC and the BSC serving the LMU, the SMLC sends a BSSMAP Paging message to the serving BSC inside an SCCP Unitdata message.
2. The serving BSC broadcasts an RR Paging Request.
3. The LMU returns an RR Paging Response.
4. The serving BSC transfers the Paging Response to the SMLC in a BSSMAP Complete Layer 3 Information message contained in an SCCP Connection Request.
5. The SMLC performs normal GSM authentication and ciphering if this is needed for the LMU.
6. If the SMLC needs to send data to the LMU, it may send one or more DTAP-LE REGISTER, FACILITY or RELEASE COMPLETE messages to the BSC. Each DTAP-LE message contains an embedded LLP message ~~or message segment~~ and an indication of whether release of the SDCCH by the LMU is forbidden. Each DTAP-LE message is transferred by the BSC to the LMU.
7. The SMLC may initiate release of the SDCCH to the LMU by sending a BSSMAP Clear Command to the BSC.

8. The BSC returns a BSSMAP Clear Complete.
9. The BSC orders release of the SDCCH by sending an RR Channel Release to the LMU.
10. The SMLC releases the SCCP connection to the BSC by sending an SCCP Released message.
11. When the LMU has LCS data to send and does not currently have a signaling link, it sends an RR Channel Request to the serving BTS to request an SDCCH. The RR Channel Request contains an establishment cause identifying an LMU. After assignment of the SDCCH, the LMU sends a DTAP CM Service request to the serving BSC.
12. The serving BSC forwards the CM Service Request with an indication that this came from an LMU to the SMLC inside a BSSMAP Complete Layer 3 Information message that is contained in an SCCP Connection Request.
13. The SMLC performs authentication and ciphering if needed for the LMU. Otherwise, a CM Service Accept is returned.
14. The LMU sends one or more DTAP-LE REGISTER, FACILITY or RELEASE COMPLETE messages to the serving BSC each containing an embedded LLP message ~~or message segment~~. The BSC forwards each DTAP-LE message to the SMLC.

*** NEXT MODIFIED SECTION ***

7.10 Common Procedures supporting Interaction between Peer SMLCs

7.10.1 Information Transfer between Peer SMLCs

Figure 39 illustrates LCS information transfer between peer SMLCs where, in this scenario, one SMLC is NSS based and the other BSS based. It is assumed that while the NSS based SMLC has SS7 links to an STP, the BSS based SMLC does not.

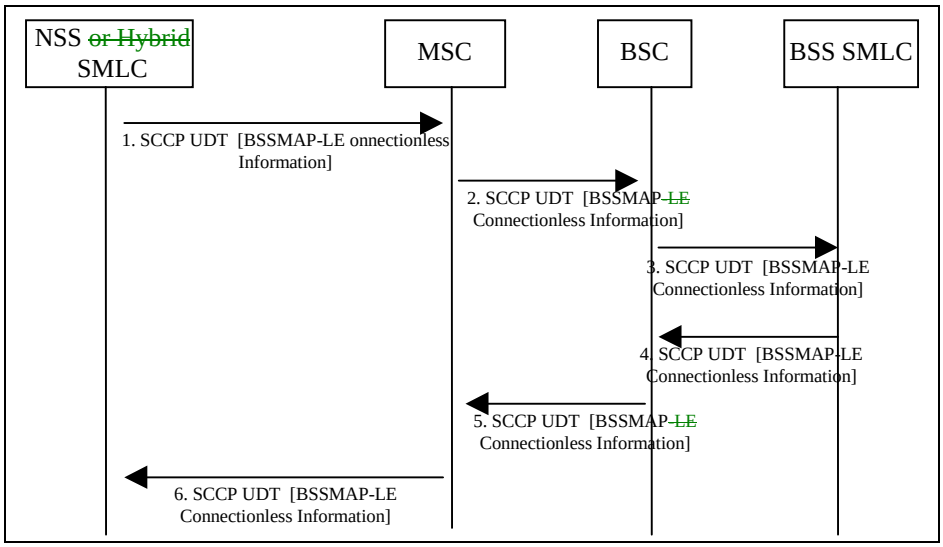


Figure 39 - Information Transfer between an NSS based and a BSS based SMLC

1. When the NSS based SMLC has LCS information to send to another SMLC, it transmits a BSSMAP-LE Connectionless Information message containing an embedded SMLCPP message and the LAC/CI cell address identifying the other SMLC. . If an SMLCPP message is too large to fit in a single BSSMAP-LE Connectionless Information message, it may be segmented and transferred inside a sequence of BSSMAP-LE messages. The BSSMAP-LE message is transferred inside an SCCP Unitdata message. The message is routed to an SS7 signaling point code associated with the LAC/CI address. In this scenario, the signaling point code is that for the MSC connected to the BSC for the BSS based SMLC.
2. The MSC forwards the BSSMAP message to the BSC associated with the LAC/CI address received in step 1. . If an SMLCPP message is too large to fit in a single BSSMAP message, it may be segmented and transferred inside a sequence of BSSMAP messages.
3. The BSC transfers the BSSMAP-LE message to the SMLC. The BSC recognizes the SMLC as the final destination due to the presence of the embedded SMLCPP message. If an SMLCPP message is too large to fit in a single BSSMAP-LE message, it may be segmented and transferred inside a sequence of BSSMAP-LE messages.
4. When the BSS based SMLC has positioning information to return to the NSS based SMLC, it passes this to its associated BSC in a BSSMAP-LE Connectionless message contained in an SCCP Unitdata message. The BSSMAP-LE message contains an embedded SMLCPP message and the LAC/CI address identifying the other SMLC. . If an SMLCPP message is too large to fit in a single BSSMAP-LE message, it may be segmented and transferred inside a sequence of BSSMAP-LE messages.
5. The serving BSC forwards the BSSMAP message to its MSC. If an SMLCPP message is too large to fit in a single BSSMAP message, it may be segmented and transferred inside a sequence of BSSMAP messages.
6. The MSC forwards the BSSMAP-LE message directly to the NSS based SMLC in an SCCP Unitdata message. The message is routed to an SS7 signaling point code associated with the LAC/CI address in the BSSMAP-LE message. In this scenario, the signaling point code is that for the NSS based SMLC. If an SMLCPP message is too large to fit in a single BSSMAP-LE message, it may be segmented and transferred inside a sequence of BSSMAP-LE messages.