Technical Specification Group Services and System Aspects ***TSGS#12(01)0329***

Meeting #12, Stockholm, Sweden, 18-21 June 2001

Source: **TSG SA WG2**
Title: **CRs on 23.002 v.4.2.0 and v.5.2.0**
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 #12.
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 both Release 4 and Release 5

CR#	***re***	***Rel***	***title***	***cat***	***in***	***out***	***S2#***	***WI***
052	1	R4	Addition of Radio Access Technologies	F	4.2.0	4.3.0	S2-011475	LCRTDD
053	1	R5	Addition of Radio Access Technologies	A	5.2.0	5.3.0	S2-011476	LCRTDD
061	1	R4	Clarification of the role of the SGWs	F	4.2.0	4.3.0	S2-011478	IMS-CCR
062	1	R5	Clarification of the role of the SGWs	F	5.2.0	5.3.0	S2-011479	IMS-CCR

CRs applicable to Release 5

CR#	***re***	***Rel***	***title***	***cat***	***in***	***out***	***S2#***	***WI***
051r3	3	R5	Addition to 23.002 of GTT	B	5.2.0	5.3.0	S2-011468	GTT
037	1	R5	HSS / HLR structuring	C	5.2.0	5.3.0	S2-011565	IMS-CCR

3GPP TSG-SA WG2 #18 **S2-01475**
Puerto Rico, 14.-18.5.2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.002** **CR** **052** ⌘ rev **1** ⌘ Current version: **4.2.0** ⌘

*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 ☐

Title:	⌘	Radio Access Technologies
Source:	⌘	Siemens
Work item code:	⌘	LCRTDD
Date:	⌘	8.5.2001
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:	⌘	A UTRAN may support different access technologies (FDD, TDD). This is not yet reflected in 23.002.
Summary of change:	⌘	The sentence on the radio access technologies is replaced by a reference to the 25-series and 45-series of specifications.
Consequences if not approved:	⌘	An error would remain in 23.002.

Clauses affected:	⌘	4.2
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.

4.2 The Access Network (AN) entities

Two different types of access network are used by the CN: the Base Station System (BSS) and the Radio Network System (RNS). ~~The BSS offers a Time Division Multiple Access (TDMA) based technology to access the Mobile Station whereas the RNS offers a Wideband-Code Division Multiple Access (W-CDMA) based technology.~~ The MSC (resp. SGSN) can connect to one of these Access Network type or to both of them.

The access technologies offered by the BSS are described in the 45-series of 3GPP specifications. The access technologies offered by the RNS (FDD, TDD) are described in the 25-series of 3GPP specifications.

3GPP TSG-SA WG2 #18 **S2-01476**
Puerto Rico, 14.-18.5.2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.002** **CR** **053** ⌘ rev **1** ⌘ Current version: **5.2.0** ⌘

*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 ☐

Title:	⌘	Radio Access Technologies
Source:	⌘	Siemens
Work item code:	⌘	LCRTDD
Date:	⌘	15.5.2001
Category:	⌘	**A**
Release:	⌘	REL-5

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)*
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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:	⌘	A UTRAN may support different access technologies (FDD, TDD). This is not yet reflected in 23.002.
Summary of change:	⌘	The sentence on the radio access technologies is replaced by a reference to the 25-series and 45-series of specifications.
Consequences if not approved:	⌘	An error would remain in 23.002.

Clauses affected:	⌘	4.2
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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The access technologies offered by the BSS are described in the 45-series of 3GPP specifications. The access technologies offered by the RNS (FDD, TDD) are described in the 25-series of 3GPP specifications.

3GPP TSG-SA/WG2 Meeting #18
Puerto Rico, USA, May 14th- 18th, 2001

Tdoc S2-011478

CR-Form-v3

CHANGE REQUEST

⌘ **23.002** **CR** **061** ⌘ rev **r1** ⌘ Current version: **4.2.0** ⌘

*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 ☒

Title:	⌘	Clarification of the role of the SGWs
Source:	⌘	Ericsson
Work item code:	⌘	TEI4
Date:	⌘	2001-05-08
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:	⌘	Currently the R-SGW is placed in a specific place in the architecture, however the signalling gateway can and will be deployed wherewer needed. Since the R-SGW only deals with interworking on lower layers and do not effect the applications running on top (e.g MAP, CAP, BICC, and ISUP) it does not belong in the general reference model.
Summary of change:	⌘	- The description of the R-SGW have been replaced with a more general description on signalling gateways. - The R- and T-SGW have been removed from the reference model - A new subchapter have been included to describe the configuration when using a SGW - The description of the interface between HLR and R-SGW has been deleted - Editorial: HSS(HLR) replaced with HLR since HSS is in R5 not in R4
Consequences if not approved:	⌘	Missguiding description of signalling gateways

Clauses affected:	⌘	4.1.1.7, 4a.7, 5.1, 5.5, 6.4.3.3		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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4 The basic 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.

4.1 The Core Network (CN) entities

4.1.1 Entities common to the PS and CS domains

4.1.1.1 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:

- 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:

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

Different types of identity are attached to each mobile subscription and are stored in the HLR. The following identities are stored:

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

if GPRS is supported, the following identity is also stored:

- zero or more Packet Data Protocol (PDP) address(es);

and, if LCS is supported, the following identity is also stored:

- the LMU indicator.

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:

- 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 23.008.

4.1.1.2 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 TS 23.003 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;
- the last known location and the initial location of the MS.

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 TS 23.008.

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

4.1.1.4 The 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 TS 22.016 and TS 29.002.

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").

See also TS 22.016 on IMEI.

4.1.1.5 SMS Gateway MSC (SMS-GMSC)

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

The choice of which MSCs can act as SMS Gateway MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

4.1.1.6 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.

The choice of which MSCs can act as SMS Interworking MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

~~4.1.1.7 Roaming Signalling Gateway Function (R-SGW)~~

~~The R-SGW performs the signalling conversion (both ways) at transport level between the SS7 based transport of signaling used in pre-Rel 4 networks, and the IP based transport of signalling possibly used in post-R99 networks (Sigtran SCTP/IP versus SS7 MTP). The R-SGW does not interpret the MAP / CAP messages but may have to interpret the underlying SCCP layer to ensure proper routing of the signaling.~~

~~For the support of pre-Rel 4 CS terminals, the services of the R-SGW are used to ensure transport interworking between the SS7 and the IP transport of MAP-E and MAP-G signalling interfaces with a pre-Rel 4 MSC/VLR.~~

4.1.2 Entities of the CS domain

4.1.2.1 The 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 circuit switched services 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.

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 TS 23.012);

- procedures required for handover (see TS 23.009).

NOTE: When this improves the readibility (e.g. when dealing with inter-releases handover), the term 2G-MSC can be used to refer to an MSC Release 98 or prior, and the term 3G-MSC can be used to refer to an MSC Release 99 or later.

When needed, the MSC can be implemented in two different entities: the MSC Server, handling only signalling, and the CS-MGW, handling user's data. A MSC Server and a CS-MGW make up the full functionality of a MSC.

4.1.2.1.1 MSC Server

The MSC Server mainly comprises the call control (CC) and mobility control parts of a MSC.

The MSC Server is responsible for the control of mobile originated and mobile terminated CC CS Domain calls. It terminates the user-network signalling and translates it into the relevant network – network signalling. The MSC Server also contains a VLR to hold the mobile subscriber's service data and CAMEL related data.

The MSC Server controls the parts of the call state that pertain to connection control for media channels in a CS-MGW.

4.1.2.1.2 Circuit Switched - Media Gateway Function (CS-MGW)

Note: In this document the term Media Gateway Function (MGW) is used when there is no need to differentiate between the CS domain entity and the IP Multimedia CN Subsystem entity. When refering specifically to the CS domain entity the term CS-MGW is used. When refering specifically to the IP Multimedia CN Subsystem entity, the term IM-MGW is used.

This component is PSTN/PLMN transport termination point for a defined network and interfaces UTRAN with the core network over Iu.

A CS-MGW may terminate bearer channels from a switched circuit network and media streams from a packet network (e.g., RTP streams in an IP network). Over Iu, the CS-MGW may support media conversion, bearer control and payload processing (e.g. codec, echo canceller, conference bridge) for support of different Iu options for CS services (AAL2/ATM based as well as RTP/UDP/IP based).

The CS-MGW:

- Interacts with MSC server and GMSC server for resource control.
- Owns and handles resources such as echo cancellers etc.
- May need to have codecs.

The CS-MGW will be provisioned with the necessary resources for supporting UMTS/GSM transport media. Further tailoring (i.e packages) of the H.248 may be required to support additional codecs and framing protocols, etc.

The CS-MGW bearer control and payload processing capabilities will also need to support mobile specific functions such as SRNS relocation/handover and anchoring. It is expected that current H.248 standard mechanisms can be applied to enable this.

4.1.2.2 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).

If the call is a voice group/broadcast call, it is routed directly from the GMSC to the VBS/VGCS Anchor MSC, based on information (VBS/VGCS call reference) contained in the dialled number. See also GSM 03.68 and 03.69.

When needed, the GMSC can be implemented in two different entities: the GMSC Server, handling only signalling, as defined bellow, and the CS-MGW, defined above. A GMSC Server and a CS-MGW make up the full functionality of a GMSC.

4.1.2.2.1 Gateway MSC Server (GMSC Server)

The GMSC server mainly comprises the call control and mobility control parts of a GMSC.

4.1.2.3 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 TS Technical Specifications 29.004, 29.005, 29.007 and 09.09.

4.1.3 Entities of the PS domain

The UMTS PS-domain (or GPRS) Support Nodes (GSN) are the Gateway GSN (GGSN) and the Serving GSN (SGSN). They constitute 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.

4.1.3.1 Serving GPRS Support Node (SGSN)

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 TS 23.008 and TS 23.060.

The procedures for information transfer between the SGSN, the GGSN, the VLR and the HLR are defined in TS 23.016 and TS 23.060.

NOTE: When this improves the readibility (e.g. when dealing with inter-releases handover), the term 2G-SGSN can be used to refer to an MSC Release 98 or prior, and the term 3G-SGSN can be used to refer to an MSC Release 99 or later.

4.1.3.2 Gateway GPRS Support Node (GGSN)

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 TS 23.008 and TS 23.060.

The procedures for information transfer between the GGSN, the SGSN and the HLR are defined in TS 23.016 and TS 23.060.

4.1.3.3 Border Gateway (BG)

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.

4.2 The Access Network (AN) entities

Two different types of access network are used by the CN: the Base Station System (BSS) and the Radio Network System (RNS). The BSS offers a Time Division Multiple Access (TDMA) based technology to access the Mobile Station whereas the RNS offers a Wideband-Code Division Multiple Access (W-CDMA) based technology. The MSC (resp. SGSN) can connect to one of these Access Network type or to both of them.

4.2.1 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 is viewed by the SGSN through a single Gb interface. The functionality for the A interface is described in GSM 08.02 and for the Gb interface in TS 23.060. The functionality for the Iu-CS interface is described in TS 25.410 and for the Iu-PS interface in TS 23.060.

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

4.2.1.1 Base Station Controller (BSC)

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

4.2.1.2 Base Transceiver Station (BTS)

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

4.2.2 The Radio Network System (RNS)

The Radio Network System (RNS) is the system of base station equipments (transceivers, controllers, etc...) which is viewed by the MSC through a single Iu-interface as being the entity responsible for communicating with Mobile Stations in a certain area. Similarly, in PLMNs supporting GPRS, the RNS is viewed by the SGSN through a single Iu-PS interface. The functionality for the Iu-CS interface is described in TS 25.410 and for the Iu-PS interface in TS 23.060. The radio equipment of a RNS may support one or more cells. A RNS may consist of one or more base stations. The RNS consists of one Radio Network Controller (RNC) and one or more Node B.

The split of functions between RNS and CN is described in the 25-series of UMTS Technical Specifications.

4.2.2.1 Radio Network Controller (RNC)

A Radio Network Controller (RNC) is a network component in the PLMN with the functions for control of one or more Node B.

4.2.2.2 Node B

A Node B is a network component which serves one cell.

4.3 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), called UMTS Subscriber Identity Module (USIM) for Release 99 and following. 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.

[editor's note: an input is expected to introduce the UE (User Equipment) definition and clarify the difference between MS and UE.]

4a The specific entities of the mobile system

The entities presented in this clause are dedicated to the provisionning of a given (set of) service(s). The fact that they are implemented or not in a given PLMN should have limited impact on all the other entities of the PLMN.

All the specific entities defined so far are located in the Core Network.

4a.1 The Group Call Register (GCR) entity

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.

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 TS 23.068 and 23.069.

4a.2 The Shared InterWorking Function (SIWF) entity

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 4.1.2.3. 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.

4a.3 The Location Services (LCS) entities

For further details on LCS in GSM, see GSM 03.71.

For further details on LCS in UMTS from system and core network point view, see TS 23.171.

For further details on LCS in UTRAN, see TS 25.305.

4a.3.1 Serving Mobile Location Center (SMLC)

In GSM, 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.

In UMTS, the SMLC functionality is integrated in SRNC.

In GSM, 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/SRNC 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/SRNC is administered with the capabilities and types of measurement produced by each of its LMUs.

In GSM, 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.

In GSM, 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 [8].

In UMTS, for Location Services the SRNC generates LCS assistance data. Broadcasting, encryption and charging of LCS assistance data in UMTS is for further study and will be specified in later releases.

4a.3.2 Gateway Mobile Location Center (GMLC)

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.

4a.3.3 Location Measurement Unit (LMU)

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 base station to controller interface (Abis in GSM and Iub in UMTS).

A type A LMU is accessed exclusively over the GSM air interface (Um interface): there is no wired connection to any other network element.

In GSM, 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.

In UMTS, a type A LMU has signaling access to the SRNC. Type A LMU is not supported in UMTS release 1999.

In GSM, 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.

In UMTS, a Type B LMU is accessed over the Iub interface from an RNC. The LMU may be either a standalone network element addressed using some pseudo-cell ID or connected to or integrated in a Node B.

4a.4 CAMEL entities

The entities of this subclause support the CAMEL feature (Customised Applications for Mobile network Enhanced Logic). This feature provides the mechanisms to support services consistently independently of the serving network, as described in 22.078 [2c]. The following definitions are extracted from 23.078 [10c], which completely specifies CAMEL stage 2.

4a.4.1 GSM Service Control Function (gsmSCF)

A functional entity that contains the CAMEL service logic to implement Operator Specific Service. It interfaces with the gsmSSF, the gsmSRF and the HLR.

4a.4.2 GSM Service Switching Function (gsmSSF)

A functional entity that interfaces the MSC/GMSC to the gsmSCF. The concept of the gsmSSF is derived from the IN SSF, but uses different triggering mechanisms because of the nature of the mobile network.

4a.4.3 GSM Specialised Resource Function (gsmSRF)

A functional entity which provides various specialized resources. It interfaces with the gsmSCF and with the MSC. This entity is defined in ITU-T Q.1214 [11] with variations defined in 23.078.

4a.4.4 GPRS Service Switching Function (gprsSSF)

A functional entity that interfaces the SGSN to the gsmSCF. The concept of the gprsSSF is derived from the IN SSF, but uses different triggering mechanisms because of the nature of the mobile network.

4a.5 CBS-specific entities

The cell broadcast service (CBS) is a Teleservice which enables an Information Provider to submit short messages for broadcasting to a specified area within the PLMN. The 3G Technical Specification 23.041 [8] contains the technical realization of the service.

4a.5.1 Cell Broadcast Center (CBC)

The CBC shall be responsible for the management of CBS messages and for determining the CBS delivery parameters of the RNS. The CBC may be connected to several BSCs/RNCs. In UMTS the CBC is regarded to be integrated as a node into the core network.

NOTE: Whether it should be possible that an RNC is connected to at least two CBCs at the same time (the "normal" one as in GSM and a second one for LCS) is for further study and depents on the solution taken for LCS.

4a.6 Number Portability Specific entities

Two different solutions are defined to support Number Portability. The first one is an IN based solution and is described in the next subclause. The second one is a "Signalling Relay" based solution described in next but one subclause.

For details on MNP see TS 23.066.

4a.6.1 IN-based solution: Number Portability Database (NPDB)

The Number Portability Database (NPDB) is the central element of the IN based solution for Mobile Number Portability (MNP). MNP is the ability for a mobile subscriber to change the GSM subscription network within a portability cluster (e.g. a country) whilst retaining his/her original MSISDN or MSISDNs.

The NPDB stores the table of correspondence between MSISDNs and Subscription networks. Upon request of the (gateway or visited) MSC, the NPDB retrieves from the MSISDN the Routing Number pointing out the Subscription network.

4a.6.2 Signalling Relay-based solution: Mobile Number Portability/Signalling Relay function (MNP-SRF)

The MNP-Signalling Relay Function (MNP-SRF) is the central element of the Signalling Relay based solution for Mobile Number Portability.

The MNP-SRF obtains the routing information from a NP database to identify the subscription network associated with a particular national MSISDN. Upon request from gateway MSC, the MNP-SRF may perform one of the following actions:

1. the MNP-SRF will reply back to the GMSC with the necessary routing information to route the call;
2. the message is relayed to the HLR;
3. the message is relayed to MNP-SRF in the subscription network.

For non-call related signalling (e.g. delivery of SMS), only cases 2 and 3 are applicable.

4a.7 Signalling Gateway Function (SGW)

The SGW performs the signalling conversion (both ways) at transport level between the SS7 based transport of signaling used in pre-Rel 4 networks, and the IP based transport of signalling possibly used in post-R99 networks (i.e. between Sigtran SCTP/IP and SS7 MTP). The SGW does not interpret the application layer (e.g. MAP, CAP, BICC or ISUP) messages but may have to interpret the underlying SCCP or SCTP layer to ensure proper routing of the signaling.

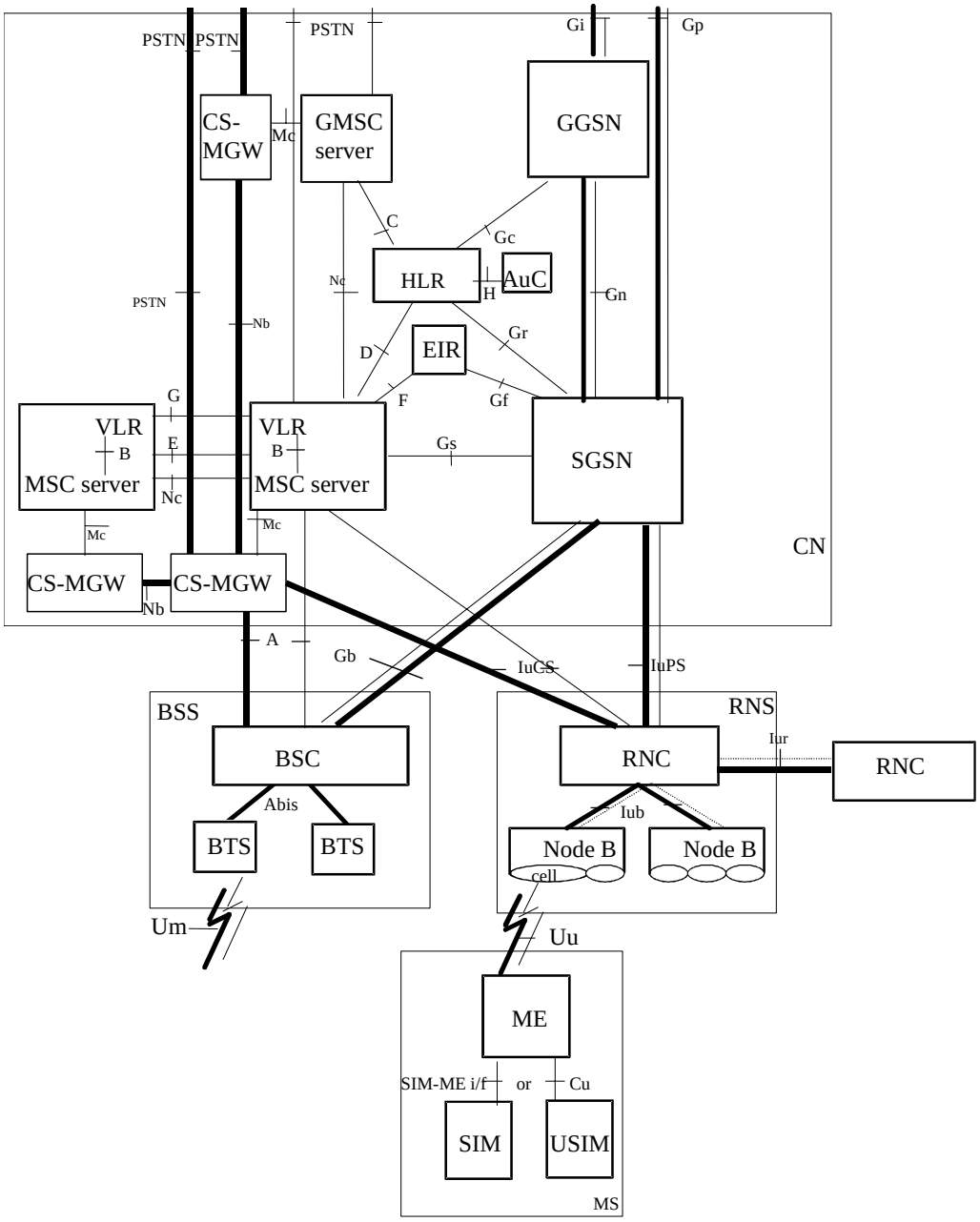
5 Configuration of a Public Land Mobile Network

5.1 Basic configuration

The basic configuration of a Public Land Mobile Network (PLMN) supporting GPRS and the interconnection to the PSTN/ISDN and PDN is presented in figure 1. This configuration presents signalling and user traffic 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.

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 Iu, Iur and Iub are defined in the UMTS 25.4xx-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. All the GPRS-specific interfaces (G- series) are defined in the UMTS 23-series and 24-series of Technical Specifications. Interfaces Mc, Nb, and Nc are defined in UMTS 23.205 and in the UMTS 29-series of technical specifications.

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.


PSTN
PSTN
PSTN
Gi
Gp
CS-MGW
Mc
GMSC server
GGSN
C
Gc
Nc
HLR
AuC
H
Gn
PSTN
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D
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F
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MSC server
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MSC server
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CN
CS-MGW
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BSC
Abis
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cell
Node B
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SIM-ME i/f
or
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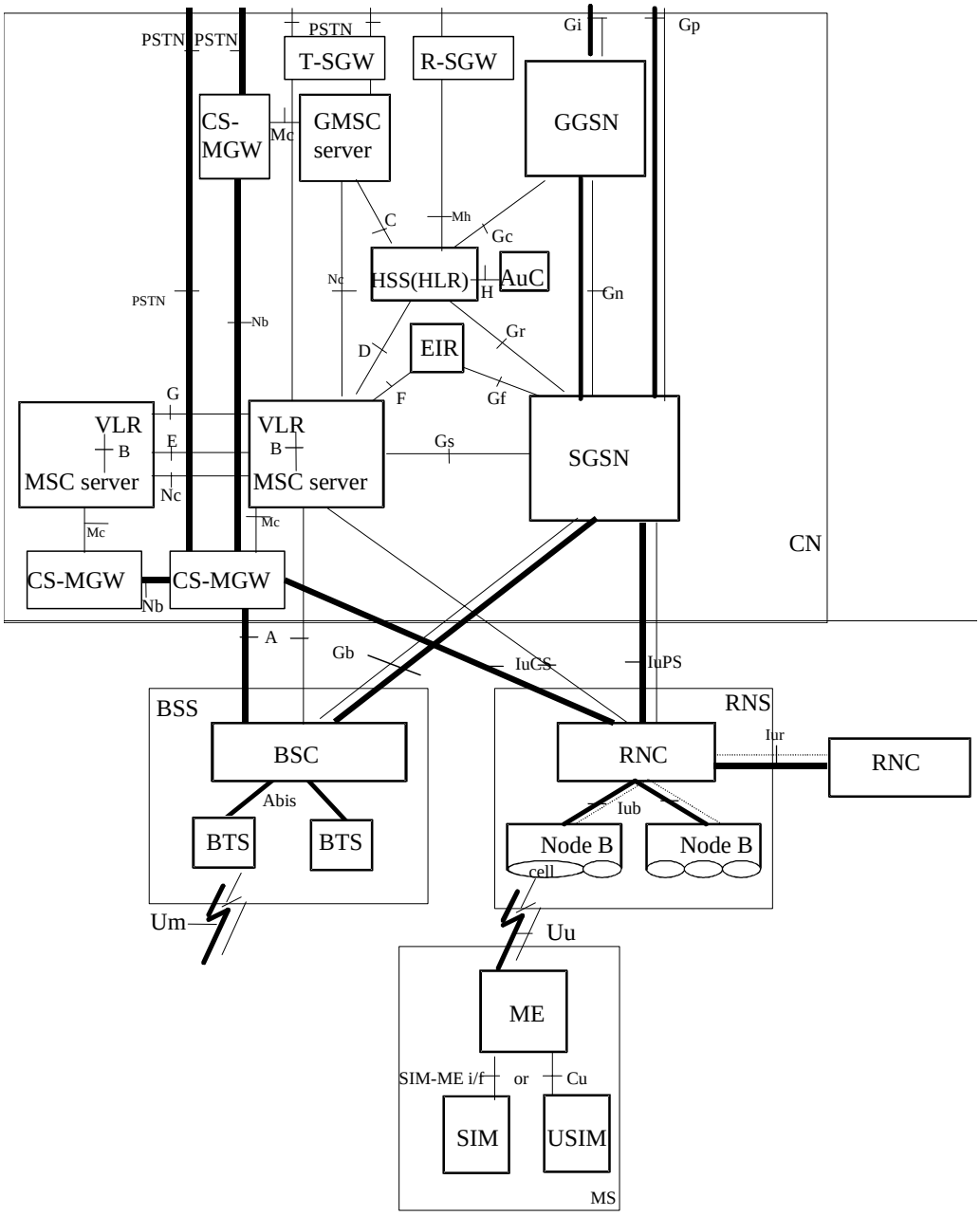
USIM
MS



Legend:
Bold lines: interfaces supporting user traffic;
Dashed lines: interfaces supporting signalling.

NOTE 1: The figure shows direct interconnections between the entities. The actual links may be provided by an underlying network (e.g. SS7 or IP): this needs further studies.

NOTE 2: When the MSC and the SGSN are integrated in a single physical entity, this entity is called UMTS MSC (UMSC).

NOTE 3: A (G)MSC server and associated CS-MGW can be implemented as a single node: the (G)MSC.

NOTE 4: The Gn interface (between two SGSNs) is also part of the reference architecture, but is not shown for layout purposes only.

Figure 1: Basic Configuration of a PLMN supporting CS and PS services and interfaces

5.2 Configuration of LCS entities

5.2.1 Configuration of LCS entities in GSM

The configuration of LCS entities for GSM are is presented in figure 2. In the figure, 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.

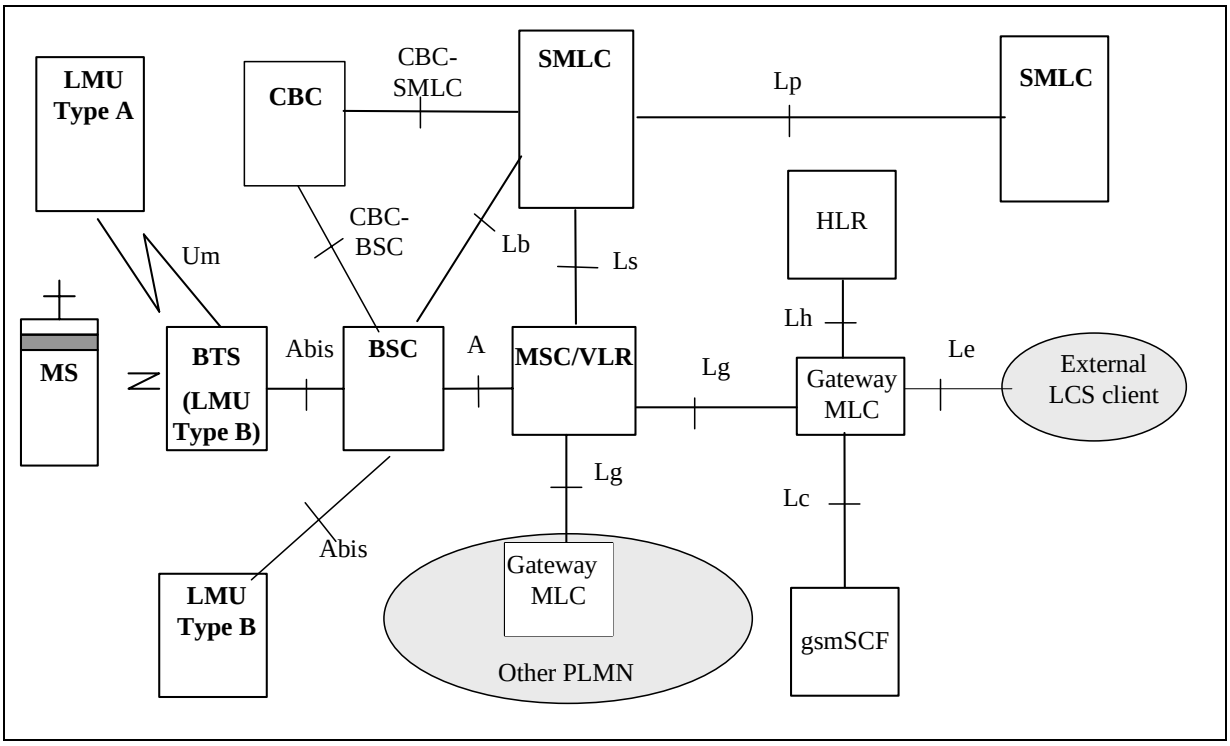


Figure 2: Configuration of LCS entities in a GSM PLMN

5.2.2 Configuration of LCS entities in UMTS

The basic configuration of UMTS LCS is presented in figure 3. There is no SMLC entity in this figure because the SMLC functionality of UTRAN is integrated in SRNC.

NOTE: The usage of CBC for LCS assistance data in UMTS is for further study. The assistance data is generated in SRNC.

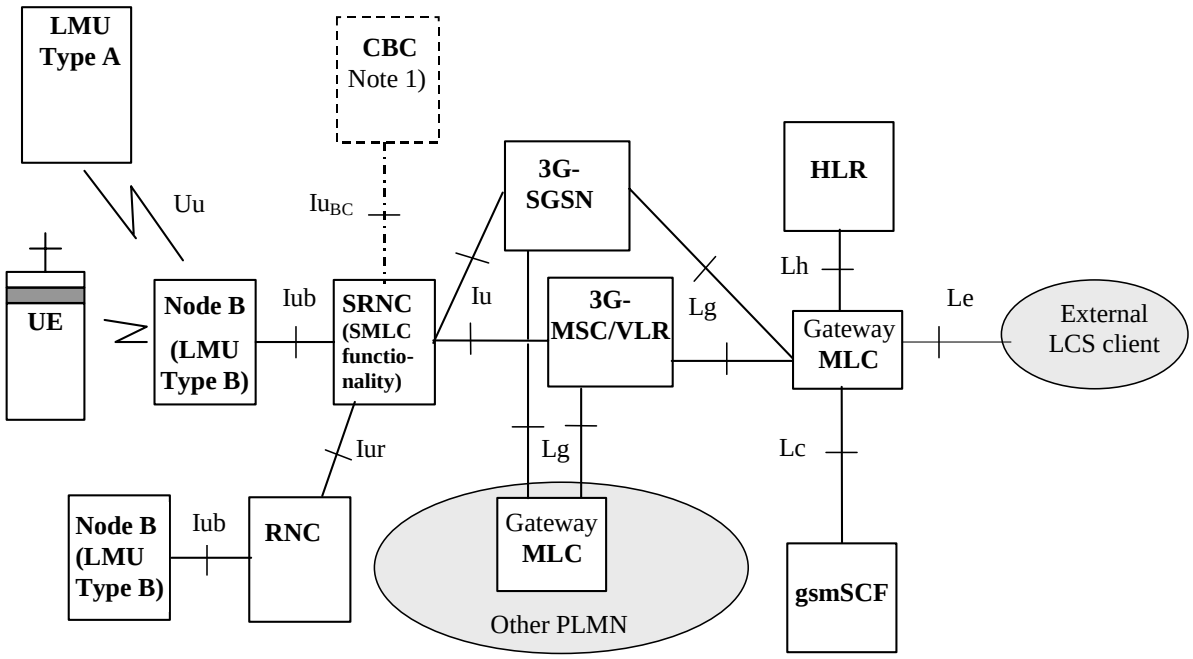


Figure 3: Configuration of a LCS entities in a UMTS PLMN

5.3 Configuration of CAMEL entities

The following figure shows the interconnection of the CAMEL-specific entities with the rest of the network. Only the interfaces specificly involved in CAMEL provisionning are shown, i.e. all the GMSC, MSC, SGSN and HLR interfaces depicted in figure 1 are still supported by these entities even if not shown.

NOTE: The CAMEL-specific interfaces have no particular name. They are designated by the name of the two entities they link together, e.g. "the gsmSSF-gsmSCF interface".

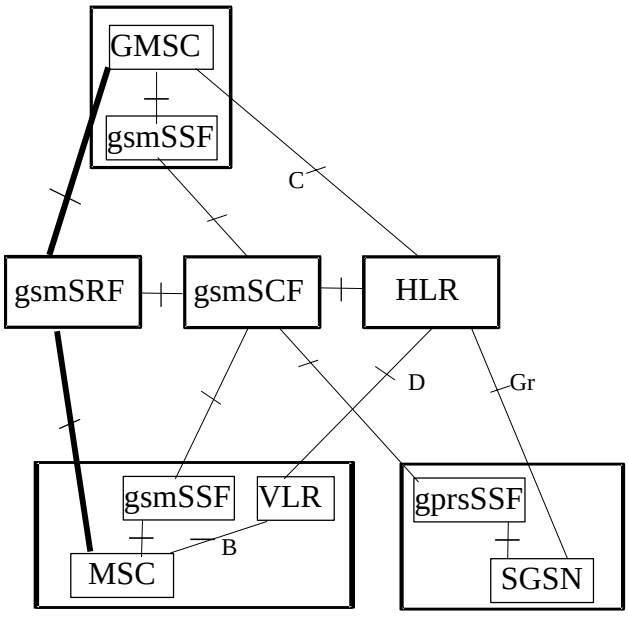


Figure 4: configuration of CAMEL entities

The bold lines are used for interfaces supporting user data only, the dashed lines are used for interfaces supporting signalling only.

5.4 Configuration of CBS entities

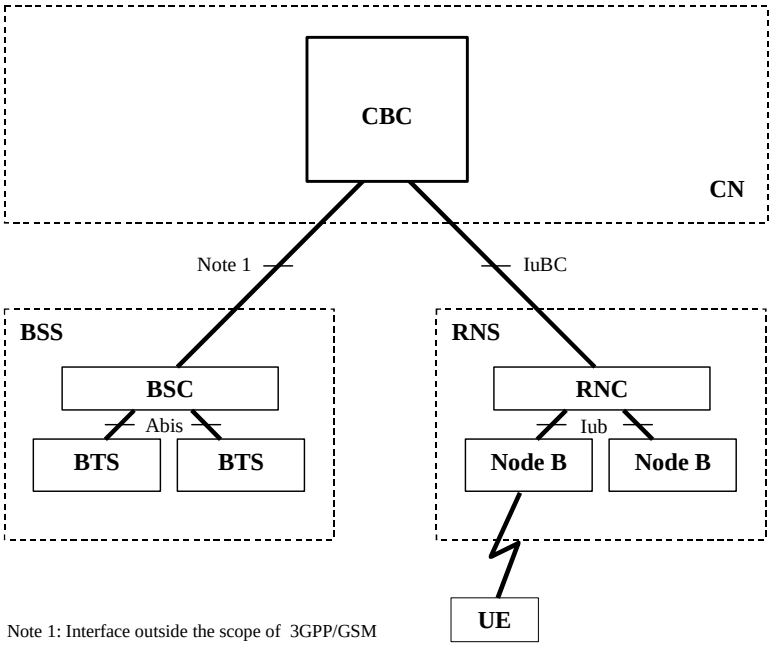


Figure 5: Configuration of a PLMN supporting Cell Broadcast Service entities

5.5 Configuration of Signalling Gateway Function

The Signalling gateway function is used to interconnect different signalling networks i.e. SCTP/IP based signalling networks and SS7 signalling networks. The application layer (e.g. ISUP, BICC, MAP or CAP) is not affected. The signalling gateway function may be implemented as a stand alone entity or inside another entity.

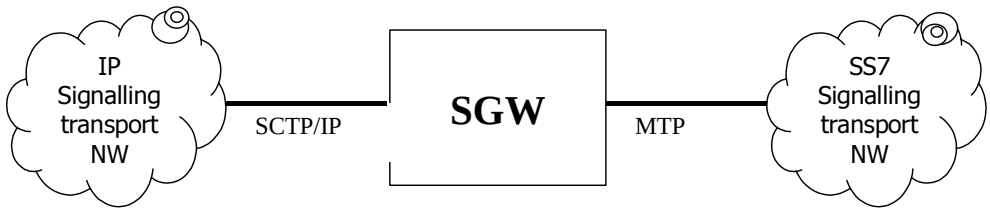


Figure 6: Configuration of a signalling gateway function

Note: SS7 application transport and SCTP/IP adaption protocols are not shown.

6 PLMN basic interfaces and reference points

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.

[editor's note: either the difference between interface and reference point should be cleary provided, or only one of the terms should be used].

6.1 Interfaces between Mobile Station and the Fixed Infrastructure

6.1.1 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.

6.1.2 Interface between Mobile Station and Radio Netwok System (Uu-interface)

The interface between the MS and the RNS is specified in the 24- and 25-series of UMTS Technical Specifications.

6.2 Interface between the Core Network and the Access Network

6.2.1 Interfaces between the CS domain and the Access Network

6.2.1.1 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.

6.2.1.2 Interface between the MSC and RNS (Iu_CS interface)

The interface between the MSC and its RNS is specified in the 25.41x-series of UMTS Technical Specifications.

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

- RNS management;
- call handling;
- mobility management.

6.2.2 Interfaces between the PS domain and the Access Network

6.2.2.1 Interface between SGSN and BSS (Gb-interface)

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 and 08.18.

6.2.2.2 Interface between SGSN and RNS (Iu_PS-interface)

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

- packet data transmission;
- mobility management.

The Iu_PS interface is defined in the 25.41x-series of UMTS Technical Specifications.

6.3 Interfaces internal to the Access Network

6.3.1 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.

6.3.2 Interface between RNC and Node B (Iub-interface)

When the RNS consists of a Radio Network Controller (RNC) and one or more Node B, this interface is used between the RNC and Node B to support the services offered to the UMTS users and subscribers.

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

The interface is specified in the 28.5x-series of UMTS Technical Specifications.

6.3.3 Interface between two RNCs (Iur-interface)

This interface is defined in the 25.42x series of recommendations.

6.4 Interfaces internal to the Core Network

6.4.1 Interfaces internal to the CS domain

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

The VLR is the location and management database for the mobile subscribers roaming in the area controlled by the associated MSC server(s). Whenever the MSC server 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 server, the MSC server 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 server informs (via the VLR) the HLR which stores these modifications and updates the VLR if required.

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

6.4.1.2 Interface between the HLR and the MSC server (C-interface)

The Gateway MSC server 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 TS 29.002.

For CAMEL purposes, this interface is used as described in 23.078. It is used e.g. at terminating calls to exchange routeing information, subscriber status, location information, subscription information, etc.

6.4.1.3 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 TS 29.002.

For CAMEL purposes, this interface is used to send the CAMEL related subscriber data to the visited PLMN and for provision of MSRN. The interface is also used for the other purposes described in 23.078, e.g. to retrieve subscriber status and location information of the mobile subscriber or to indicate suppression of announcement for a CAMEL service.

6.4.1.4 Interface between MSC servers (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 MSC servers have to exchange data to initiate and then to realise the operation.

After the handover operation has been completed, the MSC servers 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 server serving the Mobile Station and the MSC server 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 TS 29.002.

6.4.1.5 Interface between MSC server and EIR (F-interface)

This interface is used between MSC server 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 TS 29.002.

6.4.1.6 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 TS 29.002.

6.4.1.7 Reference point (G)MSC server – CS-MGW (Mc Reference Point)

The Mc reference point describes the interfaces between the MSC Server and CS-MGW, and between the GMSC Server and CS-MGW. It has the following properties:

- full compliance with the H.248 standard, baseline work of which is currently carried out in ITU-T Study Group 16, in conjunction with IETF MEGACO WG.

- flexible connection handling which allows support of different call models and different media processing purposes not restricted to H.323 usage.
- open architecture where extensions/Packages definition work on the interface may be carried out.
- dynamic sharing of MGW physical node resources. A physical MGW can be partitioned into logically separate virtual MGWs/domains consisting of a set of statically allocated terminations.
- dynamic sharing of transmission resources between the domains as the MGW controls bearers and manage resources according to the H.248 protocols.

The functionality across the Mc reference point will need to support mobile specific functions such as SRNS relocation/handover and anchoring. It is expected that current H.248/IETF Megaco standard mechanisms can be applied to enable this.

6.4.1.8 Reference Point MSC Server – GMSC Server (Nc Reference Point)

Over the Nc reference point, the Network-Network based call control is performed. Examples of this are ISUP or an evolvement of ISUP for bearer independent call control (BICC). In the R'00 architecture different options for signalling transport on Nc shall be possible including IP.

6.4.1.9 Reference Point CS-MGW – CS-MGW (Nb Reference Point)

Over the Nb reference point the bearer control and transport are performed. The transport may be RTP/UDP/IP or AAL2 for transport of user data. In the R00 architecture different options for user data transport and bearer control shall be possible on Nb, for example: AAL2/Q.AAL2, STM/none, RTP/H.245.

6.4.2 Interfaces internal to the PS domain

6.4.2.1 Interface between SGSN and HLR (Gr-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 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 TS 29.002.

6.4.2.2 Interface between SGSN and GGSN (Gn- and Gp-interface)

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 TS 29.060.

6.4.2.3 Signalling Path between GGSN and HLR (Gc-interface)

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 TS 29.002;

- 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.

6.4.2.4 Interface between SGSN and EIR (Gf-interface)

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 TS 29.002.

6.4.3 Interfaces used by CS and PS domains

6.4.3.1 Interface between MSC/VLR and SGSN (Gs-interface)

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 TS 29.016 and 29.018.

6.4.3.2 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.

~~6.4.3.3 Reference Point HSS - R-SGW (Mh Reference Point)~~

~~This interface supports the exchange of mobility management and subscription data information between HSS and networks of R99 or prior. This is required to support network users of Rel 4 or above who are roaming in networks of previous releases.~~

3GPP TSG-SA/WG2 Meeting #15
Puerto Rico, USA, May 14th- 18th, 2001

Tdoc S2-011479

CR-Form-v3

CHANGE REQUEST

⌘ **23.002** **CR** **062** ⌘ rev **R1** ⌘ Current version: **5.2.0** ⌘

*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 ☒

Title:	⌘	Clarification of the role of the SGWs
Source:	⌘	Ericsson
Work item code:	⌘	TEI5 ***Date:*** ⌘ 2001-05-08
Category:	⌘	**F** ***Release:*** ⌘ REL-5

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:	⌘	Currently the T- and R-SGW is placed in specific places in the architecture, however signalling gateways can and will be deployed wherewer needed. Since the SGW only deals with interworking on lower layers and do not effect the applications running on top (e.g MAP, CAP, BICC and ISUP) they do not belong in the general reference model.
Summary of change:	⌘	- The description of the T- and R-SGW have been replaced with a more general description on signalling gateways. - The R- and T-SGW have been removed from the reference models - A new subchapter have been included to describe the configuration when using a SGW - The description of the reference points between between R-SGW and other entities has been deleted
Consequences if not approved:	⌘	Missguiding description of signalling gateways

Clauses affected:	⌘	4.1.1.7, 4a.7.3, 4a.8, 5.1, 5.5, 5.6, 6.4.3.3, 6a.7.7
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.

4 The basic 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.

4.1 The Core Network (CN) entities

4.1.1 Entities common to the PS and CS domains

4.1.1.1 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:

- 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:

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

Different types of identity are attached to each mobile subscription and are stored in the HLR. The following identities are stored:

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

if GPRS is supported, the following identity is also stored:

- zero or more Packet Data Protocol (PDP) address(es);

and, if LCS is supported, the following identity is also stored:

- the LMU indicator.

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:

- 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 23.008.

4.1.1.1a The Home Subscriber Server (HSS)

[editor's note: most of the text bellow on the HSS applies also to the HLR. It will widely increase the readability to provide in this section only the functions that the HSS provides on top of the HLR. Also, the implementation-specific text provided bellow should be deleted or moved e.g. to 23.008.]

The HSS substitutes the HLR when the IM subsystem is implemented.

The Home Subscriber Server (HSS) is the master database for a given user. It is the entity containing the subscription related information to support the network entities actually handling calls/sessions.

As an example, HSS could provide support to the call control servers in order to complete the routing/roaming procedures by solving authentication, authorisation, naming/addressing resolution, location dependencies, etc…

The HSS is responsible for holding the following user related information:

- User Identification, Numbering and addressing information.
- User Security information: Network access control information for authentication and authorization
- User Location information at inter-system level: the HSS handles the user registration, and stores inter-system location information, etc.
- The User profile (services, service specific information…)

Based on this information, the HSS is also responsible of supporting the CC/SM entities of the different control systems (CS Domain control, PS Domain control, IP Multimedia control…) offered by the operator.

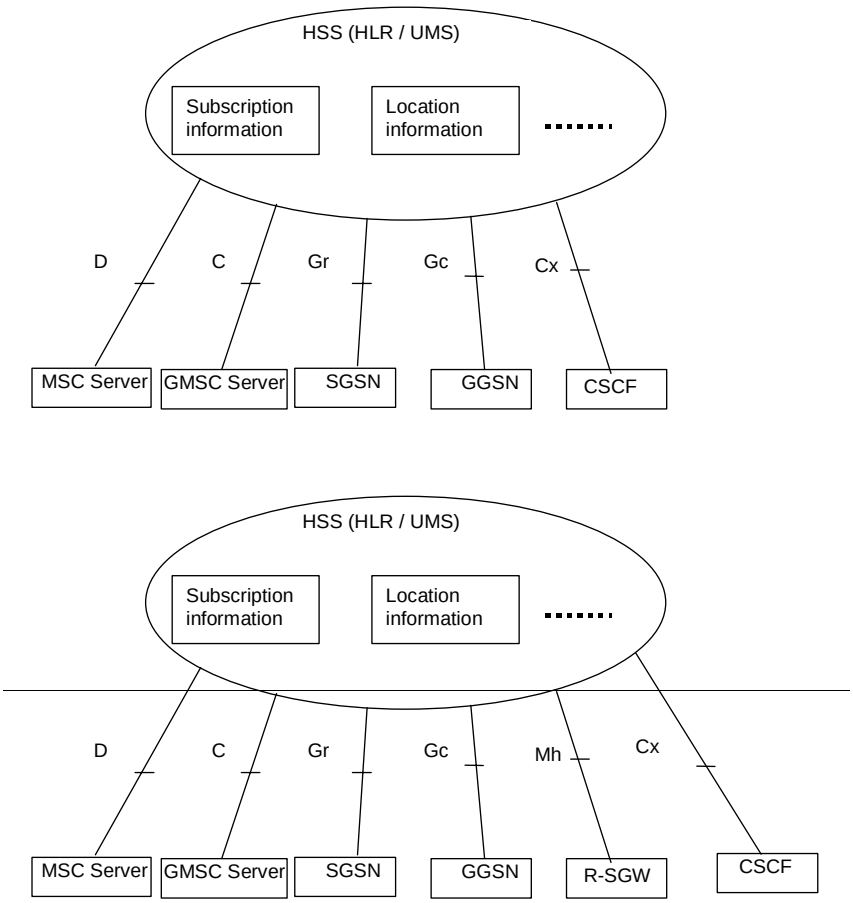


Figure 0-a: Example of a Generic HSS structure and basic interfaces

HSS may integrate heterogeneous information, and enable enhanced features in the core network to be offered to the application & services domain, at the same time hiding the heterogeneity.

The HSS consists of the following functionalities:

- User control functions required by the IM subsystem.
- The subset of the HLR functionality required by the PS Domain.
- The CS part of the HLR, if it is desired to enable subscriber access to the CS Domain or to support roaming to legacy GSM/UMTS CS Domain networks.

The HSS structure is as follow (see also Figure 0-b):

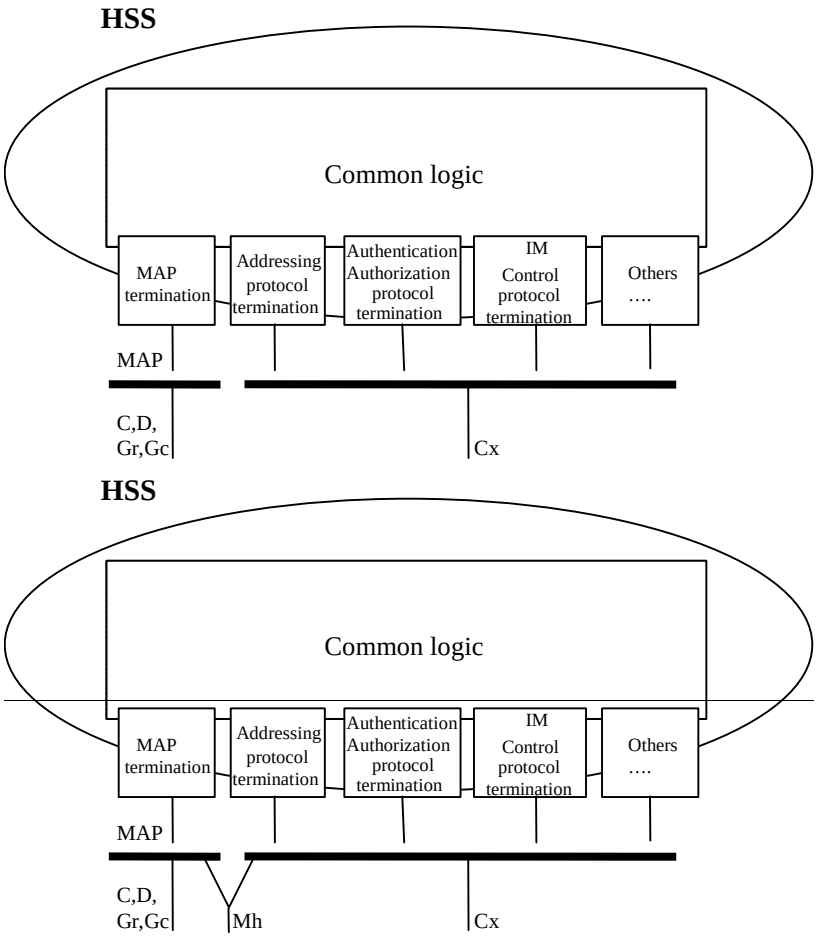


Figure 0-b: Example of a generic HSS structure with further breakdown into protocols over the basic interfaces

- MAP termination

HSS terminates the MAP protocol as described in MAP specifications:

  - User Location Management procedures
  - User Authentication Management procedures
  - Subscriber profile Management procedures,
  - Call handling support procedures (Routing information handling)
  - SS related procedures, etc…

- Addressing protocol termination

HSS terminates a protocol to solve addressing according to appropriate standards:

  - Procedures for user names/numbers/addresses resolution
  - As an example, DNS+ protocol could be a suitable candidate, as it is being defined within the ENUM group in IETF (currently looking into URL/E.164 naming translation, etc…).

[editor's note*:* the statement above is too vague. It should be confirmed or deleted.]

- Authentication, Authorization protocol termination

HSS terminates authentication and authorization protocols according to appropriate standards:

- User authentication and authorisation procedures for IP based Multimedia services
- As an example, Diameter protocol could be a suitable candidate, as it is being defined within IETF.

[editor's note*:* the statement above is too vague. It should be confirmed or deleted.]

- IM Control termination

HSS terminates the IP based MM call control protocol, according to appropriate standards:

- User Location Management procedures for IP based Multimedia services
- IP based Multimedia Call handling support procedures (Routing information handling)
- As an example, the SIP protocol (or some parts of it, related with location procedures) could be a suitable candidate.

[editor's note*:* the statement above is too vague. It should be confirmed or deleted.]

4.1.1.2 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 TS 23.003 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;
- the last known location and the initial location of the MS.

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 TS 23.008.

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

4.1.1.4 The 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 TS 22.016 and TS 29.002.

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").

See also TS 22.016 on IMEI.

4.1.1.5 SMS Gateway MSC (SMS-GMSC)

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

The choice of which MSCs can act as SMS Gateway MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

4.1.1.6 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.

The choice of which MSCs can act as SMS Interworking MSCs is a network operator matter (e.g. all MSCs or some designated MSCs).

~~4.1.1.7 Roaming Signalling Gateway Function (R-SGW)~~

~~The R-SGW performs the signalling conversion (both ways) at transport level between the SS7 based transport of signaling used in pre-Rel 4 networks, and the IP based transport of signalling possibly used in post-R99 networks (Sigtran SCTP/IP versus SS7 MTP). The R-SGW does not interpret the MAP / CAP messages but may have to interpret the underlying SCCP layer to ensure proper routing of the signaling.~~

~~For the support of pre-Rel 4 CS terminals, the services of the R-SGW are used to ensure transport interworking between the SS7 and the IP transport of MAP-E and MAP-G signalling interfaces with a pre-Rel 4 MSC/VLR.~~

4.1.2 Entities of the CS domain

4.1.2.1 The 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 circuit switched services 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.

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 TS 23.012);
- procedures required for handover (see TS 23.009).

NOTE: When this improves the readibility (e.g. when dealing with inter-releases handover), the term 2G-MSC can be used to refer to an MSC Release 98 or prior, and the term 3G-MSC can be used to refer to an MSC Release 99 or later.

When needed, the MSC can be implemented in two different entities: the MSC Server, handling only signalling, and the CS-MGW, handling user's data. A MSC Server and a CS-MGW make up the full functionality of a MSC.

4.1.2.1.1 MSC Server

The MSC Server mainly comprises the call control (CC) and mobility control parts of a MSC.

The MSC Server is responsible for the control of mobile originated and mobile terminated CC CS Domain calls. It terminates the user-network signalling and translates it into the relevant network – network signalling. The MSC Server also contains a VLR to hold the mobile subscriber's service data and CAMEL related data.

The MSC Server controls the parts of the call state that pertain to connection control for media channels in a CS-MGW.

4.1.2.1.2 Circuit Switched - Media Gateway Function (CS-MGW)

Note: In this document the term Media Gateway Function (MGW) is used when there is no need to differentiate between the CS domain entity and the IP Multimedia CN Subsystem entity. When refering specifically to the CS domain entity the term CS-MGW is used. When refering specifically to the IP Multimedia CN Subsystem entity, the term IM-MGW is used.

This component is PSTN/PLMN transport termination point for a defined network and interfaces UTRAN with the core network over Iu.

A CS-MGW may terminate bearer channels from a switched circuit network and media streams from a packet network (e.g., RTP streams in an IP network). Over Iu, the CS-MGW may support media conversion, bearer control and payload processing (e.g. codec, echo canceller, conference bridge) for support of different Iu options for CS services (AAL2/ATM based as well as RTP/UDP/IP based).

The CS-MGW:

- Interacts with MGCF, MSC server and GMSC server for resource control.
- Owns and handles resources such as echo cancellers etc.
- May need to have codecs.

The CS-MGW will be provisioned with the necessary resources for supporting UMTS/GSM transport media. Further tailoring (i.e packages) of the H.248 may be required to support additional codecs and framing protocols, etc.

The CS-MGW bearer control and payload processing capabilities will also need to support mobile specific functions such as SRNS relocation/handover and anchoring. It is expected that current H.248 standard mechanisms can be applied to enable this.

4.1.2.2 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).

If the call is a voice group/broadcast call, it is routed directly from the GMSC to the VBS/VGCS Anchor MSC, based on information (VBS/VGCS call reference) contained in the dialled number. See also GSM 03.68 and 03.69.

[Editor's note: There is a need to consider possibilities that call incoming to the PLMN may be routed to entities other than the GMSC, e.g., for networks that do not deploy CS domain.]

When needed, the GMSC can be implemented in two different entities: the GMSC Server, handling only signalling, as defined bellow, and the CS-MGW, defined above. A GMSC Server and a CS-MGW make up the full functionality of a GMSC.

4.1.2.2.1 Gateway MSC Server (GMSC Server)

The GMSC server mainly comprises the call control and mobility control parts of a GMSC.

4.1.2.3 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 TS Technical Specifications 29.004, 29.005, 29.007 and 09.09.

4.1.3 Entities of the PS domain

The UMTS PS-domain (or GPRS) Support Nodes (GSN) are the Gateway GSN (GGSN) and the Serving GSN (SGSN). They constitute 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.

4.1.3.1 Serving GPRS Support Node (SGSN)

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 TS 23.008 and TS 23.060.

The procedures for information transfer between the SGSN, the GGSN, the VLR and the HLR are defined in TS 23.016 and TS 23.060.

NOTE: When this improves the readibility (e.g. when dealing with inter-releases handover), the term 2G-SGSN can be used to refer to an MSC Release 98 or prior, and the term 3G-SGSN can be used to refer to an MSC Release 99 or later.

4.1.3.2 Gateway GPRS Support Node (GGSN)

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 TS 23.008 and TS 23.060.

The procedures for information transfer between the GGSN, the SGSN and the HLR are defined in TS 23.016 and TS 23.060.

4.1.3.3 Border Gateway (BG)

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.

4.2 The Access Network (AN) entities

Two different types of access network are used by the CN: the Base Station System (BSS) and the Radio Network System (RNS). The BSS offers a Time Division Multiple Access (TDMA) based technology to access the Mobile Station whereas the RNS offers a Wideband-Code Division Multiple Access (W-CDMA) based technology. The MSC (resp. SGSN) can connect to one of these Access Network type or to both of them.

4.2.1 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 or Iu-CS interface as being the entity responsible for communicating with Mobile Stations in a certain area. Similarly, in PLMNs supporting GPRS, the BSS is viewed by the SGSN through a single Gb or Iu-PS interface. The functionality for the A interface is described in GSM 08.02 and for the Gb interface in TS 23.060. The functionality for the Iu-CS interface is described in TS 25.410 and for the Iu-PS interface in TS 23.060.

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 split of functions between BSS and CN for a Iu interface is desribed in the 25-series of UMTS Technical Specifications.

The split of functions between BSS and CN for a A/Gb interface is described in the 08-series of GSM Technical Specifications. The split of functions between BSS and CN for a Iu interface is desribed in the 25-series of UMTS Technical Specifications.

NOTE: The mobile station shall operate using **only the following modes:**

a. **A / G_b mode**, e.g. for pre-Release 4 terminals, for Release 4 terminals when connected to a BSS with no Iu interface towards the Core Network.
b. **Iu mode** (i.e. Iu-CS and Iu-PS), e.g. for Release 4 terminals when connected to a BSS with Iu interfaces towards the Core Network

No other modes (e.g. A/Iu-PS or Iu-CS/Gb) shall be allowed.

See also TS 43.051.

4.2.1.1 Base Station Controller (BSC)

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

4.2.1.2 Base Transceiver Station (BTS)

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

4.2.2 The Radio Network System (RNS)

The Radio Network System (RNS) is the system of base station equipments (transceivers, controllers, etc...) which is viewed by the MSC through a single Iu-interface as being the entity responsible for communicating with Mobile Stations in a certain area. Similarly, in PLMNs supporting GPRS, the RNS is viewed by the SGSN through a single Iu-PS interface. The functionality for the Iu-CS interface is described in TS 25.410 and for the Iu-PS interface in TS 23.060. The radio equipment of a RNS may support one or more cells. A RNS may consist of one or more base stations. The RNS consists of one Radio Network Controller (RNC) and one or more Node B.

The split of functions between RNS and CN is described in the 25-series of UMTS Technical Specifications.

4.2.2.1 Radio Network Controller (RNC)

A Radio Network Controller (RNC) is a network component in the PLMN with the functions for control of one or more Node B.

4.2.2.2 Node B

A Node B is a network component which serves one cell.

4.3 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), called UMTS Subscriber Identity Module (USIM) for Release 99 and following. 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.

[editor's note: an input is expected to introduce the UE (User Equipment) definition and clarify the difference between MS and UE.]

4a The specific entities of the mobile system

The entities presented in this clause are dedicated to the provisionning of a given (set of) service(s). The fact that they are implemented or not in a given PLMN should have limited impact on all the other entities of the PLMN.

All the specific entities defined so far are located in the Core Network.

4a.1 The Group Call Register (GCR) entity

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.

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 TS 23.068 and 23.069.

4a.2 The Shared InterWorking Function (SIWF) entity

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 4.1.2.3. 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.

4a.3 The Location Services (LCS) entities

For further details on LCS in GSM, see GSM 03.71.

For further details on LCS in UMTS from system and core network point view, see TS 23.171.

For further details on LCS in UTRAN, see TS 25.305.

4a.3.1 Serving Mobile Location Center (SMLC)

In GSM, 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.

In UMTS, the SMLC functionality is integrated in SRNC.

In GSM, 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/SRNC 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/SRNC is administered with the capabilities and types of measurement produced by each of its LMUs.

In GSM, 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.

In GSM, 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 [8].

In UMTS, for Location Services the SRNC generates LCS assistance data. Broadcasting, encryption and charging of LCS assistance data in UMTS is for further study and will be specified in later releases.

4a.3.2 Gateway Mobile Location Center (GMLC)

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.

4a.3.3 Location Measurement Unit (LMU)

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 base station to controller interface (Abis in GSM and Iub in UMTS).

A type A LMU is accessed exclusively over the GSM air interface (Um interface): there is no wired connection to any other network element.

In GSM, 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.

In UMTS, a type A LMU has signaling access to the SRNC. Type A LMU is not supported in UMTS release 1999.

In GSM, 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.

In UMTS, a Type B LMU is accessed over the Iub interface from an RNC. The LMU may be either a standalone network element addressed using some pseudo-cell ID or connected to or integrated in a Node B.

4a.4 CAMEL entities

The entities of this subclause support the CAMEL feature (Customised Applications for Mobile network Enhanced Logic). This feature provides the mechanisms to support services consistently independently of the serving network, as described in 22.078 [2c]. The following definitions are extracted from 23.078 [10c], which completely specifies CAMEL stage 2.

4a.4.1 GSM Service Control Function (gsmSCF)

A functional entity that contains the CAMEL service logic to implement Operator Specific Service. It interfaces with the gsmSSF, the gsmSRF and the HLR.

4a.4.2 GSM Service Switching Function (gsmSSF)

A functional entity that interfaces the MSC/GMSC to the gsmSCF. The concept of the gsmSSF is derived from the IN SSF, but uses different triggering mechanisms because of the nature of the mobile network.

4a.4.3 GSM Specialised Resource Function (gsmSRF)

A functional entity which provides various specialized resources. It interfaces with the gsmSCF and with the MSC. This entity is defined in ITU-T Q.1214 [11] with variations defined in 23.078.

4a.4.4 GPRS Service Switching Function (gprsSSF)

A functional entity that interfaces the SGSN to the gsmSCF. The concept of the gprsSSF is derived from the IN SSF, but uses different triggering mechanisms because of the nature of the mobile network.

4a.5 CBS-specific entities

The cell broadcast service (CBS) is a Teleservice which enables an Information Provider to submit short messages for broadcasting to a specified area within the PLMN. The 3G Technical Specification 23.041 [8] contains the technical realization of the service.

4a.5.1 Cell Broadcast Center (CBC)

The CBC shall be responsible for the management of CBS messages and for determining the CBS delivery parameters of the RNS. The CBC may be connected to several BSCs/RNCs. In UMTS the CBC is regarded to be integrated as a node into the core network.

Note: Whether it should be possible that an RNC is connected to at least two CBCs at the same time (the "normal" one as in GSM and a second one for LCS) is for further study and depents on the solution taken for LCS.

4a.6 Number Portability Specific entities

Two different solutions are defined to support Number Portability. The first one is an IN based solution and is described in the next subclause. The second one is a "Signalling Relay" based solution described in next but one subclause.

For details on MNP see TS 23.066.

4a.6.1 IN-based solution: Number Portability Database (NPDB)

The Number Portability Database (NPDB) is the central element of the IN based solution for Mobile Number Portability (MNP). MNP is the ability for a mobile subscriber to change the GSM subscription network within a portability cluster (e.g. a country) whilst retaining his/her original MSISDN or MSISDNs.

The NPDB stores the table of correspondence between MSISDNs and Subscription networks. Upon request of the (gateway or visited) MSC, the NPDB retrieves from the MSISDN the Routing Number pointing out the Subscription network.

4a.6.2 Signalling Relay-based solution: Mobile Number Portability/Signalling Relay function (MNP-SRF)

The MNP-Signalling Relay Function (MNP-SRF) is the central element of the Signalling Relay based solution for Mobile Number Portability.

The MNP-SRF obtains the routing information from a NP database to identify the subscription network associated with a particular national MSISDN. Upon request from gateway MSC, the MNP-SRF may perform one of the following actions:

1. the MNP-SRF will reply back to the GMSC with the necessary routing information to route the call;
2. the message is relayed to the HLR;
3. the message is relayed to MNP-SRF in the subscription network.

For non-call related signalling (e.g. delivery of SMS), only cases 2 and 3 are applicable.

4a.7 IP Multimedia (IM) Subsystem entities

4.a.7.1 Call State Control Function (CSCF)

The CSCF can act as Proxy CSCF (P-CSCF), Serving CSCF (S-CSCF) or Interrogating CSCF (I-CSCF). The P-CSCF is characterised by being the first contact point for the UE within the IM subsystem; the S-CSCF actually handles the session states in the network; the I-CSCF is mainly the contact point within an operator's network for all connections destined to a subscriber of that network operator. Further definitions of the P-, S- and I-CSCF are provided in [34].

The CSCF handles the following functionalities:

[editor's note: it may be appropriate to specify (in 23.002 or in 23.228) which functions are handled by which type of CSCF (P-, S- or I-CSCF). If this is going to be specified in 23.228, the following text should be summarised.]

- ICGW (Incoming call gateway)
  - Acts as a first entry point and performs routing of incoming calls,
  - Incoming call service triggering (e.g. call screening/call forwarding unconditional) may need to reside for optimisation purposes,
  - Query Address Handling (implies administrative dependency with other entities)
  - Communicates with HSS
- CCF (Call Control Function)
  - Call set-up/termination and state/event management
  - Interact with MRF in order to support multi-party and other services
  - Reports call events for billing, auditing, intercept or other purpose
  - Receives and process application level registration
  - Query Address Handling (implies administrative dependency)
  - May provide service trigger mechanisms (service capabilities features) towards Application & services network (VHE/OSA)

- May invoke location based services relevant to the serving network
- May check whether the requested outgoing communication is allowed given the current subscription.

[Comment: The role of the CCF (see below) with the Interrogating and Serving CSCF is for further study.]

- SPD (Serving Profile Database)
  - Interacts with HSS in the home domain to receive profile information for the IM user and may store them depending on the SLA with the home domain
  - Notifies the home domain of initial user's access (includes e.g. CSCF signalling transport address, user ID etc. needs further study)
  - May cache access related information (e.g. terminal IP address(es) where the user may be reached etc.)
- AH (Address Handling)
  - Analysis, translation, modification if required, address portability, mapping of alias addresses
  - May do temporary address handling for inter-network routing.

4.a.7.2 Media Gateway Control Function (MGCF)

The MGCF:

- Controls the parts of the call state that pertain to connection control for media channels in an IM-MGW.
- Communicates with CSCF.
- Selects the CSCF depending on the routing number for incoming calls from legacy networks.
- Performs protocol conversion between ISUP and the IM subsystem call control protocols.
- Out of band information assumed to be received in MGCF and may be forwarded to CSCF/IM-MGW.

4.a.7.3 IP Multimedia - Media Gateway Function (IM-MGW)

Note: In this document the term Media Gateway Function (MGW) is used when there is no need to differentiate between the CS domain entity and the IP Multimedia CN Subsystem entity. When refering specifically to the CS domain entity the term CS-MGW is used. When refering specifically to the IP Multimedia CN Subsystem entity, the term IM-MGW is used.

A IM-MGW may terminate bearer channels from a switched circuit network (i.e., DSOs) and media streams from a packet network (e.g., RTP streams in an IP network). The IM-MGW may support media conversion, bearer control and payload processing (e.g. codec, echo canceller, conference bridge), it:

- Interacts with the MGCF for resource control.
- Owns and handles resources such as echo cancellers etc.
- May need to have codecs.

The IM-MGW will be provisioned with the necessary resources for supporting UMTS/GSM transport media. Further tailoring (i.e packages) of the H.248 may be required to support additional codecs and framing protocols, etc.

~~4.a.7.4 Transport Signalling Gateway Function (T-SGW)~~

~~The T-SGW:~~

~~- Maps call related signalling from/to PSTN/PLMN on an IP bearer and sends it to/from the MGCF.~~

~~Needs to provide PSTN/PLMN <-> IP transport level address mapping.~~

4.a.7.5 Multimedia Resource Function (MRF)

The MRF:

- Performs multiparty call and multi media conferencing functions. MRF would have the same functions of an MCU in an H.323 network.
- Is responsible for bearer control (with GGSN and IM-MGW) in case of multi party/multi media conference
- May communicate with CSCF for service validation for multiparty/multimedia sessions.

4a.8 Signalling Gateway Function (SGW)

The SGW performs the signalling conversion (both ways) at transport level between the SS7 based transport of signaling used in pre-Rel 4 networks, and the IP based transport of signalling possibly used in post-R99 networks (i.e. between Sigtran SCTP/IP and SS7 MTP). The SGW does not interpret the application layer (e.g. MAP, CAP, BICC, ISUP) messages but may have to interpret the underlying SCCP or SCTP layer to ensure proper routing of the signaling.

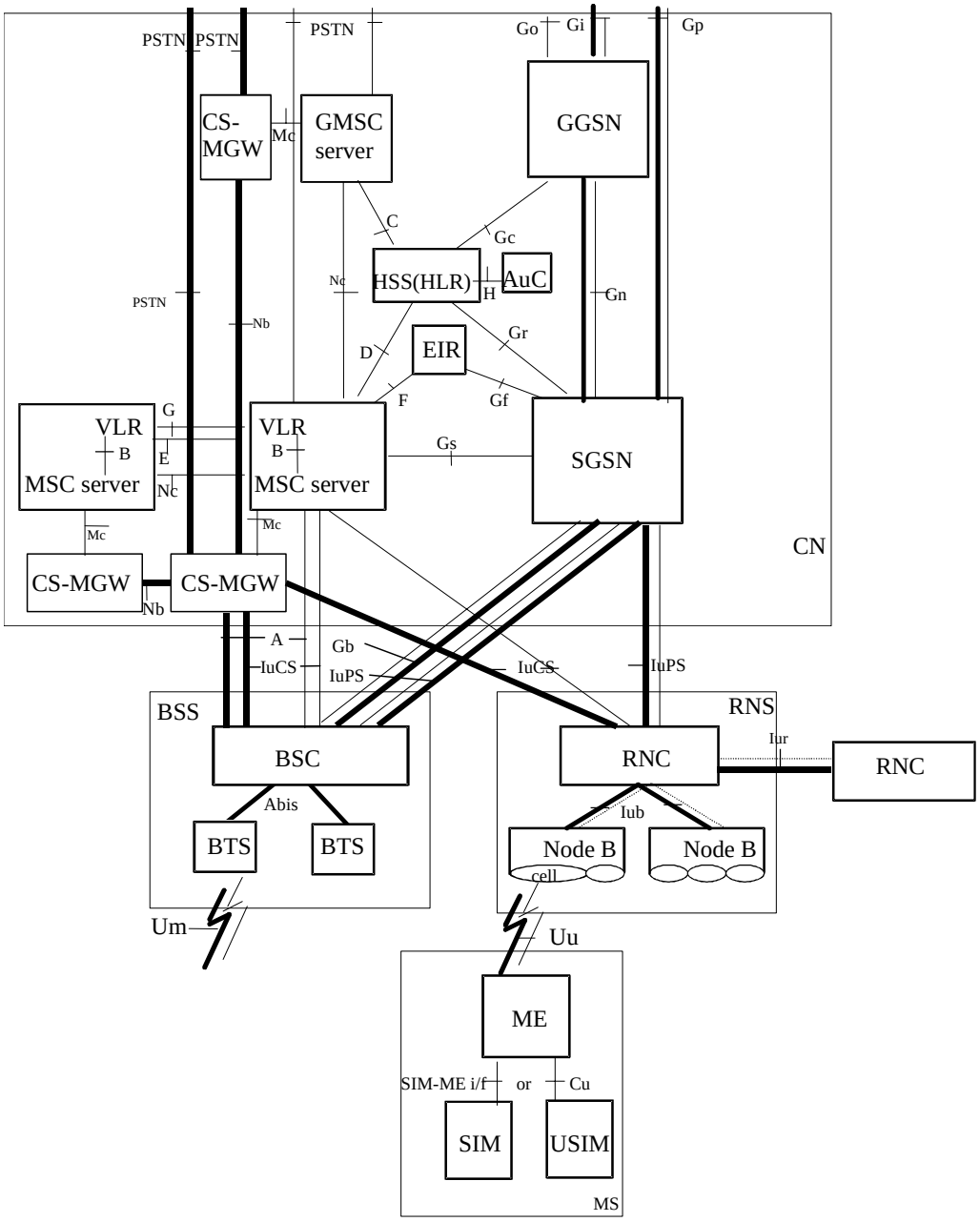
5 Configuration of a Public Land Mobile Network

5.1 Basic configuration

The basic configuration of a Public Land Mobile Network (PLMN) supporting GPRS and the interconnection to the PSTN/ISDN and PDN is presented in figure 1. This configuration presents signalling and user traffic 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.

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 Iu, Iur and Iub are defined in the UMTS 25.4xx-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. All the GPRS-specific interfaces (G- series) are defined in the UMTS 23-series and 24-series of Technical Specifications. Interfaces Mc, Nb, and Nc are defined in UMTS 23.205 and in the UMTS 29-series of technical specifications.

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.


PSTN
PSTN
PSTN
Go
Gi
Gp
CS-MGW
Mc
GMSC server
GGSN
C
Gc
Nc
HSS(HLR)
H
AuC
Gn
PSTN
Nb
D
EIR
Gr
F
Gf
VLR
B
MSC server
G
E
Nc
VLR
B
MSC server
Gs
SGSN
Mc
Mc
CN
CS-MGW
CS-MGW
Nb
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Gb
IuCS
IuPS
IuCS
IuPS
BSS
RNS
BSC
RNC
Iur
RNC
Abis
Iub
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Node B
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or
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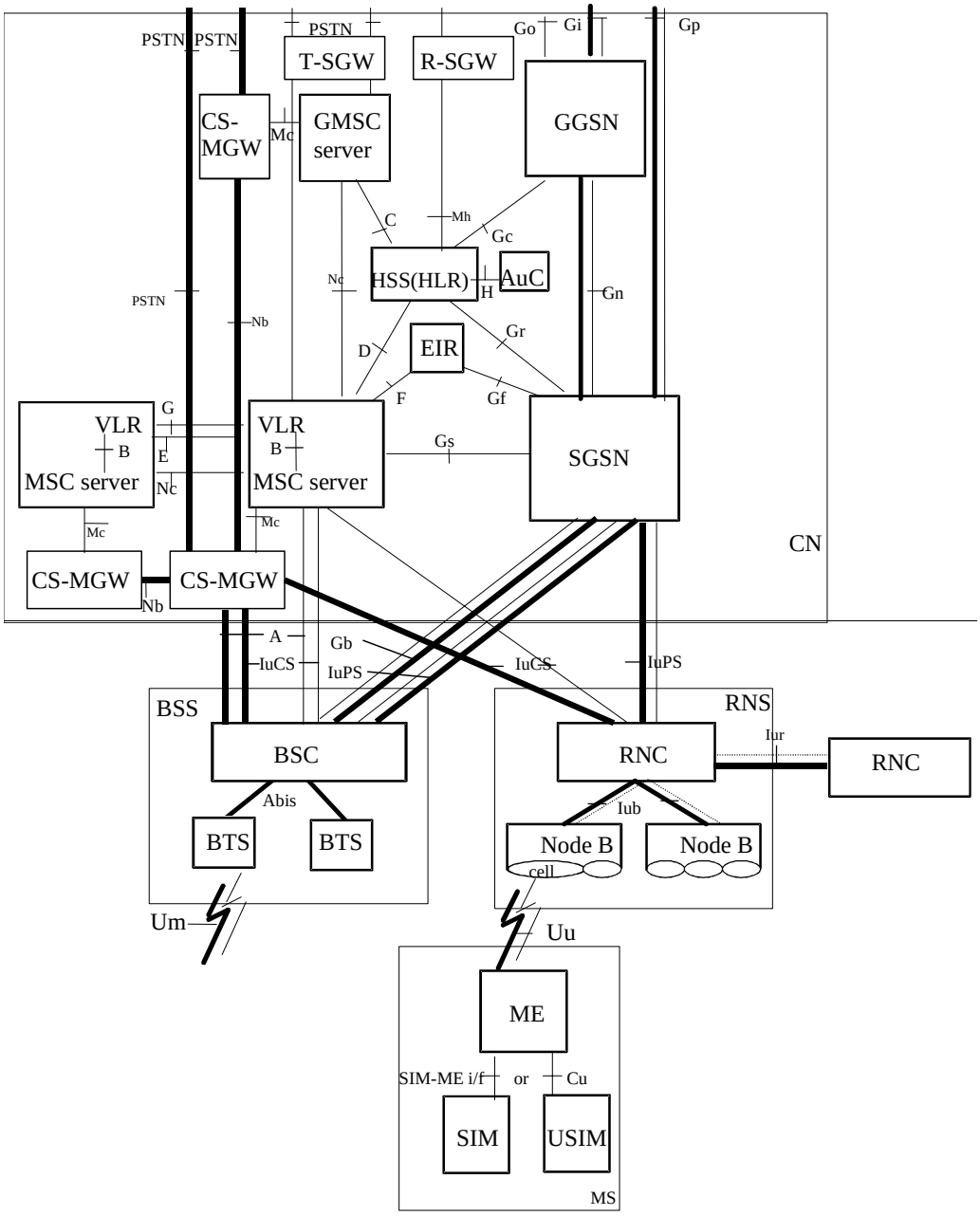


Legend:
Bold lines: interfaces supporting user traffic;
Dashed lines: interfaces supporting signalling.

NOTE 1: The figure shows direct interconnections between the entities. The actual links may be provided by an underlying network (e.g. SS7 or IP): this needs further studies.

NOTE 2: When the MSC and the SGSN are integrated in a single physical entity, this entity is called UMTS MSC (UMSC).

NOTE 3: A (G)MSC server and associated CS-MGW can be implemented as a single node: the (G)MSC.

NOTE 4: The Gn interface (between two SGSNs) is also part of the reference architecture, but is not shown for layout purposes only.

Figure 1: Basic Configuration of a PLMN supporting CS and PS services and interfaces

5.2 Configuration of LCS entities

5.2.1 Configuration of LCS entities in GSM

The configuration of LCS entities for GSM are is presented in figure 2. In the figure, 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.

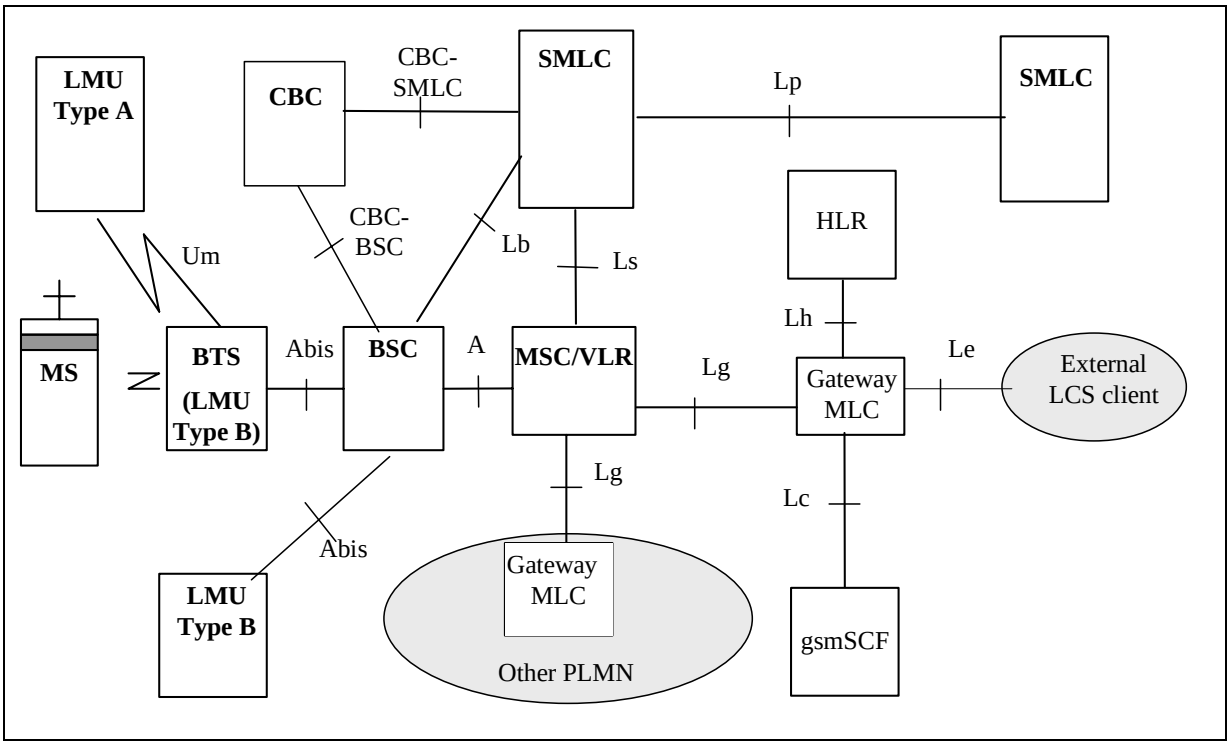


Figure 2: Configuration of LCS entities in a GSM PLMN

5.2.2 Configuration of LCS entities in UMTS

The basic configuration of UMTS LCS is presented in figure 3. There is no SMLC entity in this figure because the SMLC functionality of UTRAN is integrated in SRNC.

NOTE: The usage of CBC for LCS assistance data in UMTS is for further study. The assistance data is generated in SRNC.

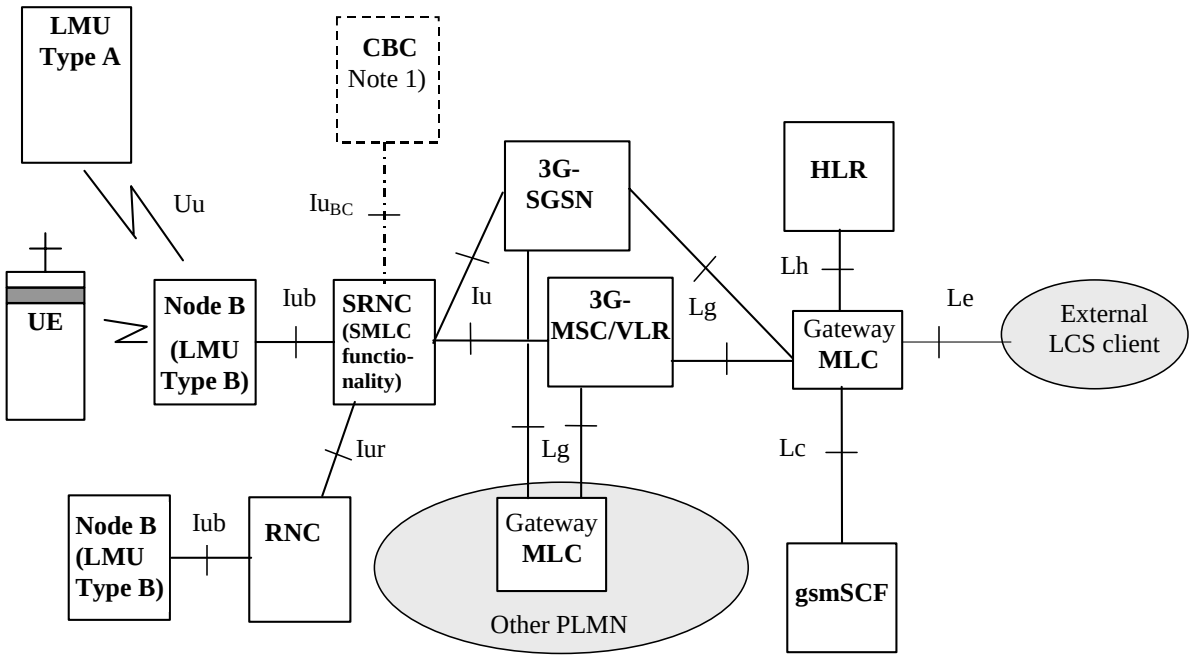


Figure 3: Configuration of a LCS entities in a UMTS PLMN

5.3 Configuration of CAMEL entities

The following figure shows the interconnection of the CAMEL-specific entities with the rest of the network. Only the interfaces specificly involved in CAMEL provisionning are shown, i.e. all the GMSC, MSC, SGSN and HLR interfaces depicted in figure 1 are still supported by these entities even if not shown.

NOTE: The CAMEL-specific interfaces have no particular name. They are designated by the name of the two entities they link together, e.g. "the gsmSSF-gsmSCF interface".

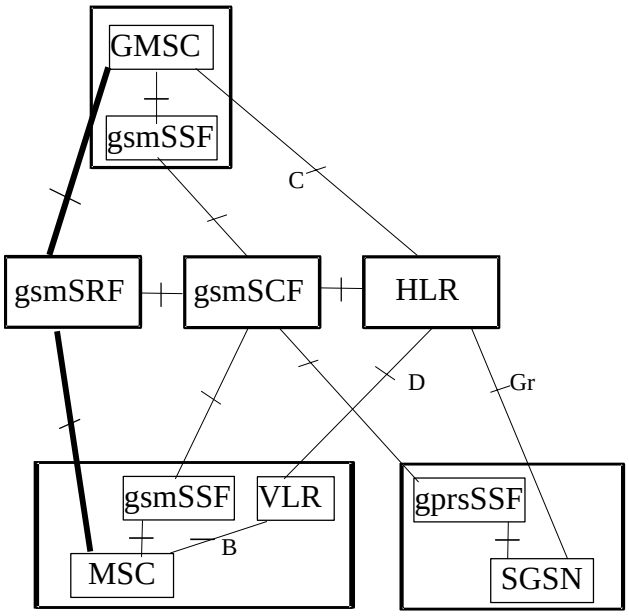


Figure 4: configuration of CAMEL entities

The bold lines are used for interfaces supporting user data only, the dashed lines are used for interfaces supporting signalling only.

5.4 Configuration of CBS entities

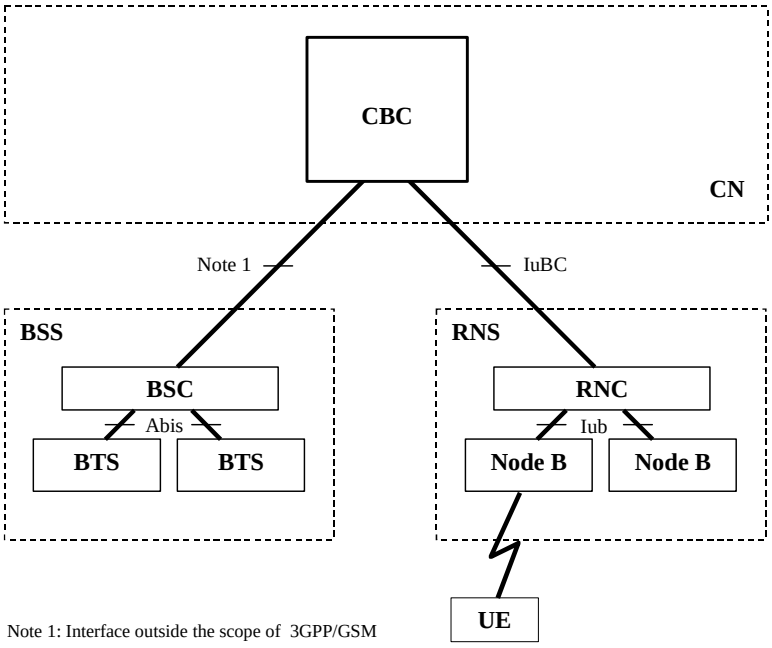


Figure 5: Configuration of a PLMN supporting Cell Broadcast Service entities

5.5 Configuration of IM Subsystem entities

The configuration of IM CN Subsystem entities is presented in figure 6. In the figure, 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.

Only the interfaces specifically linked to the IM subsystem are shown, i.e. all the SGSN, GGSN and HSS interfaces depicted in figure 1 are still supported by these entities even if not shown.

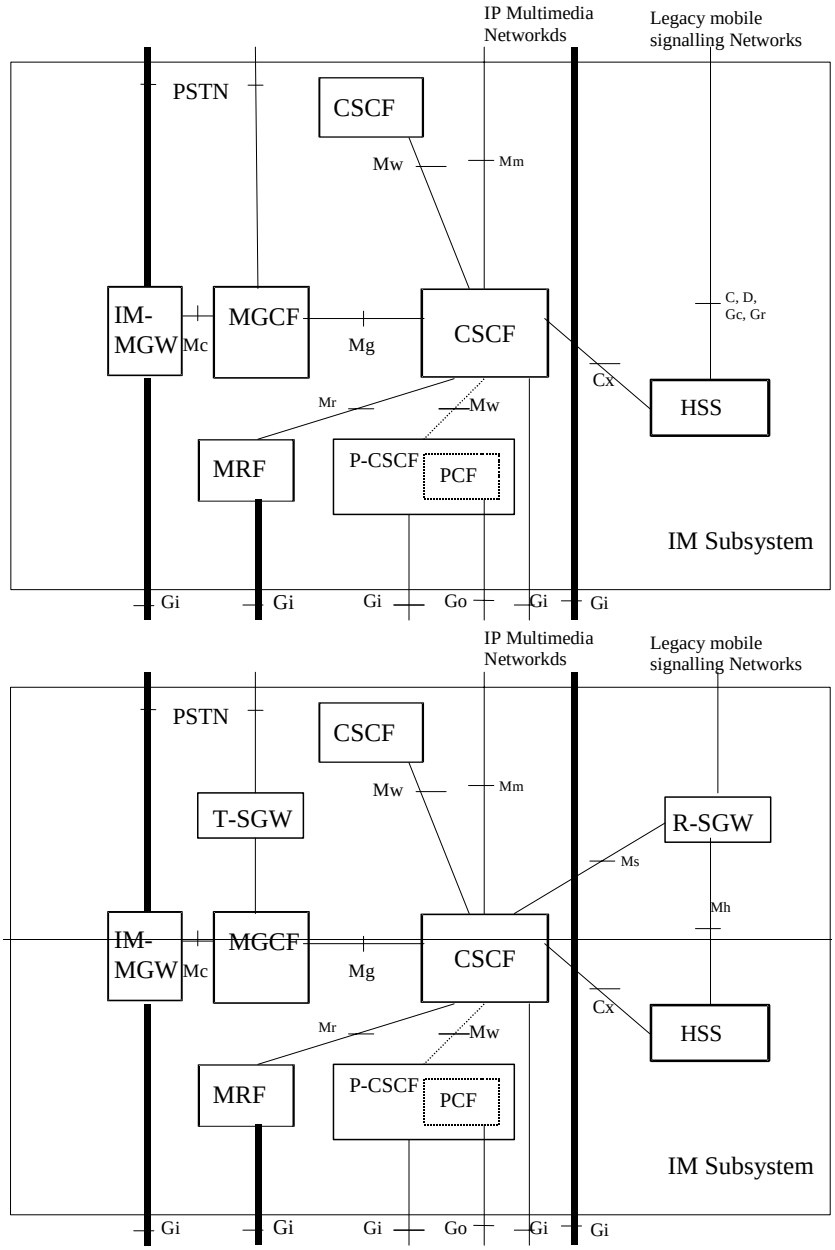


Figure 6: configuration of IM Subsystem entities

Legend:
Bold lines: interfaces supporting user traffic;
Dashed lines: interfaces supporting only signalling.
NOTE: The Gm interface (between CSCF and UE) is also part of the configuration, but is not shown for layout purposes only.

5.6 Configuration of Signalling Gateway Function

The Signalling gateway function is used to interconnect different signalling networks i.e. SCTP/IP based signalling networks and SS7 signalling networks. The application layer (e.g. ISUP, BICC, MAP or CAP) is not affected. The signalling gateway function may be implemented as a stand alone entity or inside another entity.

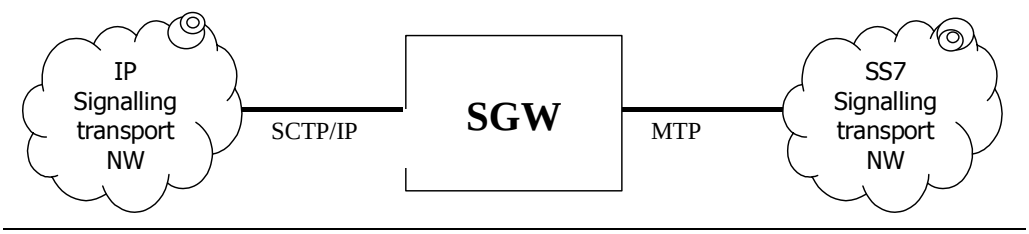


Figure 7: Configuration of a signalling gateway function

Note: SS7 application transport and SCTP/IP adaption protocols are not shown.

6 PLMN basic interfaces and reference points

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.

[editor's note: either the difference between interface and reference point should be cleary provided, or only one of the terms should be used].

6.1 Interfaces between Mobile Station and the Fixed Infrastructure

6.1.1 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.

6.1.2 Interface between Mobile Station and Radio Netwok System (Uu-interface)

The interface between the MS and the RNS is specified in the 24- and 25-series of UMTS Technical Specifications.

6.2 Interface between the Core Network and the Access Network

6.2.1 Interfaces between the CS domain and the Access Network

6.2.1.1 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.

6.2.1.2 Interface between the MSC and Base Station System (Iu_CS interface)

The interface between the MSC and its BSS is specified in the 25.41x-series of UMTS Technical Specifications.

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

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

6.2.1.3 Interface between the MSC and RNS (Iu_CS interface)

The interface between the MSC and its RNS is specified in the 25.41x-series of UMTS Technical Specifications.

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

- RNS management;
- call handling;
- mobility management.

6.2.2 Interfaces between the PS domain and the Access Network

6.2.2.1 Interface between SGSN and BSS (Gb-interface)

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 and 08.18.

6.2.2.2 Interface between SGSN and BSS (Iu_PS-interface)

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

- packet data transmission;
- mobility management.

The Iu_PS interface is defined in the 25.41x-series of UMTS Technical Specifications.

6.2.2.3 Interface between SGSN and RNS (Iu_PS-interface)

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

- packet data transmission;
- mobility management.

The Iu_PS interface is defined in the 25.41x-series of UMTS Technical Specifications.

6.3 Interfaces internal to the Access Network

6.3.1 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.

6.3.2 Interface between RNC and Node B (Iub-interface)

When the RNS consists of a Radio Network Controller (RNC) and one or more Node B, this interface is used between the RNC and Node B to support the services offered to the UMTS users and subscribers.

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

The interface is specified in the 28.5x-series of UMTS Technical Specifications.

6.3.3 Interface between two RNCs (Iur-interface)

This interface is defined in the 25.42x series of recommendations.

6.4 Interfaces internal to the Core Network

6.4.1 Interfaces internal to the CS domain

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

The VLR is the location and management database for the mobile subscribers roaming in the area controlled by the associated MSC server(s). Whenever the MSC server 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 server, the MSC server 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 server informs (via the VLR) the HLR which stores these modifications and updates the VLR if required.

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

6.4.1.2 Interface between the HLR and the MSC server (C-interface)

The Gateway MSC server 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 TS 29.002.

For CAMEL purposes, this interface is used as described in 23.078. It is used e.g. at terminating calls to exchange routeing information, subscriber status, location information, subscription information, etc.

6.4.1.3 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 TS 29.002.

For CAMEL purposes, this interface is used to send the CAMEL related subscriber data to the visited PLMN and for provision of MSRN. The interface is also used for the other purposes described in 23.078, e.g. to retrieve subscriber status and location information of the mobile subscriber or to indicate suppression of announcement for a CAMEL service.

6.4.1.4 Interface between MSC servers (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 MSC servers have to exchange data to initiate and then to realise the operation.

After the handover operation has been completed, the MSC servers 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 server serving the Mobile Station and the MSC server 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 TS 29.002.

6.4.1.5 Interface between MSC server and EIR (F-interface)

This interface is used between MSC server 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 TS 29.002.

6.4.1.6 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 3G TS 29.002.

6.4.1.7 Reference point (G)MSC server – CS-MGW (Mc Reference Point)

See also section 6a.7.3.

The Mc reference point describes the interfaces between the MGCF and IM-MGW, between the MSC Server and CS-MGW, and between the GMSC Server and CS-MGW. It has the following properties:

- full compliance with the H.248 standard, baseline work of which is currently carried out in ITU-T Study Group 16, in conjunction with IETF MEGACO WG.
- flexible connection handling which allows support of different call models and different media processing purposes not restricted to H.323 usage.
- open architecture where extensions/Packages definition work on the interface may be carried out.
- dynamic sharing of MGW physical node resources. A physical MGW can be partitioned into logically separate virtual MGWs/domains consisting of a set of statically allocated Terminations.

- dynamic sharing of transmission resources between the domains as the MGW controls bearers and manage resources according to the H.248 protocols.

The functionality across the Mc reference point will need to support mobile specific functions such as SRNS relocation/handover and anchoring. It is expected that current H.248/IETF Megaco standard mechanisms can be applied to enable this.

6.4.1.8 Reference Point MSC Server – GMSC Server (Nc Reference Point)

Over the Nc reference point, the Network-Network based call control is performed. Examples of this are ISUP or an evolvement of ISUP for bearer independent call control (BICC). In the R'00 architecture different options for signalling transport on Nc shall be possible including IP.

6.4.1.9 Reference Point CS-MGW – CS-MGW (Nb Reference Point)

Over the Nb reference point the bearer control and transport are performed. The transport may be RTP/UDP/IP or AAL2 for transport of user data. In the R00 architecture different options for user data transport and bearer control shall be possible on Nb, for example: AAL2/Q.AAL2, STM/none, RTP/H.245.

6.4.2 Interfaces internal to the PS domain

6.4.2.1 Interface between SGSN and HLR (Gr-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 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 TS 29.002.

6.4.2.2 Interface between SGSN and GGSN (Gn- and Gp-interface)

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 TS 29.060.

6.4.2.3 Signalling Path between GGSN and HLR (Gc-interface)

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 3G TS 29.002;

- 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.

6.4.2.4 Interface between SGSN and EIR (Gf-interface)

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 3G TS 29.002.

6.4.3 Interfaces used by CS and PS domains

6.4.3.1 Interface between MSC/VLR and SGSN (Gs-interface)

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 TS 29.016 and 29.018.

6.4.3.2 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.

~~6.4.3.3 Reference Point HSS - R-SGW (Mh Reference Point)~~

~~This interface supports the exchange of mobility management and subscription data information between HSS and networks of R99 or prior. This is required to support network users of Rel 4 or above who are roaming in networks of previous releases.~~

6a PLMN specific interfaces

6a.1 GCR-specific interface

6a.1.1 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.

6a.2 SIWFS-specific interface

6a.2.1 Interface between MSC and SIWFS (K-Interface)

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

6a.3 LCS-specific interfaces

6a.3.1 Interface between MSC and GMLC (Lg-interface)

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 TS 29.002.

6a.3.2 Interface between MSC and SMLC (Ls-interface)

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 TS 29.002.

6a.3.4 Interface between GMLC and HLR (Lh-interface)

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 TS 29.002.

6a.3.3 Interface between SMLC and MSC/VLR (Ls-interface)

In GSM, 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 GSM 09.31.

In UMTS, the Ls interface is not standardized, because the SMLC functionality is included in SRNC.

6a.3.4 Interface between BSC and SMLC (Lb-interface)

In GSM, 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.

In UMTS, the Lb interface is not standardized, because the SMLC functionality is included in SRNC.

6a.3.6 Interface between Peer SMLCs (Lp-interface)

In GSM, 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.

In UMTS, the SMLC functionality is included in SRNC and the Iur interface shall include the Lp interface type of functionality.

6a.3.7 Interface between BTS and LMU (Um-interface)

The Um/Uu interface specific to LCS is defined in 24.071.

6a.4 CAMEL-specific interfaces

The CAMEL-specific interfaces are detailed in 23.078 [10c]. These interfaces are.

6a.4.1 GMSC - gsmSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of Detection Points (arming/disarming of DPs, DP processing etc.).

6a.4.2 gsmSSF - gsmSCF interface

This interface is used by the gsmSCF to control a call in a certain gsmSSF and to request the gsmSSF to establish a connection with a gsmSRF. Relationships on this interface are opened as a result of the gsmSSF sending a request for instructions to the gsmSCF.

6a.4.3 MSC - gsmSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

6a.4.4 gsmSCF - HLR interface

This interface is used by the gsmSCF to request information from the HLR. As a network operator option the HLR may refuse to provide the information requested by the gsmSCF.

This interface is also used for USSD operations, both for gsmSCF-initiated dialogues and MS-initiated dialogues (relayed via HLR). It is a network operator option whether to support or not USSD operations on this interface.

6a.4.5 gsmSCF - gsmSRF interface

This interface is used by the gsmSCF to instruct the gsmSRF to play tones/announcements to the users.

6a.4.6 MSC - gsmSCF interface

This interface is used by the MSC to send supplementary service invocation notifications to the gsmSCF.

6a.4.7 SGSN - gprsSSF interface

This is an internal interface. The interface is described in the specification to make it easier to understand the handling of DPs (arming/disarming of DPs, DP processing etc.).

6a.4.8 gprsSSF - gsmSCF interface

This interface is used by the gsmSCF to control a GPRS session or individual PDP Context in a certain gprsSSF. Relationships between the gprsSSF and the gsmSCF (GPRS dialogues) on this interface are opened as a result of the gprsSSF sending a request for instructions to the gsmSCF.

6a.5 CBS-specific interfaces

6a.5.1 Interface between the CBC and RNS (Iu_BC Interface)

The interface between the CBC and the RNS is specified in the 25.41x-series of 3G Technical Specifications.

The CBC-RNS interface is used to carry information concerning:

- the CBS messages itself; and
- CBS delivery parameter.

6a.6 Number portability specific interfaces

6a.6.1 IN-based solution

6a.6.1.1 NPDB to MSC interface

Upon receiving an ISUP IAM, the (gateway or visited) MSC send a database query to the NPDB as a result of analysis of the received MSISDN. The MSISDN is included in the query to the NPDB. The NPDB determines whether the MSISDN is ported or not. If not, it responds back to the MSC to continue the normal call setup procedure for MT calls (optionally providing the Routing Number). If it is ported, the NPDB responds back to the MSC with a Routing Number pointing out the Subscription network.

6a.6.2 Signalling Relay-based solution

6a.6.2.1 GMSC to MNP-SRF interface

Upon receiving an ISUP IAM, the gateway MSC sends a routing interrogation to the MNP-SRF, which in turn will perform one of the actions, described in subclause 4a.7, depending on the portability status of the subscriber and the network configuration. For more details see TS 23.066.

6a.6.2.2 MNP-SRF to HLR interface

When the MNP-SRF receives a routing interrogation from the GMSC or an interrogating network entity (non/call related signalling), and it determines that the subscriber is not ported or it has been ported from another network, the MNP-SRF relays the message to the HLR.

6a.7 IM Subsystem Reference Points

6a.7.1 Reference Point HSS – CSCF (Cx Reference Point)

The Cx reference point supports information transfer between CSCF and HSS.

The main procedures that require information transfer between CSCF and HSS are

1) Procedures related to Serving CSCF assignment
2) Procedures related to routing information retrieval from HSS to CSCF
3) Procedures related to UE-HSS infromation tunneling via CSCF

6a.7.2 Reference Point CSCF – UE (Gm Reference Point)

This interface is to allow UE to communicate with the CSCF e.g.

- Register with a CSCF,
- Call origination and termination
- Supplementary services control.

The Gm reference point supports information transfer between UE and serving CSCF. The main procedures that require information transfer between UE and serving CSCF are

- Procedures related to Serving CSCF registration,
- Procedures related to User service requests to the serving CSCF,
- Procedures related to the Authentication of the Application/Service,

- Procedures related to the CSCF's request for Core Network resources in the Visited Network.

6a.7.3 Reference Point MGCF – IM-MGW (Mc Reference Point)

See also section 6.4.1.7.

The Mc reference point describes the interfaces between the MGCF and IM-MGW, between the MSC Server and CS-MGW, and between the GMSC Server and CS-MGW. It has the following properties:

- full compliance with the H.248 standard, baseline work of which is currently carried out in ITU-T Study Group 16, in conjunction with IETF MEGACO WG.
- flexible connection handling which allows support of different call models and different media processing purposes not restricted to H.323 usage.
- open architecture where extensions/Packages definition work on the interface may be carried out.
- dynamic sharing of MGW physical node resources. A physical MGW can be partitioned into logically separate virtual MGWs/domains consisting of a set of statically allocated Terminations.
- dynamic sharing of transmission resources between the domains as the MGW controls bearers and manage resources according to the H.248 protocols.

The functionality across the Mc reference point will need to support mobile specific functions such as SRNS relocation/handover and anchoring. It is expected that current H.248/IETF Megaco standard mechanisms can be applied to enable this.

6a.7.4 Reference Point MGCF – CSCF (Mg Reference Point)

The Mg reference point is based on external specifications, e.g. SIP

6a.7.5 Reference Point CSCF – Multimedia IP networks (Mm Reference Point)

This is an IP interface between CSCF and IP networks. This interface is used, for example, to receive a call request from another VoIP call control server or terminal.

6a.7.6 Reference Point CSCF - MRF (Mr Reference Point)

Allows the CSCF to control the resources within the MRF.

~~6a.7.7 Reference Point CSCF – R-SGW (Ms Reference Point)~~

~~This is an interface between the CSCF and R-SGW.~~

~~[editor's note: can be improved…]~~

6a.7.8 Reference Point CSCF – CSCF (Mw Reference Point)

The interface allows the Interrogating CSCF to direct mobile terminated calls to the Serving CSCF.

6a.7.9 Reference Points towards SCP

This includes the interfaces from the SGSN to the SCP, from the Serving CSCF (and possibly the Interrogating CSCF) to the SCP, from the MSC Server to the SCP, and the GMSC Server to the SCP.

The interface from the CSCF to the SCP is required to allow the support of existing CAMEL based services.

6a.7.10 Reference Point GGSN-PCF (Go Reference Point)

This interface allows the Policy Control Function (PCF) to apply policy to the bearer usage in the GGSN.

The Policy Control Function (PCF) is a logical entity of the P-CSCF. If the PCF is implemented in a separate physical node, the interface between the PCF and the P-CSCF is not standardized.

3GPP TSG SA2 Service Architecture **S2-011468**

Puerto Rico, May 14-18, 2001

Source:	**S2 GTT drafting group**
Title:	**CR to 23.002 : Introduction of GTT specific entities**
Document for:	**Approval**
Agenda Item:	**11**

This is an update of the change request introduced in 3GPP S2#17 as S2-010745, describing the location of the GTT-Voice Interworking function.

Initially it describeded the core network location of CTM.

A section for the CTM Circuit pool location is introduced.

A section for the All Transcoder location of CTM is introduced.

A reference to the description in TS 23.226 GTT Stage 2 is inserted.

A reference to TS 26.226 CTM description is inserted.

The reference chapter is updated.

It is proposed to be approved.

CR-Form-v3

CHANGE REQUEST

⌘ **23.002** **CR** **051** ⌘ rev **3** ⌘ Current version: **5.2.0** ⌘

*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 **X** Radio Access Network **X** Core Network x

Title:	⌘	Introduction of GTT specific entities
Source:	⌘	S2 GTT Drafting group
Work item code:	⌘	GTT
Date:	⌘	15.5.2001
Category:	⌘	**B**
Release:	⌘	REL-5

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:	⌘	Addition of GTT specific entities
Summary of change:	⌘	Introduction of a new chapter (4a.8~~7~~) describing the support of interworking between CTM and external text telephony standards.
Consequences if not approved:	⌘	No support for GTT-Voice in Release 5

Clauses affected:	⌘	4a.8
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
	⌘	
Other comments:	⌘	

2 References

[x] 3GPP TS 26.226 Cellular Text Telephone Modem, general description

[x+1] 3GPP TS 23.226 Global Text Telephony Stage 2.

4a.~~7~~8 Global Text Telephony Specific entities

Interworking between cellular text modem (CTM) and text telephony standards (e.g. V.18) used in external networks can be~~is~~ supported by three methods:

- Routing calls through a CTM Special resource function (CTM-SRF) in the core network. The CTM-SRF is linked in to the call path via CAMEL procedures. Depending on operator configuration the CTM-SRF may also be linked in to the call path for Emergency calls.
- A CTM / Text telephone converting function included along the speech call path selected by the network after an indication from the terminal that CTM is required.
- A CTM / Text telephone converting function included in all speech call paths.

Further information of the support for text telephony is found in 3GPP TS 23.226 [x+1].

For further details of CTM, see TS 26.226. [x]

~~4a.7.1 CTM-SRF~~

~~The CTM-SRF is a special application of the gsmSRF. The CTM-SRF is linked in to the call path via CAMEL procedures.~~

~~Depending on operator configuration the CTM-SRF may also be linked in to the call path for Emergency calls.~~

3GPP TSG-SA2 #18
Puerto Rico, May 2001

Tdoc S2-011565~~325~~

CR-Form-v3

CHANGE REQUEST

⌘ **23.002** **CR** **037** ⌘ rev **R2** ⌘ Current version: **5.2.0** ⌘

*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 ☒

Title:	⌘	HSS / HLR structuring
Source:	⌘	Ericsson, Nokia
Work item code:	⌘	CCR
Date:	⌘	2001-05-09
Category:	⌘	**C**
Release:	⌘	REL-5

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:	⌘	HSS is a new logical entity introduced in R5. The HLR can be considered a particular configuration of HSS. This CR aims to update TS 23.002 accordingly.
Summary of change:	⌘	Removal of chapter 4.1.1.1. Subchapter 4.1.1.1.a renumbered to 4.1.1.1 and modified with relevant information from removed chapter 4.1.1.1. New sub-chapter within 4.1.1.1 for HLR
Consequences if not approved:	⌘	Misleading information for the 3GPP CN WGs.

Clauses affected:	⌘	4.1.1.1, 4.1.1.1a
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.

4.1.1.1 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:

- 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:

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

Different types of identity are attached to each mobile subscription and are stored in the HLR. The following identities are stored:

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

if GPRS is supported, the following identity is also stored:

- zero or more Packet Data Protocol (PDP) address(es);

and, if LCS is supported, the following identity is also stored:

- the LMU indicator.

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:

- 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 23.008.

4.1.1.1a The Home Subscriber Server (HSS)

[editor's note: most of the text bellow on the HSS applies also to the HLR. It will widely increase the readability to provide in this section only the functions that the HSS provides on top of the HLR. Also, the implementation-specific text provided bellow should be deleted or moved e.g. to 23.008.]

The HSS substitutes the HLR when the IM subsystem is implemented.

The Home Subscriber Server (HSS) is the master database for a given user. It is the entity containing the subscription related information to support the network entities actually handling calls/sessions.

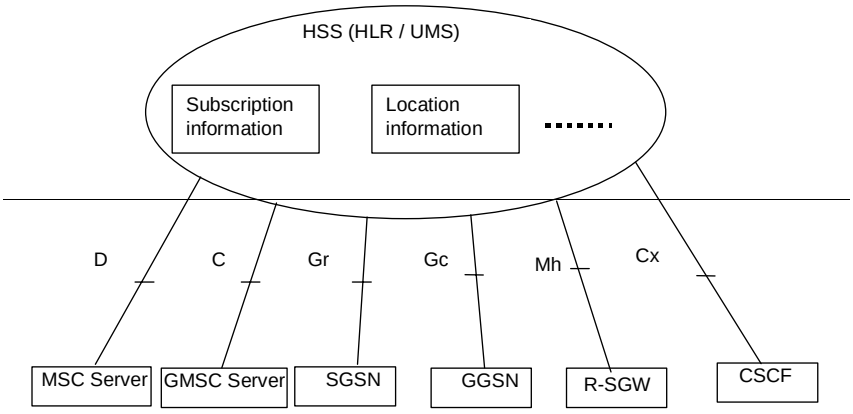
A Home Network may contain one or several HSSs: it depends on the number of mobile subscribers, on the capacity of the equipment and on the organisation of the network.

As an example, HSS could provide support to the call control servers in order to complete the routing/roaming procedures by solving authentication, authorisation, naming/addressing resolution, location dependencies, etc…

The HSS is responsible for holding the following user related information:

- User Identification, Numbering and addressing information.
- User Security information: Network access control information for authentication and authorization
- User Location information at inter-system level: the HSS handles supports the user registration, and stores inter-system location information, etc.
- The User profile information (services, service specific information…)

Based on this information, the HSS is also responsible of supporting the CC/Smcall control and session management entities of the different control systems (CS Domain control, PS Domain control, IP Multimedia control…) offered by Ddomains and Ssubsystems (defined in section 3.3 and 3.3a) of the operator as shown in Figure 0-a.



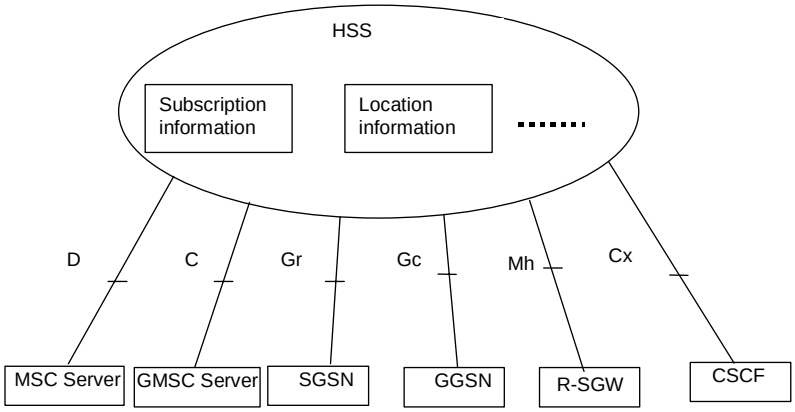


Figure 0-a: Example of a Generic HSS structure and basic interfaces

HSS may integrate heterogeneous information, and enable enhanced features in the core network to be offered to the application & services domain, at the same time hiding the heterogeneity.

The HSS consists of the following functionalities:

- IP m~~M~~ultim~~M~~edia functionality to provide support to control functions of the IM subsystem such as the CSCF. It is needed to enable subscriber access to the IM CN subsystem services.

~~User control functions required by the IM subsystem.~~

- The subset of the HLR functionality required by the PS Domain.
- The subset of the HLR functionality required by the CS Domain, if it is desired to enable subscriber access to the CS Domain or to support roaming to legacy GSM/UMTS CS Domain networks.

~~The CS part of the HLR, if it is desired to enable subscriber access to the CS Domain or to support roaming to legacy GSM/UMTS CS Domain networks.~~

The organisation of the subscriber data is outlined in UMTS TS 23.008. TS 23.008 also indicates which numbers, addresses and identifiers specified in TS 23.003 are stored in HSS.

4.1.1.1.1 Home Location Register (HLR)

The HLR is shown in the Reference Architecture up to and including R4.

The HLR can be considered a subset of the~~a particular~~ HSS ~~configuration~~ that holds the following functionality:

- The functionality required to provide support to PS D~~d~~omain~~s~~ entities such as the SGSN and GGSN, through the Gr and Gc interfaces. It is needed to enable subscriber access to the PS domain services.
- The functionality required to provide support to CS Domain entities such as the MSC/MSC server and GMSC/GMSC server, through the C and D interfaces. It is needed to enable subscriber access to the CS Domain services and to support roaming to legacy GSM/UMTS CS Domain networks.

4.1.1.1.2 Functional Mapping to Basic Interfaces in the HSS~~The HSS structure is as follow (see also Figure 0-b):~~

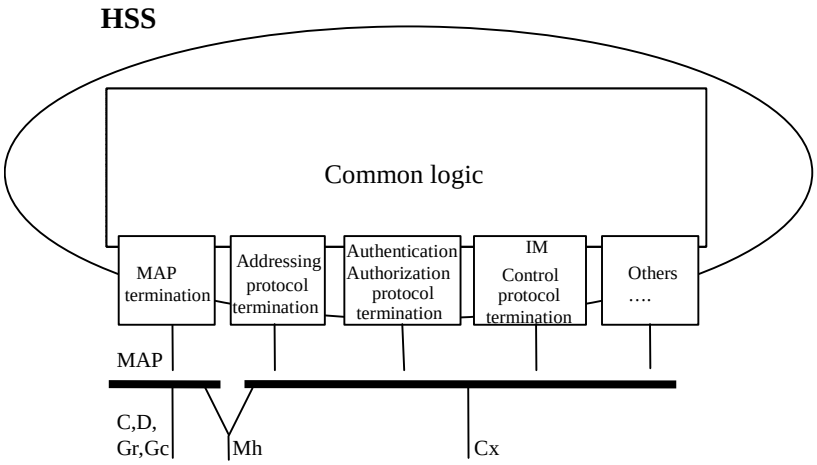


Figure 0-b: Example of a generic HSS structure with further breakdown into protocols over the basic interfaces

- MAP termination

HSS terminates the MAP protocol as described in MAP specifications:

  - User Location Management procedures
  - User Authentication Management procedures
  - Subscriber profile Management procedures,
  - Call handling support procedures (Routing information handling)
  - SS related procedures, etc…

- Addressing protocol termination

HSS terminates a protocol to solve addressing according to appropriate standards:

  - Procedures for user names/numbers/addresses resolution
  - As an example, DNS+ protocol could be a suitable candidate, as it is being defined within the ENUM group in IETF (currently looking into URL/E.164 naming translation, etc…).

[editor's note*:* the statement above is too vague. It should be confirmed or deleted.]

- Authentication, Authorization protocol termination

HSS terminates authentication and authorization protocols according to appropriate standards:

  - User authentication and authorisation procedures for IP based Multimedia services
  - As an example, Diameter protocol could be a suitable candidate, as it is being defined within IETF.

[editor's note*:* the statement above is too vague. It should be confirmed or deleted.]

- IM Control termination

HSS terminates the IP based MM call control protocol, according to appropriate standards:

  - User Location Management procedures for IP based Multimedia services
  - IP based Multimedia Call handling support procedures (Routing information handling)

- As an example, the SIP protocol (or some parts of it, related with location procedures) could be a suitable candidate.

[editor's note: the statement above is too vague. It should be confirmed or deleted.]