3GPP TSG_CN#6 **NP-99494**

Nice, France

13th – 15th December 1999

Agenda item:

Source: **TSG_N WG2**

Title: **CRs to GSM 03.03, 03.07, 03.08, 03.16, 09.02, 3G TS 23.003, 23.007, 23.008, 23.016, 29.002 (Work Item Location Services)**

Introduction:

This document contains **10** CRs on **Work Item Location Services** agreed by **TSG_N WG2** and forwarded to **TSG_N Plenary** meeting #6 for approval.

TDoc	Spec	CR	Rev	Ph.	Cat	Old v.	New v.	Subject
N2-99K44	03.03	A034		R98	C	7.2.1	7.3.0	Support of VLR and HLR Data Restoration procedures with LCS
P-99-700	03.07	A009	1	R98	C	7.0.0	7.1.0	Support of VLR and HLR Data Restoration procedures with LCS
N2-99K46	03.08	A029		R98	C	7.1.0	7.2.0	Organization of Subscriber Data for LCS
N2-99K48	03.16	A038		R98	C	7.1.0	7.2.0	Support of Subscriber Data Management in the HLR and VLR for LCS
P-99-702	09.02	A273	1	R98	C	7.2.0	7.3.0	MAP Impacts for Location Services (LCS)
N2-99H65	23.003	011		R99	A	3.2.1	3.3.0	Support of VLR and HLR Data Restoration procedures with LCS
N2-99H89	23.007	003		R99	B	3.1.3	3.2.0	Support of VLR and HLR Data Restoration procedures with LCS
N2-99K56	23.008	011		R99	A	3.1.0	3.2.0	Organisation of subscriber data for LCS
N2-99H66	23.016	006		R99	A	3.2.1	3.3.0	Support of Subscriber Data Management in the HLR and VLR for LCS
N2-99K52	29.002	060	1	R99	A	3.2.0	3.3.0	MAP Impacts for Location Services (LCS)

CN2 meeting
Phoenix, AZ, 15-19 Nov 1999

Document N2-99K44
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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03.03	**CR**	**A034**	Current Version:	7.1.1

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

For submission to: CN#06	for approval	X	strategic	X	*(for SMG use only)*
list expected approval meeting # here ↑	for information		non-strategic		

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

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

Source: TSG N2 **Date:** 5 Nov 1999

Subject: Support of VLR and HLR Data Restoration procedures with LCS

Work item: Location Services (LCS)

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

Correction	
Corresponds to a correction in an earlier release	
Addition of feature	
Functional modification of feature	X
Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	X
Release 99	
Release 00	

Reason for change: Add new SCCP SSNs for LCS

Clauses affected: 8

Other specs affected:

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

Other comments: The MAP SSN for the SMLC is no longer needed.
SSNs to support BSSAP-LE signaling (as defined in GSM 09.31) are needed for the SMLC, MSC and BSC

8 SCCP subsystem numbers

Subsystem numbers are used to identify applications within network entities which use SCCP signalling. In GSM, subsystem numbers may be used between PLMNs, in which case they are taken from the globally standardised range (1 - 31) or the part of the national network range (129 – 150) reserved for GSM use between PLMNs, or within a PLMN, in which case they are taken from the part of the national network range (32 – 128 & 151 - 254) not reserved for GSM use between PLMNs.

8.1 Globally standardised subsystem numbers used for GSM

The following globally standardised subsystem numbers have been allocated for use by GSM:

0000 0110 HLR (MAP);

0000 0111 VLR (MAP);

0000 1000 MSC (MAP);

0000 1001 EIR (MAP);

0000 1010 is allocated for evolution (possible Authentication centre).

8.2 National network subsystem numbers used for GSM

The following national network subsystem numbers have been allocated for use within GSM networks:

1111 1010 BSC (BSSAP-LE)

1111 1011 MSC (BSSAP-LE)

1111 1100 SMLC (BSSAP-LE)

1111 1101 BSS O&M (A interface);

1111 1110 BSSAP (A interface).

The following national network subsystem numbers have been allocated for use within and between GSM networks:

~~1001 0000 SMLC(MAP);~~

1001 0001 GMLC(MAP);

1001 0010 CAP;

1001 0011 gsmSCF(MAP);

1001 0100 SIWF(MAP);

1001 0101 SGSN(MAP);

1001 0110 GGSN(MAP).

SMG#30
Brighton, UK, 09-11 Nov 1999

Document P-99-700
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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03.07	**CR**	**A009r1**	Current Version:	7.0.0

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

For submission to: SMG#30 *list expected approval meeting # here ↑*	for approval	X	strategic	X	*(for SMG use only)*
	for information		non-strategic		

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

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

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

Subject: Support of VLR and HLR Data Restoration procedures with LCS

Work item: Location Services (LCS)

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

Correction	
Corresponds to a correction in an earlier release	
Addition of feature	
Functional modification of feature	X
Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	X
Release 99	
Release 00	

Reason for change: Modify data restoration procedures for the new LCS phase 2 architecture.

Clauses affected: 1, 3, 4, 12, 13

Other specs affected:

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

Other comments: Changes made in this revision of the CR (editorial only) are shown with yellow highlighting.

1 Scope

The data stored in location registers are automatically updated in normal operation; the main information stored in a location register defines the location of each mobile station and the subscriber data required to handle traffic for each mobile subscriber. The loss or corruption of these data will seriously degrade the service offered to mobile subscribers; it is therefore necessary to define procedures to limit the effects of failure of a location register, and to restore the location register data automatically. The present document defines the necessary procedures.

The basic principle is that restoration should be based on radio contact to avoid faulty data being spread in the system.

Subscriber data for supplementary services must also be correctly restored, although the impact on service of corruption of supplementary service data is less severe.

Procedures for supporting these functions are defined in GSM 09.02 and 09.60.

The MAP operation "IMSI Attach" is used only in MAP version 1; in MAP version 2 the same function is performed by the MAP operation "Update Location Area". References in this specification to IMSI attach apply only to MAP version 1 network entities.

If the restoration of subscriber data in the VLR is triggered by Location Updating or IMSI Attach, the VLR retrieves subscriber data from the HLR by sending an "Update Location" request, which triggers one or more "Insert Subscriber Data" operations from the HLR. The "Update Location" request may also be used to send the LMSI to the HLR.

If the restoration of subscriber data in the VLR is triggered by a "Provide Roaming Number" request, the behaviour of the VLR depends on whether it is implemented according to MAP version 1 or MAP version 2. For MAP version 2, the VLR retrieves subscriber data from the HLR by sending a "Restore Data" request, which triggers one or more "Insert Subscriber Data" operations from the HLR. The "Restore Data" request is also used to send the LMSI to the HLR. For MAP version 1, the VLR retrieves subscriber data from the HLR by sending a "Send Parameters" request with parameter type "Subscriber Data", which cannot be used to send the LMSI to the HLR.

The VLR number and MSC number in the subscriber data in the HLR are updated by the "Update Location" procedure.

The GGSN (Gateway GPRS Support Node) is the point of PDN interconnection with the GSM PLMN supporting GPRS. The GGSN contains routing information for GPRS users with a PDP context active. The necessary procedures needed to restore GGSN data information after a restart are described in this document.

The SGSN (Serving GPRS Support Node) is the node that is serving the MS. The SGSN stores information regarding e.g. mobility management, routing and security. The necessary procedures needed to restore this SGSN information after a restart are described in this document.

~~The~~A Type A LMU (Location Measurement Unit) is a network node, accessed over the GSM air interface, that is functionally similar to an MS. All requirements associated with a non-GPRS MS in this specification apply also to a~~n~~ Type A LMU except where specified otherwise.

1.1 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] GSM 03.05: "Digital cellular telecommunication system (Phase 2+): Technical performance objectives".

[3] GSM 03.18: "Digital cellular telecommunications system (Phase 2+); Basic call handling; Technical realization".

[4] GSM 03.22: "Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode".

[5] GSM 03.40: "Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS) Point-to-Point (PP)".

[6] GSM 03.60: "Digital cellular telecommunication system (Phase 2+); Stage 2 Service Description of the General Packet Radio Service (GPRS)".

[6a] GSM 03.71: “Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Functional Description; Stage 2”.

[7] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[8] GSM 09.18:"Digital cellular telecommunications system (Phase 2+); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR); Gs interface layer 3 specification”.

[9] GSM 09.60: "Digital cellular telecommunication system (Phase 2+); General Packet radio Service (GPRS); GPRS Tunneling Protocol (GTP) across the Gn and Gp Interface”.

[10] GSM 12.07: "Digital cellular telecommunications system (Phase 2); Operations and performance management".

1.2 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04.

**** NEXT MODIFIED SECTION ****

3 Restoration indicators in location registers and in GPRS support nodes

3.1 Restoration Indicators in the VLR

Three restoration indicators are provided in the VLR for each IMSI record: "Confirmed by Radio Contact", "Subscriber Data Confirmed by HLR" and "Location Information Confirmed in HLR". ~~A further restoration indicator is provided in the VLR for each IMSI record belonging to an LMU: "Location Information Confirmed in SMLC".~~

The indicator "Confirmed by Radio Contact" indicates whether the VLR"s record of location area identity and MSC number for the mobile station is confirmed by radio contact.

The indicator "Confirmed by Radio Contact" in an IMSI record is set to the initial value "Not Confirmed" when the VLR receives a "Provide Roaming Number" request, an "Update Location Area" request or an "IMSI Attach" request for an MS for which the VLR does not have an IMSI record. The indicator "Confirmed by Radio Contact" in an IMSI record is also set to the initial value "Not Confirmed" when the VLR receives a Reset indication message from the SGSN serving the MS if the MS is attached to both GPRS and non-GPRS services.

The indicator "Confirmed by Radio Contact" is set to "Confirmed" when the radio contact that has been established with the MS is authenticated.

The indicator "Subscriber Data Confirmed by HLR" indicates whether the subscriber data set for the mobile station held by the VLR is consistent with that held by the HLR.

The indicator "Subscriber Data Confirmed by HLR" is set to the initial value "Not Confirmed" when the VLR receives a "Provide Roaming Number" request, an "Update Location Area" request or an "IMSI Attach" request for an MS for which the VLR does not have an IMSI record.

The indicator "Subscriber Data Confirmed by HLR" is set to "Confirmed" at either of the following events:

- The VLR successfully performs an "Update Location" to the HLR;
- The VLR successfully performs a "Restore Data" operation to the HLR.

The indicator "Location Information Confirmed in HLR" indicates whether the HLR"s record of VLR number and MSC number for the mobile station is confirmed by radio contact.

The indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" at any of the following events:

- The VLR receives an "Update Location Area" request or an IMSI Attach" request for an MS for which the VLR has no IMSI record;
- A VLR which serves two or more MSCs receives a "Provide Roaming Number" request for an MS for which the VLR has no IMSI record;
- The VLR receives a "Reset" message from the HLR with which the MS is registered.

The indicator "Location Information Confirmed in HLR" is set to "Confirmed" at either of the following events:

- A VLR which serves only one MSC receives a "Provide Roaming Number" request for an MS for which the VLR has no IMSI record;
- Successful completion of the "Update Location" procedure triggered by authenticated radio contact.

~~The indicator "Location Information Confirmed in SMLC" indicates whether an SMLC's record of MSC number for a particular LMU is confirmed by radio contact.~~

~~The indicator “Location Information Confirmed in SMLC” is set to “Not Confirmed” at any of the following events:~~

- ~~The VLR receives an “Update Location Area” request or an “IMSI Attach” request for an MS for which the VLR has no IMSI record. The indicator, in this case, becomes valid only if HLR subscriber data later indicates an LMU.~~
- ~~The VLR receives an “LCS Reset” message from an SMLC where the message is targetted to either a specific LMU or all LMUs registered with the SMLC.~~
- ~~The VLR receives an “IMSI Detach” from an LMU that is registered with an SMLC~~

~~The indicator “Location Information Confirmed in SMLC” is set to “Confirmed” at the following event:~~

- ~~Successful completion of the “LCS Registration” procedure triggered by a successful location update~~
- ~~Successful transfer of an LCS Information message from an SMLC to the LMU~~

3.2 Restoration Indicators in the HLR

As an implementation option, one restoration indicator may be provided in the HLR for each IMSI record: "Check SS".

The "Check SS" indicator is set to "Check Required" when the HLR restarts after a failure.

The "Check SS" indicator is checked whenever the HLR receives an "Update Location" request from a VLR. If it is set to "Check Required", after successful completion of subscriber data retrieval that ran embedded in the "Update Location" procedure the HLR sends a "Forward Check SS Indication" request message to the VLR and sets the "Check SS" indicator to "Check Not Required".

3.3 Restoration Indicators in the SGSN

Two restoration indicators are provided in the SGSN for reach IMSI record: “Subscriber Data Confirmed by HLR” and “Location Information Confirmed in HLR”.

The indicator "Subscriber Data Confirmed by HLR" indicates whether the subscriber data set for the mobile station held by the SGSN is consistent with that held by the HLR.

The indicator "Subscriber Data Confirmed by HLR" is set to the initial value "Not Confirmed" when the SGSN receives a Routing Area Update request or an IMSI- and/or GPRS Attach request for an MS for which the SGSN does not have an IMSI record.

The indicator "Subscriber Data Confirmed by HLR" is set to "Confirmed" at the following event:

- The SGSN successfully performs an Update GPRS Location to the HLR;

The indicator "Location Information Confirmed in HLR" indicates whether the HLRs record of the SGSN address for the mobile station is confirmed by radio contact.

The indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" at any of the following events:

- The SGSN receives a Routing Area Update request or an IMSI- and/or GPRS Attach request for an MS for which the SGSN has no IMSI record;
- The SGSN receives a “Reset” message from the HLR with which the MS is registered.

The indicator "Location Information Confirmed in HLR" is set to "Confirmed" at the following event:

- Successful completion of the Update GPRS Location procedure to the HLR.

The indicator "VLR-Reliable" indicates whether the VLR serving the MS has performed a restart.

The indicator "VLR-Reliable" is set to the value "false" when the SGSN receives a Reset indication message from the VLR serving the MS if the MS is attached to both GPRS and non-GPRS services. The indicator "VLR-Reliable" is set

to the value "true" when the SGSN receives a confirmation from a VLR that a location update procedure to the affected VLR has been successfully performed.

The indicator “SGSN-Reset” indicates whether the SGSN has recently experienced a restart.

The indicator "SGSN-Reset" is set to the value "true" when the SGSN suffers a restart. This indicator is unique per SGSN. The indicator "SGSN-Reset" is set to the value "false" after a certain time specified by the operator. The value of the timer controlling the reset of the “SGSN-Reset” indicator shall be longer than the periodic routeing area update timer value used by the MSs.

4 Restoration of data in the VLR

The effect on service of failure of a VLR is different from the effect of failure of an HLR. The procedures for restoration of a VLR and an HLR are therefore different.

4.1 Restart of the VLR

When a VLR restarts after a failure, all IMSI records affected by the failure are erased.

There will be no subscriber data or location information stored for an affected mobile station until after the VLR has received either a "Provide Roaming Number" request or an "Update location Area" request for that mobile station.

The VLR causes all affected TMSIs and all affected LMSIs to become invalid. "Invalid" in this context means that the TMSI and LMSI can no longer be regarded as accurate. The term is used to avoid unnecessary constraints on the implementation.

On receipt of either a "Provide Roaming Number" request or an "Update Location Area" request, restoration of subscriber data in the VLR is triggered individually for each IMSI record as described below.

4.2 Restoration Procedures

The objective of the restoration procedure is to handle all traffic for each mobile subscriber correctly. In order to meet this objective, the procedure must make the subscriber data in the VLR consistent with that in the HLR, and make the location information in the HLR and VLR reflect accurately the current location of the MS. ~~For an LMU, the procedure must also make the location information in the SMLC reflect accurately the current serving location of the LMU.~~

4.2.1 Incoming Call

a) Send Routing Information (GMSC->HLR)

The HLR sends "Provide Roaming Number" to the VLR as for normal operation. The LMSI is updated by the VLR when the VLR requests the transfer of subscriber data from the HLR using the "Restore Data" operation.

b) Provide Roaming Number (HLR->VLR)

- Regardless of whether the VLR has an IMSI record corresponding to the IMSI in the "Provide Roaming Number", it returns an MSRN. If no IMSI record exists, the VLR creates a skeleton IMSI record, sets the indicators "Subscriber Data Confirmed by Radio Contact" and "Confirmed by HLR" to "Not Confirmed" and (if IMSI Attach is used) marks the IMSI as attached. If the VLR serves two or more MSCs, the VLR sets the indicator "Location Information Confirmed in HLR" to "Not Confirmed". Otherwise, if the VLR serves only one MSC, the indicator "Location Information Confirmed in HLR" is set to the initial value "Confirmed".

- If the indicator "Subscriber Data Confirmed by HLR" is "Not Confirmed" the VLR requests authentication data, if required and still not available and subscriber data from the HLR. When the dialogue that covers the subscriber data retrieval procedure is completed successfully, the VLR sets the indicator "Subscriber Data Confirmed by HLR" to "Confirmed". The indicators "Confirmed by Radio Contact" and "Location Information Confirmed in HLR" remain unchanged.

- If the IMSI record for the MS is marked "Subscriber Data Confirmed by HLR" but "Not Confirmed by Radio Contact" the operator may choose an appropriate method to limit the number of "Search for MS" procedures for that MS.

- ~~If subscriber data from the HLR indicates an LMU, the indicator "Location Information Confirmed in SMLC" becomes applicable and is set to "not confirmed". The means by which this indicator is set to "confirmed" are described under "Incoming LCS Information Request" and "Outgoing LMU Request".~~

c) Send Information for I/C Call Setup (MSC->VLR)

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" the VLR returns a "System Failure" error.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact", the VLR handles the request in the normal way; for this MS, VLR restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the "Send Information for I/C Call Setup" procedure.

d) Process Access Request in Response to Search (MSC->VLR)

- If the MS responds to paging, the MSC sends a positive response to the search request and a "Process Access Request" to the VLR. After successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed", sets the location area information for the MS, and handles the request in the normal way.

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this MS, VLR restoration is complete.

4.2.2 Mobile Terminated Short Message

a) Send Routing Information for MT SMS (SMS-GMSC->HLR)

The HLR returns the MSC number as for normal operation.

b) Send Information for MT SMS (MSC->VLR) - MAP version 2

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" the VLR returns an "Unidentified Subscriber" error. This causes the MSC to report a short message delivery failure, with cause "Unidentified Subscriber", to the SMS gateway MSC. The Gateway MSC sends a "Report SM Delivery Status" request, with a cause of "Absent Subscriber", to the HLR. This causes the HLR to set the "Mobile Station Not Reachable Flag" for the MS, as described in Technical Specifications GSM 03.40 and GSM 09.02.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact", the VLR handles the request in the normal way; for this MS, VLR restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the "Send Information for MT SMS" procedure.

c) Send Information for I/C Call Setup (MSC->VLR) - MAP version 1

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" the VLR returns a "System Failure" error. This causes the MSC to report a short message delivery failure, with cause "System Failure", to the SMS gateway MSC.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact", the VLR handles the request in the normal way; for this MS, VLR restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the "Send Information for MT SMS" procedure.

d) Process Access Request in Response to Search (MSC->VLR)

- If the MS responds to paging, the MSC sends a positive response to the search request and a "Process Access Request" to the VLR. After successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed", sets the location area information for the MS, and handles the request in the normal way.

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed, the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this MS, VLR restoration is complete.

4.2.3 Mobile Terminating Location Request (MT-LR)

Receipt of an MT-LR for a target MS identified by its IMSI in a serving MSC during VLR restoration is supported by the procedures below.

a) Provide Subscriber Location (GMLC->MSC/VLR)

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" the VLR returns an "Unidentified Subscriber" error. This causes the MSC to report a location failure, with cause "Unidentified Subscriber", to the GMLC.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure when paging for the MS.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact", the VLR handles the request in the normal way; for this MS, VLR restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the "Provide Subscriber Location" procedure.

b) Process Access Request in Response to Search (MSC->VLR)

- If the MS responds to paging, the MSC sends a positive response to the search request and a "Process Access Request" to the VLR. After successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed", sets the location area information for the MS, and handles the request in the normal way.

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed, the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this MS, VLR restoration is complete.

4.2.4 Incoming LCS Information Request

Receipt of an incoming BSSMAP-LE LMU Connection Request~~LCS Information Request~~ from an SMLC directed to a specific Type A LMU is supported by the procedures below.

a) Request associated with an LMU (SMLC->MSC/VLR)

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR"~~ or if both the record is marked "Location Information not Confirmed in SMLC" and any LMSI supplied by the SMLC is incorrect~~, the VLR returns an "Unidentified Subscriber" error.

- If the VLR has an IMSI record for an LMU marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure when paging for the LMU.

- ~~If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact" and "Location Information not Confirmed in SMLC", then if the VLR serves more than one MSC, the VLR verifies if the Location Area for the LMU belongs to the MSC to which the SMLC sent the LCS Information. Request. If this is not verified, the VLR returns an "Unidentified subscriber" error. Otherwise, the VLR handles the request in the normal way and sets the "Location Information Confirmed in SMLC" indicator to "Confirmed". For this LMU, data restoration is complete.~~

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact"~~ and "Location Information Confirmed in SMLC"~~, the VLR handles the request in the normal way. For this LMU, data restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the incoming ~~LCS Information~~LMU Connection Request.

b) Process Access Request in Response to Search (MSC->VLR)

- If the LMU responds to paging, the MSC sends a positive response to the search request and a "Process Access Request" to the VLR. After successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed"~~, sets the indicator "Location Information Confirmed in SMLC" to "Confirmed" (if not already "Confirmed")~~, sets the location area information for the LMU, and handles the request in the normal way.

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed, the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this LMU, VLR restoration is complete.

4.2.5 Outgoing MS request

An outgoing request (MS originated call, mobile originated Short Message or call-independent supplementary service activity) from the MS causes the VLR to check its IMSI record for that MS.

- If the MS is unknown in this VLR (i.e. the VLR has no IMSI record for the MS) or there is an IMSI record marked "Subscriber Data Not Confirmed by HLR" the outgoing request is rejected with error cause "Unidentified Subscriber". This causes the MS to initiate the location registration procedure described below.

- If the VLR has an IMSI record for the MS marked "Subscriber Data Confirmed by HLR" the request is handled in the normal way, and after any necessary authentication and/or IMEI checking the record is marked "Confirmed by Radio Contact".

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this MS, VLR restoration is complete.

4.2.6 Outgoing LMU Request

An outgoing request (CM ServiceRequest) for LCS from ~~a~~n Type A LMU causes the VLR to check its IMSI record for that LMU.

- If the LMU is unknown in this VLR (i.e. the VLR has no IMSI record for the LMU) or there is an IMSI record marked "Subscriber Data Not Confirmed by HLR" the outgoing request is rejected with error cause "Unidentified Subscriber". This causes the LMU to initiate the location registration procedure described below.

- ~~If the VLR has an IMSI record for the MS marked "Subscriber Data Confirmed by HLR" and "Location Information not Confirmed in SMLC", the outgoing request is rejected with the error cause "Not registered in SMLC". This causes the LMU to initiate the location registration procedure described below.~~

- If the VLR has an IMSI record for the LMU~~MS~~ marked "Subscriber Data Confirmed by HLR"~~ and "Location Information Confirmed in SMLC"~~, the request is handled in the normal way, and after any necessary authentication and/or IMEI checking the record is marked "Confirmed by Radio Contact".

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this LMU, VLR restoration is complete.

4.2.7 Location Updating or IMSI Attach

A location registration request (location updating or IMSI attach) from an MS causes the VLR to check its IMSI record for that MS.

- If the MS is unknown in this VLR (i.e. the VLR has no IMSI record for the MS) the VLR creates a skeleton IMSI record for the MS and sets the indicators "Confirmed by Radio Contact", "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Not Confirmed". If authentication is required, the VLR retrieves authentication data. When the radio contact with the Mobile Station is authenticated, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed. The VLR then performs an "Update Location" to the HLR. If this is successful, the VLR sets the indicators "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Confirmed". For this MS, VLR restoration is complete.

- If the VLR has an IMSI record for the MS, after successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed". If the record is marked "Location Information Not Confirmed in HLR" or "Subscriber Data Not Confirmed by HLR" the VLR performs an "Update Location" to the HLR. If this is successful, the VLR sets the indicators "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Confirmed". For this MS, VLR restoration is complete.

- ~~If the VLR performs a successful "Update Location" and the IMSI record indicates an LMU with the indicator "Location Information Confirmed in SMLC" set to "Not Confirmed", the VLR performs an "LCS Registration" to the SMLC associated with either the IMSI or serving cell of the LMU. If this is sucessful, the VLR sets the indicator "Location Information Confirmed in SMLC" to "Confirmed". For this LMU, VLR restoration is complete.~~

4.2.8 Use of TMSI

After the VLR has restarted but before the next authenticated radio contact the TMSI known by the MS is invalid, as it was allocated before the VLR restarted. The VLR therefore uses the IMSI to identify the MS on the first radio contact during restoration.

- A VLR which initiates a "Search for Subscriber" procedure uses the IMSI to identify the MS.

- If an MS identifies itself by a TMSI in a "Location Registration" request, the VLR proceeds as follows:

  a) The VLR checks the location area identity (LAI) of the previous location area sent by the MS. If this LAI is in a VLR different from the current one, the request is handled in the normal way.

  b) If the LAI is in the current VLR, the status of the TMSI is checked.

- If the TMSI was allocated after the VLR restarted, and corresponds to a valid IMSI record, the request is handled as described in subclause 4.2.4.

- If the TMSI was allocated before the VLR restarted, or does not correspond to a valid IMSI record, the VLR requests the IMSI from the MS. If the MS returns an IMSI the VLR proceeds as described in subclause 4.2.4. If the MS does not return an IMSI the network aborts the location registration procedure.

- If an MS identifies itself by a TMSI in an outgoing MS request, the VLR proceeds as follows:

  - If the TMSI was allocated after the VLR restarted, and corresponds to a valid IMSI record, the request is handled as described in subclause 4.2.3.

  - If the TMSI was allocated before the VLR restarted, or does not correspond to a valid IMSI record, the VLR requests the IMSI from the MS. If the MS returns an IMSI the VLR proceeds as described in subclause 4.2.3. If the MS does not return an IMSI the network aborts the outgoing request.

4.2.9 SGSN associations

Based on configuration data, “Reset” messages are sent on the Gs-interface to the SGSNs in the Location Areas served by the VLR. The SGSNs mark all associations with the VLR as unreliable by setting the restoration indicator "VLR-Reliable" to "false" for the MSs served by that VLR. The associations will be re-initiated one by one by the SGSN at the next Routing Area update or combined RA/LA update from each MS.

**** NEXT MODIFIED SECTION ****

12 Restoration of Data in an SMLC

12.1 Restart of an SMLC

When an SMLC restarts after a failure, it performs the following actions for those of its associated LMUs whose records have been affected by the fault:

- Reload all administered LMU data from non-volatile back-up

~~- Mark each LMU as "not registered"~~

- Reinitialize other temporary data for each LMU to indicate no ongoing measurement or diagnostic activities

- Perform data restoration for each affected Type A and Type B LMU as described below.

~~- Send an "LCS Reset" message containing no LMU identifier to each VLR where an LMU may be currently served~~

~~Any VLR receiving an "LCS Reset" containing no LMU identifier shall reset the indicator "Location Information Confirmed in SMLC" to "Not Confirmed" for each LMU registered with this SMLC. The VLR shall also request the serving MSC for each affected LMU to release any LCS signaling connection to this LMU with the cause "Not registered in SMLC".~~

~~While the "Location Information Confirmed in SMLC" indicator remains "not Confirmed" for any LMU, the VLR shall react to any outgoing request from the LMU as follows~~

~~- For an outgoing request for LCS service, the VLR shall return an error response with cause "not registered in SMLC". This shall cause the LMU to request a location update.~~

~~- For a location update request, the VLR shall behave as for a normal MS. Once any location update to the HLR is completed successfully, or if no location update to the HLR is needed, the VLR shall perform an "LCS Registration" to the SMLC. If this is successful, the indicator "Location Information Confirmed in SMLC" shall be set to "Confirmed".~~

~~After an "LCS Registration" has been successfully completed, the SMLC may send an LCS Information Request to the LMU containing an LCS O&M Reset command. On receipt of this, the LMU shall cancel all active LCS measurement and O&M tasks previously ordered by the SMLC.~~

~~For this LMU, data restoration in the SMLC is complete.~~

12.2 Data Restoration for a Specific LMU

An SMLC may restore data for a specific LMU when the data in the SMLC or LMU is considered unreliable (e.g. if there is no communication between the SMLC and LMU for a long time or if messages received by the SMLC are inconsistent with the LMU state kept by the SMLC). To restore data for a specific LMU, the SMLC shall open a signaling connection to the LMU if this is Type A, as described in GSM 03.71. For both a Type A LMU and Type B LMU, the SMLC shall then send an LLP Reset message to the LMU.~~"LCS Reset" containing the identity of the LMU to the current serving VLR or to every VLR that may serve the LMU.~~ On receiving an LLP Reset, an LMU shall cancel any LCS measurement and O&M tasks previously ordered by the SMLC and shall return an LLP Reset acknowledgment to the SMLC.

~~Any VLR receiving an "LCS Reset" containing a specific LMU identifier shall reset the indicator "Location Information Confirmed in SMLC" to "Not Confirmed" for this LMU and shall request the serving MSC to release any LCS signaling connection to this LMU with the cause "Not registered in SMLC". Further actions by the MSC, LMU and SMLC are as described in section 12.1~~

13 Restoration of Data in an LMU

When an LMU restarts following a failure, it shall reinitialize all data concerning LCS measurement and O&M tasks to indicate that no tasks ordered by an SMLC are active. ~~The~~A Type A LMU shall then perform an "IMSI Attach". ~~Other actions are for further study.~~A Type A LMU shall then open a signaling connection to its controlling SMLC as described in GSM 03.71. Both a Type A LMU and a Type B LMU shall send an LLP Status Update message to their controlling SMLC containing an indication that the LMU has restarted following a failure. The SMLC shall update its data regarding the state of the LMU and shall return an LLP Update Status acknowledgment to the LMU.

CN2 meeting
Phoenix, AZ, 15-19 Nov 1999

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03.08	**CR**	**A029**	Current Version:	7.1.0

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

For submission to: CN#06	for approval	X	strategic	X	*(for SMG use only)*
list expected approval meeting # here ↑	for information		non-strategic		

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

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

Source: TSG N2 **Date:** 5 Nov 1999

Subject: Organization of Subscriber Data for LCS

Work item: Location Services (LCS)

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

Correction	
Corresponds to a correction in an earlier release	
Addition of feature	
Functional modification of feature	X
Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	X
Release 99	
Release 00	

Reason for change: Change subscriber data for LCS

Clauses affected: 1, 2, 4

Other specs affected:

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

Other comments:

1 Introduction

1.1 Definition

The term subscriber data is used to designate all information associated with a subscription which is required for service provisions, identification, authentication, routing, call handling, GPRS mode transmission, charging, subscriber tracing, operation and maintenance purposes. Some subscriber data are referred to as permanent subscriber data, i.e. they can only be changed by administration means. Other data are temporary subscriber data which may change as a result of normal operation of the system.

Unless shown to be conditional, all data items are considered to be mandatory.

1.2 Storage facilities

The present document considers subscriber data stored in the following types of functional unit:

- Home location register (HLR) which contains all permanent subscriber data and all relevant temporary subscriber data for all mobile subscribers permanently registered in the HLR.
- Visitor location register (VLR) which contains all subscriber data required for call handling and other purposes for mobile subscribers currently located in the area controlled by the VLR.
- Serving GPRS Support Node (SGSN) which contains all subscriber data required for GPRS mode transmission and other purposes for mobile subscribers currently located in the area controlled by the SGSN.
- Gateway GPRS Support Node (GGSN) which contains all subscriber data required for GPRS mode transmission for mobile subscribers using any service provided by the GGSN.
- Gateway Mobile Location Center (GMLC) which contains all subscriber data required for external clients of the location services (LCS).
- Serving Mobile Location Center (SMLC) which contains all LMU data required to manage location measurements in LMUs. (Note: ~~while an~~a Type A LMU is a network entity~~,~~ that~~it~~ shares many of the attributes of an MS including subscription data in the HLR and identification using an IMSI).

In addition, subscriber data may also be stored in the following functional unit:

- Group Call Register (GCR) which contains all data required for configuration, set-up and handling of voice group and voice broadcast calls. This encompasses subscribers identities (mobile as well as fixed network) who are nominated as dispatchers for one or several groups within the area controlled by the GCR.

NOTE: The data stored in the GCR is not strictly “subscriber data”. Description of GCR data is therefore out of scope of the present document and is covered in the corresponding specifications for enhanced Multi Level Precedence and Pre-emption Service (eMLPP), Voice Group Call Service (VGCS) and Voice Broadcast Service (VBS) instead (GSM 03.67, GSM 03.68 and GSM 03.69).

1.3 Subscriber data in functional units other than the HLR, the VLR, the SGSN, the GGSN, the GLMC, the SMLC and the LMU

The individual Subscriber Authentication Key Ki defined in GSM 03.20 is stored in the Authentication Centre AuC; it is also stored in the SIM and therefore available in the MS. Version numbers of algorithms A3 and A8 may also be stored in the AuC.

NOTE: It is for further study whether or not other types of functional units containing mobile subscriber parameters are to be included in the present document. Such units could include encryption key distribution centres, maintenance centres, etc.

2 Definition of subscriber data

2.1 Data related to subscription, identification and numbering

2.1.1 Data defining the subscription profile

2.1.1.1 International Mobile Subscriber Identity (IMSI)

International mobile subscriber identity (IMSI) is defined in GSM 03.03.

IMSI is permanent subscriber data. IMSI is stored in HLR, VLR, SGSN, GGSN and SMLC. For Anonymous Access, IMSI is not used in SGSN nor in GGSN. The IMSI serves as the root of the subscriber data pseudo-tree.

2.1.1.2 Network Access Mode (NAM)

The Network Access Mode defines if the subscriber is registered to get access to the non-GPRS network, to the GPRS network or to both networks. NAM describes the first level of the subscriber data pseudo-tree below the IMSI root. It is permanent subcriber data stored in the HLR and the SGSN with the Gs interface option..

2.1.2 Mobile Station International ISDN Number (MSISDN)

Mobile Station International ISDN Number (MSISDN) is defined in GSM 03.03.

The MSISDN is permanent subscriber data and is stored in HLR, VLR and SGSN.

If the multinumbering option applies, the MSISDN stored in the VLR and in the SGSN is the Basic MSISDN, see subclause 2.1.3.1.

2.1.3 MSISDNs for multinumbering option

If the HPLMN allocates different MSISDNs for different Basic Services (see GSM 09.07), these numbers are conditionally stored as permanent data in the HLR.

2.1.3.1 The Basic MSISDN indicator

The Basic MSISDN is defined in GSM 03.12. The Basic MSISDN indicator marks the MSISDN to be used as Basic MSISDN.

It is permanent subscriber data stored conditionally in the HLR.

2.1.3.2 The MSISDN-Alert indicator

The MSISDN-Alert is defined in GSM 03.40. The MSISDN-Alert indicator marks the MSISDN to be used as MSISDN-Alert.

It is permanent subscriber data stored conditionally in the HLR.

2.1.4 Temporary mobile subscriber identity (TMSI)

Temporary mobile subscriber identity (TMSI) is defined in GSM 03.03.

The TMSI is temporary subscriber data and is conditionally stored in the VLR.

2.1.5 Packet-Temporary Mobile Subscriber Identity (P-TMSI)

Packet-Temporary Mobile Subscriber Identity (P-TMSI) is defined in GSM 03.03. Its usage is described in GSM 03.60. P-TMSI is accompanied by the P-TMSI Signature, cf. subclause 2.3.5.

The P-TMSI is temporary subscriber data and is conditionally stored in the SGSN.

2.1.6 Temporary Link Layer Identifier (TLLI)

Temporary Link Layer Identifier (TLLI) is defined in GSM 03.03. It is derived from the P-TMSI by the MS and occurs in the variants Local TLLI and Foreign TLLI. The TLLI is temporary subscriber data and is conditionally stored in the SGSN. For use of TLLI see GSM 03.60.

2.1.7 Random TLLI

Random TLLI is chosen randomly by the MS. It is defined in GSM 03.03. Random TLLI is short living temporary subscriber data and is conditionally stored in the SGSN. For use of Random TLLI see GSM 03.60.

A Random TLLI may be used if no valid P-TMSI is available.

2.1.8 Local Mobile Station Identity (LMSI)

Local Mobile Station Identity (LMSI) is defined in GSM 03.03. The LMSI is temporary subscriber data. The LMSI may be stored in the VLR; if it is received in the HLR ~~or SMLC~~ it must be stored there.

2.1.9 International Mobile Equipment Identity (IMEI)

International Mobile Equipment Identity (IMEI) is defined in GSM 03.03. The IMEI is temporary subscriber data and is conditionally stored in the SGSN.

2.2 Data related to Mobile Station types

2.2.1 Mobile Station Category

Mobile Station Category has a structure identical to that of "Calling Party's Category" defined in ISUP (CCITT Recommendation Q.763).

The following values of category shall be supported:

- ordinary subscriber.

The category is assigned per IMSI.

Mobile Station Category is permanent subscriber data and is stored in HLR and VLR.

2.2.2 LMU Identifier

The LMU identifer is part of the subscriber data for a ~~n~~ Type A LMU, when associated with an NSS based SMLC, and serves to distinguish a ~~n~~ Type A LMU from a normal MS.

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

2.4 Data related to roaming

2.4.9 MLC number

The MLC number occurs as an SMLC number and as a GMLC number.

2.4.9.1 SMLC number

The SMLC number is the E.164 address of ~~the~~an NSS based SMLC.

The SMLC number is permanent data that may be stored in an MSC in association with either a set of IMSIs belonging to LMUs controlled by the SMLC or a set of cell identifiers belonging to the geographic area served by the SMLC.

2.4.9.2 GMLC number

The GMLC number is the E.164 address of the GMLC. One or more GMLC numbers may be stored in the MS subscriber data in the HLR and downloaded to the VLR. These GMLC numbers identify the ~~home PLMN~~ GMLCs for the particular MS from which a location request for this MS may be confined for particular LCS clients.

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

2.15 Data related to Location Services

2.15.1 Subscriber Data stored in HLR

2.15.1.1 Privacy Exception List

This data contains the privacy classes for any target MS which identify the LCS clients permitted to locate the MS. For a detailed definition of this data, refer to GSM 03.71.

2.15.1.2 ~~Home~~ GMLC Numbers

This data contains the ~~home PLMN~~ GMLC addresses for an MS subscriber. These addresses may be used to verify that a location request from specific LCS clients is authorized for the~~has been sent from the home PLMN of a~~ target MS.

2.15.1.3 MO-LR List

This data contains the classes of MO-LR that are permitted for the MS subscriber. For a detailed definition of this data, refer to GSM 03.71.

2.15.2 Data stored in GMLC

The GMLC stores data related to LCS clients. Refer to GSM 03.71 for a detailed description.

2.15.3 Data stored in SMLC

The SMLC stores data related to associated Type A and Type B LMUs from which location measurements may be received. Refer to GSM 03.71 for a detailed description.

2.15.4 Data stored in LMU

The LMU stores data related to its LCS measurement and O&M capabilities and may store data related to LCS measurements and O&M reports that it is required to provide to its controlling SMLC. The nature and content of this data is not defined in GSM.

2.15.5 Data stored in the MSC

In order to support routing of connectionless LCS messages to an SMLC or a Type B LMU, the MSC may store permanent routing data for an SMLC or a Type B LMU in association with a specific location area identifier or location area identifier plus cell identifier.

2.15.6 Data stored in the BSC

In order to support routing of connectionless LCS messages to an SMLC or a Type B LMU, the BSC may store permanent routing data for an SMLC or a Type B LMU in association with a specific location area identifier or location area identifier plus cell identifier.

4 Accessing subscriber data

It shall be possible to retrieve or store subscriber data concerning a specific MS from the HLR by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);
- Mobile Station ISDN Number (MSISDN)

It shall be possible to retrieve or store subscriber data concerning a specific MS from the VLR by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);
- Temporary Mobile Subscriber Identity (TMSI).

It shall be possible to retrieve or store subscriber data concerning a specific MS from the SGSN by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);

Table a Packet Temporary Mobile Subscriber identity (P-TMSI).

It shall be possible to retrieve or store subscriber data concerning a specific MS from the GGSN by use of each of the following references:

Table a International Mobile Subscriber Identity (IMSI);

See clause 3 for explanation of M, C, T and P in table 1 and table 2.

Table 1: Overview of data stored for non-GPRS Network Access Mode

PARAMETER	SUBCLAUSE	HLR	VLR	TYPE	
IMSI	2.1.1.1	M	M	P	Note
Network Access Mode	2.1.1.2	M	-	P	Note
International MS ISDN number	2.1.2	M	M	P	
multinumbering MSISDNs	2.1.3	C	-	P	Note
Basic MSISDN indicator	2.1.3.1	C	-	P	
MSISDN-Alert indicator	2.1.3.2	C	-	P	
TMSI	2.1.4	-	C	T	
LMSI	2.1.8	C	C	T	Note
Mobile Station Category	2.2.1	M	M	P	
LMU Identifier	2.2.1	C	C	P	
RAND, SRES and Kc	2.3.1	M	M	T	
Ciphering Key Sequence Number	2.3.2	-	M	T	
MSRN	2.4.1	-	C	T	Note
Location Area Identity	2.4.2	-	M	T	
VLR number	2.4.5	M	-	T	Note
MSC number	2.4.6	M	C	T	
HLR number	2.4.7	-	C	T	
Subscription restriction	2.4.9	C	-	P	
RSZI lists	2.4.10.1	C	-	P	
Zone Code List	2.4.10.2	-	C	P	
MSC area restricted flag	2.4.11	M	-	T	
LA not allowed flag	2.4.12	-	M	T	
ODB-induced barring data	2.4.15.1	C	-	T	
Roaming restriction due to unsupported feature	2.4.15.2	M	M	T	
Cell ID	2.4.16	-	C	T	
LSA Identity	2.4.X.1	C	C	P	
LSA Priority	2.4.X.2	C	C	P	
LSA Only Access Indicator	2.4.X.3	C	C	P	
LSA Active Mode Indicator	2.4.X.4	C	C	P	
VPLMN Identifier	2.4.X.5	C	-	P	
Provision of bearer service	2.5.1	M	M	P	
Provision of teleservice	2.5.2	M	M	P	
BC allocation	2.5.3	C	C	P	
IMSI detached flag	2.7.1	-	C	T	
Confirmed by Radio Contact indicator	2.7.4.1	-	M	T	
Subscriber Data Confirmed by HLR indicator	2.7.4.2	-	M	T	
Location Information Confirmed in HLR indicator	2.7.4.3	-	M	T	
Check SS indicator	2.7.4.4	M	-	T	
MS purged for non-GPRS flag	2.7.5	M	-	T	
MNRR	2.7.7	C	-	T	
Subscriber status	2.8.1	C	C	P	
Barring of outgoing calls	2.8.2.1	C	C	P	
Barring of incoming calls	2.8.2.2	C	-	P	
Barring of roaming	2.8.2.3	C	-	P	
Barring of premium rate calls	2.8.2.4	C	C	P	
Barring of supplementary service management	2.8.2.5	C	C	P	
Barring of registration of call forwarding	2.8.2.6	C	-	P	
Barring of invocation of call transfer	2.8.2.7	C	C	P	
Operator determined barring PLMN-specific data	2.8.3	C	C	P	
Handover Number	2.9.1	-	C	T	
Messages Waiting Data	2.10.1	C	-	T	
Mobile Station Not Reachable Flag	2.10.2	C	M	T	
Memory Capacity Exceeded Flag	2.10.3	C	-	T	

(continued)

Table 1 (concluded): Overview of data stored for non-GPRS Network Access Mode

PARAMETER	SUBCLAUSE	HLR	VLR	TYPE	
Trace Reference	2.11.1	C	C	P	
Trace Type	2.11.2	C	C	P	
Operations Systems Identity	2.11.3	C	C	P	
HLR Trace Type	2.11.4	C	-	P	
MAP Error On Trace	2.11.5	C	-	T	
Trace Activated in VLR	2.11.6	C	C	T	
Foreign Subscriber Registered in VLR	2.11.7	-	C	P	Note
VGCS Group Membership List	2.12.1	C	C	P	
VBS Group Membership List	2.12.2	C	C	P	
Broadcast Call Initiation Allowed List	2.12.2.1	C	C	P	
Originating CAMEL Subscription Information	2.14.1.1	C	C	P	
Terminating CAMEL Subscription Information	2.14.1.2	C	-	P	
Location Information/Subscriber state Information	2.14.1.3	C	-	P	
USSD CAMEL subscription information(U-CSI)	2.14.1.4	C	-	P	
SS invocation notification (SS-CSI)	2.14.1.5/3.2	C	C	P	
FTN translation information flag(TIF-CSI)	2.14.1.6	C	-	P	
USSD General CAMEL service information (UG-CSI)	2.14.2	C	-	P	
Negotiated CAMEL Capability Handling	2.14.2	C	-	T	
Privacy Exception List	2.15.1.1	C	C	P	
~~Home~~ GMLC Numbers	2.15.1.2	C	C	P	
MO-LR List	2.15.1.3	C	C	P	

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03.16	**CR**	**A038**	Current Version:	7.1.0

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

For submission to:	CN#06	for approval	X	strategic	X	*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

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

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

(U)SIM		ME		UTRAN / Radio		Core Network	X

Source: TSG N2 **Date:** 5 Nov 1999

Subject: Support of Subscriber Data Management in the HLR and VLR for LCS

Work item: Location Services (LCS)

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

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

Reason for change: Modify Subscriber Data Management for LCS

Clauses affected: 3, 4

Other specs affected:

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

Other comments:

3 Definitions and abbreviations

3.1 Abbreviations

Abbreviations used in this specification are listed in GSM 01.04.

3.2 Definitions

Subscriber data to be stored in the HLR, VLR and SGSN are defined in GSM 03.08, GSM 03.71 and in GSM 03.6x, GSM 03.8x and GSM 03.9x-series of technical specifications.

Voice Broadcast Service (VBS), Voice Group Call Service (VGCS) and enhanced Multi Level Precedence and Pre-emption Service (eMLPP) Data related to group call area, cell or dispatcher attributes is only stored in the Group Call Register (GCR) which is linked to each MSC/VLR.

The GCR and it's s*tored data is out of scope of this specification.

Subscriber related VBS, VGCS and eMLPP Data only concerns entitlement data for these-services and is seen as shared non-GPRS subscriber data.

GPRS and non-GPRS subscriber data:

The HLR has to download data to the VLR and to the SGSN. In this specification those data sent to the VLR are called non-GPRS subscriber data and those data sent to the SGSN are called GPRS subscriber data.

Whenever the refining identifier non-GPRS or GPRS is missing a common rule is addressed which hold for both kinds of subscriber data.

Subscriber data specific to non-GPRS shall only be sent from the HLR to the VLR. Subscriber data specific to GPRS shall only be sent from the HLR to the SGSN.

Subscriber data common to both non-GPRS and GPRS (regional subscription information) are downloaded from the HLR to both entities.

Shared non-GPRS subscriber data:

Common subset of subscriber data defined to be stored in both the HLR and VLR. Subscriber data only stored in the HLR is not part of shared subscriber data. Shared subscriber data includes:

BS:	Bearer Service (see GSM 02.02);
TS:	Teleservice (see GSM 02.03);
BSG:	Basic Service Group (see GSM 02.01, GSM 02.04 and GSM 03.11);
EBSG:	Elementary Basic Service Group (see GSM 03.11);
CBSG:	Collective Basic Service Group (see GSM 03.11).
LSA Information:	Localised Service Area Information (see GSM 03.73).

Shared GPRS subscriber data:

Common subset of subscriber data defined to be stored in both the HLR and SGSN. Subscriber data only stored in the HLR is not part of shared subscriber data. Shared GPRS subscriber data includes:

TS:	Teleservice (see GSM 02.03);
PDP Context	(see GSM 03.60).

LSA Information: Localised Service Area Information (see GSM 03.73).

Mandatory data:

Data required to form a self-consistent set of subscriber data. The context governs whether a specific parameter is mandatory, e.g. the data set for a specific service may be optional, however if data for this service is present, then parameters within this data set may be mandatory.

Mandatory data is defined by the service description (see e.g. GSM 03.6x, GSM 03.8x and GSM 03.9x-series of technical specifications and GSM 03.15, GSM 03.71) and by PLMN defined requirements.

NOTE 1: The above definition is seen from a semantic point of view. Semantically, mandatory parameters may be defined as syntactically optional or mandatory by the protocol.

Optional data:

Data which is defined as subscriber data, but which is not required to form a self-consistent set of subscriber data; the context governs whether a specific parameter is optional.

Optional data is data which is defined by the service description (see e.g. GSM 03.6x, GSM 03.8x and GSM 03.9x-series of technical specifications and GSM 03.15, GSM 03.71) or by PLMN defined requirements but is not defined as mandatory data.

NOTE 2: The above definition is seen from a semantic point of view. Semantically optional parameters are always defined as syntactically optional by the protocol.

Missing data:

Data which is mandatory in a given context but is not received nor is valid data available locally.

Unexpected data:

Data which is received and cannot be further processed. This may be either:

- optional data not required in a given context; or
- optional or mandatory data, required in this context but received with an unexpected value.

Overlapping data:

Two different cases of overlapping within subscriber data are possible:

- two or more parameters are to be stored at the same address in the data structure (see subclause 4.4);
- two or more BSGs within a BSG list include or are identical with one and the same EBSG.

The following **groups of non-GPRS subscriber information** are defined:

- subscriber information (Group A):
  - International Mobile Subscriber Identity (IMSI);
  - basic Mobile Station International ISDN Number (MSISDN);
  - category;
  - subscriber status,
  - LMU identifier
- basic service information (Group B):
  - Bearer Service list;
  - Teleservice list.

NOTE 3: VBS and VGCS entitlement data are subsumed under Teleservices

- Supplementary Service (SS) information (Group C):
  - forwarding information;
  - call barring information;
  - Closed User Group (CUG) information;
  - eMLPP data;
  - SS Data;
- Operator Determined Barring (ODB) information (Group D):
  - ODB Data for non-GPRS services;
- roaming restriction information (Group E):
  - roaming restriction due to unsupported feature;
- regional subscription information (Group F):
  - regional subscription data.
- VBS/VGCS subscription information (Group G):
  - VBS subscription data;
  - VGCS subscription data.
- CAMEL subscription information (Group H):
  - Originating CAMEL Subscription Information.
- LSA Information (Group I):
  - LSA data.
- Location Services (LCS) information (Group X)
  - ~~HPLMN~~ GMLC List
  - LCS Privacy Exception List
  - MO-LR List

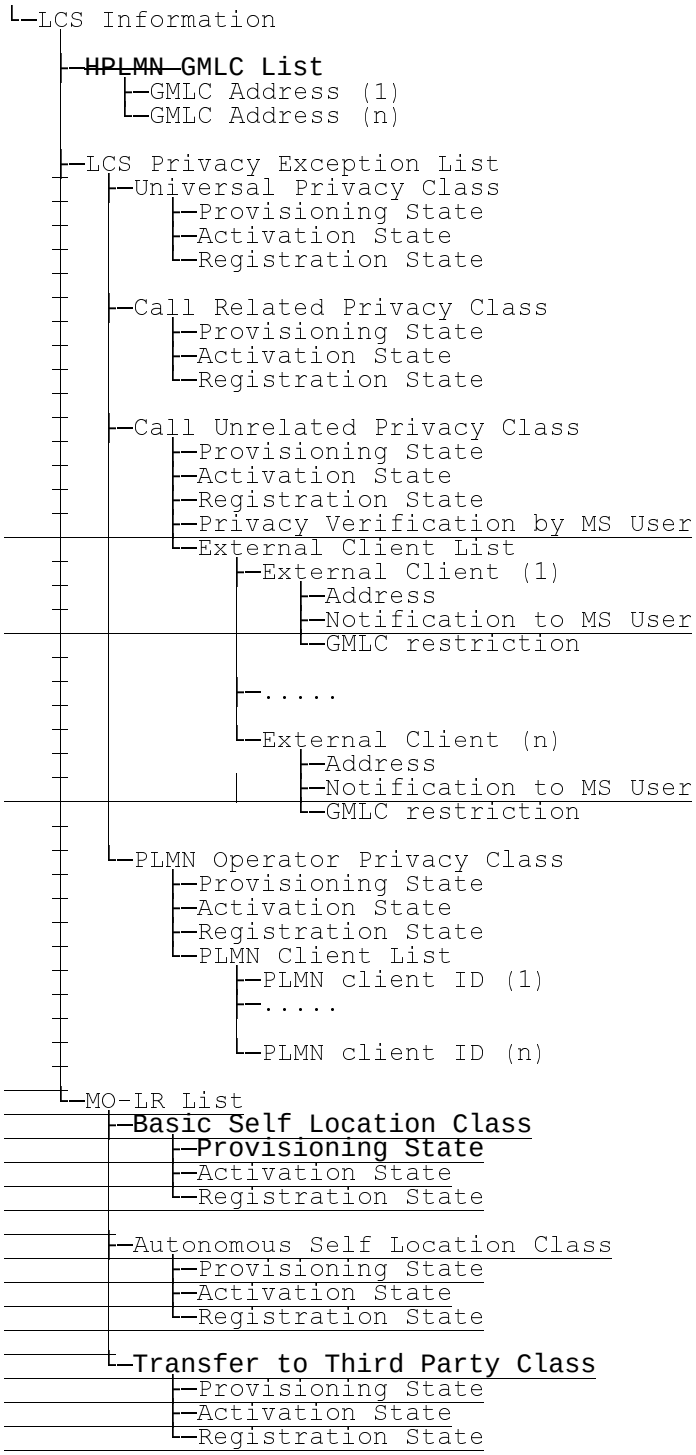
The following **groups of GPRS subscriber information** are defined:

- subscriber information (Group P1):
  - International Mobile Subscriber Identity (IMSI);
  - basic Mobile Station International ISDN Number (MSISDN);
  - subscriber status;
- basic service information (Group P2):
  - Teleservice list.
- Operator Determined Barring (ODB) information (Group P3):
  - ODB Data for GPRS services;
- roaming restriction information (Group P4):
  - roaming restriction in SGSN due to unsupported feature;

- regional subscription information (Group P5):
  - regional subscription data.
- GPRS subscription information (Group P6):
  - GPRS subscription data.
- LSA Information (Group P7):
  - LSA data.

4 General on handling of subscriber information

4.5.4 Consistency of supplementary service data



NOTE: For detailed information see GSM 03.71 and GSM 09.02.

Figure 13: LCS Information

SMG#30
Brighton, UK, 09-11 Nov 1999

Document P-99-702
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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09.02	**CR**	**A273r1**	Current Version:	7.1.0

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

For submission to: SMG#30 *list expected approval meeting # here ↑*	for approval	X	strategic	X	*(for SMG use only)*
	for information		non-strategic		

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

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

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

Subject: MAP Impacts for Location Services (LCS)

Work item: Location Services (LCS)

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

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

Reason for change: Modification of MAP messages and parameters to support enhancements to the Location Services (LCS)

Clauses affected: 2, 4, 5, 6, 7, 8, 13A, 16, 17

Other specs affected:

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

Other comments:

MAP changes are needed to support the addition of E-OTD and GPS positioning methods in LCS and for architectural changes defined in the LCS stage 2 (GSM 03.71) including removal of some LCS MAP operations.

Changes made in this revision of the CR are shown with yellow or blue highlighting and comprise:

- removal of change to add LCS Event Notification Request in a MAP Subscriber Location Report Ack.
- removal of velocity support
- addition of ellipsoid arc to Ext-GeographicalInformation
- addition of new error types (T1P1.5/99-713)
- restriction of LCS Client name length (T1P1.5/99-713)
- allow request for a vertical coordinate in the LCS QoS

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.01: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 02.02: "Digital cellular telecommunications system (Phase 2+); Bearer Services (BS) Supported by a GSM Public Land Mobile Network (PLMN)".

[4] GSM 02.03: "Digital cellular telecommunications system (Phase 2+); Teleservices Supported by a GSM Public Land Mobile Network (PLMN)".

[5] GSM 02.04: "Digital cellular telecommunications system (Phase 2+); General on supplementary services".

[6] GSM 02.09: "Digital cellular telecommunications system (Phase 2+); Security aspects".

[7] GSM 02.16: "Digital cellular telecommunications system (Phase 2+); International Mobile station Equipment Identities (IMEI)".

[8] GSM 02.41: "Digital cellular telecommunications system (Phase 2+); Operator determined barring".

[9] GSM 02.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 1".

[10] GSM 02.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 1".

[11] GSM 02.83 : "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

[12] GSM 02.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 1".

[13] GSM 02.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 1".

[14] GSM 02.86: "Digital cellular telecommunications system (Phase 2+); Advice of charge (AoC) supplementary services - Stage 1".

[15] GSM 02.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 1".

[16] GSM 02.90: "Digital cellular telecommunication system (Phase 2+); Unstructured supplementary services operation - Stage 1".

[17] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".

[18] GSM 03.04: "Digital cellular telecommunications system (Phase 2+); Signalling requirements relating to routeing of calls to mobile subscribers".

[19] GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration procedures".

[20] GSM 03.08: "Digital cellular telecommunications system (Phase 2+); Organisation of subscriber data".

[21] GSM 03.09: "Digital cellular telecommunications system (Phase 2+; Handover procedures".

[22] GSM 03.11: "Digital cellular telecommunications system (Phase 2+); Technical realization of supplementary services".

[23] GSM 03.12: "Digital cellular telecommunications system (Phase 2+); Location registration procedures".

[24] GSM 03.20: "Digital cellular telecommunications system (Phase 2+); Security related network functions".

[25] GSM 03.38: "Digital cellular telecommunications system (Phase 2+); Alphabets and language specific information for GSM".

[26] GSM 03.40: "Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS) Point to Point (PP)".

[26a] GSM 03.71: “Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Functional Description; Stage 2”.

[27] GSM 03.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 2".

[28] GSM 03.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 2".

[29] GSM 03.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".

[30] GSM 03.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 2".

[31] GSM 03.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 2".

[32] GSM 03.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 2".

[33] GSM 03.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 2".

[34] GSM 03.90: "Digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 2".

[35] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[36] GSM 04.10: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 Supplementary services specification General aspects".

[37] GSM 04.11: "Digital cellular telecommunications system (Phase 2+); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[37a] GSM 04.71: “Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 location services specification.

[38] GSM 04.80: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 supplementary services specification Formats and coding".

[39] GSM 04.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 3".

[40] GSM 04.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 3".

[41] GSM 04.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 3".

[42] GSM 04.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 3".

[43] GSM 04.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 3".

[44] GSM 04.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 3".

[45] GSM 04.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 3".

[46] GSM 04.90: "Digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 3".

[47] GSM 08.02: "Digital cellular telecommunications system (Phase 2+); Base Station System - Mobile-services Switching Centre (BSS - MSC) interface Interface principles".

[48] GSM 08.06: "Digital cellular telecommunications system (Phase 2+); Signalling transport mechanism specification for the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[49] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".

[49a] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".

[49a1] GSM 08.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Center (SMLC) – Serving Mobile Location Center (SMLC); SMLC Peer Protocol (SMLCPP)."

[49b] GSM 08.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Centre - Base Station System (SMLC - BSS) interface Layer 3 specification".

[50] GSM 09.01: "Digital cellular telecommunications system (Phase 2+); General network interworking scenarios".

[51] GSM 09.02: "Digital cellular telecommunications system (Phase 1); Mobile Application Part (MAP) specification".

[52] GSM 09.03: "Digital cellular telecommunications system (Phase 2+); Signalling requirements on interworking between the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) and the Public Land Mobile Network (PLMN)".

[53] GSM 09.04: "Digital cellular telecommunications system (Phase 2+); Interworking between the Public Land Mobile Network (PLMN) and the Circuit Switched Public Data Network (CSPDN)".

[54] GSM 09.05: "Digital cellular telecommunications system (Phase 2+); Interworking between the Public Land Mobile Network (PLMN) and the Packet Switched Public Data Network (PSPDN) for Packet Assembly/Disassembly facility (PAD) access".

[55] GSM 09.06: "Digital cellular telecommunications system (Phase 2+); Interworking between a Public Land Mobile Network (PLMN) and a Packet Switched Public Data Network/Integrated Services Digital Network (PSPDN/ISDN) for the support of packet switched data transmission services".

[56] GSM 09.07: "Digital cellular telecommunications system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[57] GSM 09.08: "Digital cellular telecommunications system (Phase 2+); Application of the Base Station System Application Part (BSSAP) on the E-interface".

[58] GSM 09.10: "Digital cellular telecommunications system (Phase 2+); Information element mapping between Mobile Station - Base Station System and BSS - Mobile-services Switching Centre (MS - BSS - MSC) Signalling procedures and the Mobile Application Part (MAP)".

[59] GSM 09.11: "Digital cellular telecommunications system (Phase 2+); Signalling interworking for supplementary services".

[59a] GSM 09.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Base Station System Application Part LCS Extension (BSSAP-LE)".

[60] GSM 09.90: "Digital cellular telecommunications system (Phase 2+); Interworking between Phase 1 infrastructure and Phase 2 Mobile Stations (MS)".

[61] GSM 12.08: "Digital cellular telecommunications system (Phase 2); Subscriber and Equipment Trace".

[62] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3 specifications for basic call control".

[63] ETS 300 136 (1992): "Integrated Services Digital Network (ISDN); Closed User Group (CUG) supplementary service description".

[64] ETS 300 138 (1992): "Integrated Services Digital Network (ISDN); Closed User Group (CUG) supplementary service Digital Subscriber Signalling System No.one (DSS1) protocol".

[65] ETS 300 287: "Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2".

[66] ETR 060: "Signalling Protocols and Switching (SPS); Guide-lines for using Abstract Syntax Notation One (ASN.1) in telecommunication application protocols".

[67] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

[68] CCITT Recommendation E.212: "Identification plan for land mobile stations".

[69] CCITT Recommendation E.213: "Telephone and ISDN numbering plan for land mobile stations".

[70] CCITT Recommendation E.214: "Structuring of the land mobile global title for the signalling connection control part".

[71] CCITT Recommendation Q.669: "Interworking between the Digital Subscriber Signalling System Layer 3 protocol and the Signalling System No.7 ISDN User part".

[72] CCITT Recommendation Q.711: "Specifications of Signalling System No.7; Functional description of the signalling connection control part".

[73] CCITT Recommendation Q.712: "Definition and function of SCCP messages".

[74] CCITT Recommendation Q.713: "Specifications of Signalling System No.7; SCCP formats and codes".

[75] CCITT Recommendation Q.714: "Specifications of Signalling System No.7; Signalling connection control part procedures".

[76] CCITT Recommendation Q.716: "Specifications of Signalling System No.7; Signalling connection control part (SCCP) performances".

[77] CCITT Recommendation Q.721 (1988): "Specifications of Signalling System No.7; Functional description of the Signalling System No.7 Telephone user part".

[78] CCITT Recommendation Q.722 (1988): "Specifications of Signalling System No.7; General function of Telephone messages and signals".

[79] CCITT Recommendation Q.723 (1988): "Specifications of Signalling System No.7; Formats and codes".

[80] CCITT Recommendation Q.724 (1988): "Specifications of Signalling System No.7; Signalling procedures".

[81] CCITT Recommendation Q.725 (1988): "Specifications of Signalling System No.7; Signalling performance in the telephone application".

[82] CCITT Recommendation Q.761 (1988): "Specifications of Signalling System No.7; Functional description of the ISDN user part of Signalling System No.7".

[83] CCITT Recommendation Q.762 (1988): "Specifications of Signalling System No.7; General function of messages and signals".

[84] CCITT Recommendation Q.763 (1988): "Specifications of Signalling System No.7; Formats and codes".

[85] CCITT Recommendation Q.764 (1988): "Specifications of Signalling System No.7; Signalling procedures".

[86] CCITT Recommendation Q.767: "Specifications of Signalling System No.7; Application of the ISDN user part of CCITT signalling System No.7 for international ISDN interconnections".

[87] CCITT Recommendation Q.771: "Specifications of Signalling System No.7; Functional description of transaction capabilities".

[88] CCITT Recommendation Q.772: "Specifications of Signalling System No.7; Transaction capabilities information element definitions".

[89] CCITT Recommendation Q.773: "Specifications of Signalling System No.7; Transaction capabilities formats and encoding".

[90] CCITT Recommendation Q.774: "Specifications of Signalling System No.7; Transaction capabilities procedures".

[91] CCITT Recommendation Q.775: "Specifications of Signalling System No.7; Guide-lines for using transaction capabilities".

[92] CCITT Recommendation X.200: "Reference Model of Open systems interconnection for CCITT Applications".

[93] CCITT Recommendation X.208 (1988): "Specification of Abstract Syntax Notation One (ASN.1)".

[94] CCITT Recommendation X.209 (1988): "Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".

[95] CCITT Recommendation X.210: "Open systems interconnection layer service definition conventions".

[96] GSM 09.02: "Digital cellular telecommunications system (Phase 2); Mobile Application Part (MAP) specification".

[97] GSM 03.18: "Digital cellular telecommunications system (Phase 2+); Basic Call Handling".

[98] GSM 03.78: "Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL) - Stage 2”.

[99] GSM 03.79: "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routeing (SOR) - Stage 2”.

[100] GSM 03.68: "Digital cellular telecommunications system (Phase 2+); - Stage 2".

[101] GSM 03.69: "Digital cellular telecommunications system (Phase 2+); - Stage 2".

[102] ANSI T1.113: "Signaling System No. 7 (SS7) - ISDN User Part".

[103] GSM 03.54 "Digital cellular telecommunications system (Phase 2+); Stage 2 Description for the use of a Shared Inter Working Function (SIWF) in a GSM PLMN".

[104] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS) Description; Stage 2".

[105] GSM 09.60: "Digital cellular telecommunications system (Phase 2+), General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".

[106] GSM 09.18: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR); Gs interface layer 3 specification".

[107] GSM 03.93: "Digital cellular telecommunications system (Phase 2+); Technical Realization of Completion of Calls to Busy Subscriber (CCBS); Stage 2".

[108] GSM 03.66: "Digital cellular telecommunications system (Phase 2+); Support of Mobile Number Portability (MNP); Technical Realisation Stage 2".

[109] ANSI T1.112 (1996): "Telecommunication – Signaling No. 7 – Signaling Connection Control Part (SCCP)".

4 Configuration of the mobile network

4.1 The entities of the mobile system

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

4.1.17 The Serving Mobile Location Center (SMLC)

An SMLC is a database and processing entity that manages the procedures for obtaining the geographic location of a target MS in the coverage area served by the SMLC. In managing the location procedures, the SMLC chooses the positioning method and provides data and instructions to the LMUs or target MS that perform the actual location measurements associated with the chosen method. The SMLC also verifies any location estimate computed by the target MS or computes a location itself from measurements provided to it by the target MS or LMUs.

An SMLC also manages a set of LMUs in its coverage area whose purpose is to provide location measurements and location assistance data to the SMLC to compute, or assist in computing, location estimates for target MSs. Management functions performed by an SMLC on behalf of its LMUs include maintaining the status and current serving MSC of each LMU and supporting O&M procedures,

The database in an SMLC contains data necessary for choosing an appropriate position method and any parameters associated with this method for a target MS in any serving cell, for computing or verifying location estimates and for managing its LMUs.

An SMLC may be either NSS based or BSS based. An NSS based SMLC supports positioning and management of its LMUs via interaction with one or more MSCs using the Ls interface. A BSS based SMLC supports positioning and management of its LMUs via interaction with one or more BSCs using the Lb interface.

4.1.18 The Gateway Mobile Location Center (GMLC)

The GMLC provides access to location services (LCS) for LCS clients external to a PLMN. A GMLC may also support access to location services from LCS clients internal to its own PLMN. The GMLC allows an LCS client to issue location requests for certain target MSs; it then conveys these requests to the VMSC currently serving each target MS and passes back the location results to the LCSclient. Any target MS whose location is requested may belong to either the GMLC's own PLMN or another PLMN and may currently be served by either the GMLC's own PLMN or another PLMN.

4.1.19 The Location Measurement Unit (LMU)

The LMU is the logical network entity that performs location measurements in the VPLMN in order to either position a target MS or provide assistance data to be used in conjunction with other location measurements. An LMU is controlled by an SMLC in the VPLMN from which location commands can be received and to which any location measurements are returned.

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

4.4 The interfaces within the mobile service

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

The description of this interface is contained in the GSM 09.18.

4.4.17A Interface between SMLC and BSC (Lb interface)

This interface is used by a BSC when an SMLC is BSS based to request either the initiation of location procedures or the retrieval of location assistance data for a particular target MS in the coverage area served by the SMLC. The interface is also used to transfer LCS measurement and O&M information between an SMLC and LMU via the BSC. A description of this interface is contained in GSM 03.71 and GSM 09.31.

4.4.18 Interface between SMLC and MSC (Ls interface)

This interface is used by the MSC when an SMLC is NSS based to request either the initiation of location procedures or the retrieval of location assistance data for a particular target MS in the coverage area served by the SMLC. The interface is also used to transfer LCS measurement and O&M information between an SMLC and LMU or BSC via the MSC. A description of this interface is contained in GSM 03.71 and GSM 09.31.

~~4.4.19 Interface between SMLC and VLR (Lv interface)~~

~~This interface is used by the VLR to register or deregister an LMU in the SMLC.~~

4.4.18A Interface between SMLC and SMLC (Lp interface)

This interface is used by an SMLC to obtain LCS measurement information from an LMU controlled by another SMLC. A description of this interface is contained in GSM 03.71 and GSM 08.31.

4.4.20 Interface between GMLC and HLR (Lh interface)

This interface is used by the GMLC to request the address of the visited MSC for a particular target MS whose location has been requested.

4.4.21 Interface between GMLC and MSC (Lg interface)

This interface is used by the GMLC to convey a location request to the MSC currently serving a particular target MS whose location was requested. The interface is used by the MSC to return location results to the GMLC.

4.4.22 Interface between LCS Client and GMLC (Le interface)

This interface is used by a client of the Location Services (LCS) to request location information from a GMLC for certain target MSs. The interface is used by the GMLC to provide location information to an LCS client. This interface is external to a PLMN and is not defined within GSM.

5 Overload and compatibility overview

5.1 Overload control

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

5.1.2 Overload control for MAP entities

Table 5.1/2: Priorities of Application Contexts for MSC/VLR as Responder

Responder = MSC/VLR	Initiating Entity
Priority high	
Handover	
handoverControl (prepareHandover/v2), (performHandover/v1)	MSC
Mobility and Location Register Management	
locationCancel (cancelLocation)	HLR
reset (reset)	HLR
interVlrInfoRetrieval (sendIdentification/v2), (sendParameters/v1)	VLR
subscriberDataMngt (insertSubscriberData), (deleteSubscriberData)	HLR
tracing (activateTraceMode), (deactivateTraceMode)	HLR
Short Message Service	
shortMsgMO-Relay (MO-ForwardSM v3) (forwardSM v1/v2)	MSC/SGSN
shortMsgMT-Relay (MT-ForwardSM v3) (forwardSM v1/v2)	MSC
shortMsgAlert (alertServiceCentre/v2), (alertServiceCentreWithoutResult/v1)	HLR
Mobile Terminating Traffic	
roamingNbEnquiry (provideRoamingNumber)	HLR
callControlTransfer (resumeCallHandling)	MSC
subscriberInfoEnquiry (provideSubscriberInformation)	HLR
reporting (remoteUserFree) (SetReportingState)	HLR
Location Services	
~~locationSvcLMUControl (lcsReset v3)~~	~~SMLC~~
~~locationSvcDataTransfer (lcsInformationRequest v3)~~	~~SMLC~~
locationSvcEnquiry (provideSubscriberLocation v3)	GMLC
Network-Initiated USSD	
networkUnstructuredSs (unstructuredSS-Request/v2), (unstructuredSS-Notify/v2)	HLR
Priority low	

NOTE: The application context name is the last component but one of the object identifier.
Operation names are given in brackets for information with "/vn" appended to vn only operations.

~~**Table 5.1/4: Priorities of Application Contexts for SMLC as Responder**~~

~~**Responder – SMLC**~~	~~**Initiating Entity**~~
~~***Priority high***~~	
~~*Location Services*~~	
~~locationSvcLMUControl (lcsRegistration v3)~~	~~VLR~~
~~locationSvcDataTransfer (lcsInformationReport v3)~~	~~MSC~~
~~locationSvcPositioning (performLocation v3)~~	~~MSC~~
~~***Priority low***~~	

~~NOTE: The application context name is the last component but one of the object identifier.~~
~~Operation names are given in brackets for information with "/vn" appended to vn.~~

6 Requirements concerning the use of SCCP and TC

6.1 Use of SCCP

6.1.3 SCCP addressing

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

6.1.3.1 Introduction

Within the GSM System there will be a need to communicate between entities within the same PLMN and in different PLMNs. Using the Mobile Application Part (MAP) for this function implies the use of Transaction Capabilities (TC) and the Signalling Connection Control Part (SCCP) of CCITT Signalling System No. 7.

Only the entities which should be addressed are described below. If the CCITT or ITU-T SCCP is used , the format and coding of address parameters carried by the SCCP for that purpose shall comply with CCITT Recommendation Q.713 with the following restrictions:

1) Intra-PLMN addressing

   For communication between entities within the same PLMN, a MAP SSN shall always be included in the called and calling party addresses. All other aspects of SCCP addressing are network specific.

2) Inter-PLMN addressing

   a) Called Party Address

   - SSN indicator = 1 (MAP SSN always included);
   - Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
   - the translation type field will be coded "00000000" (Not used). For call related messages for non-optimal routed calls (as described in GSM 03.66) directed to another PLMN the translation type field may be coded "10000000" (CRMNP);
   - Routing indicator = 0 (Routing on global title);

   b) Calling Party Address

   - SSN indicator = 1 (MAP SSNs always included);
   - Point code indicator = 0;
   - Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
   - Numbering Plan = 0001 (ISDN Numbering Plan, E.164; In Case of Inter-PLMN Signalling, the dialogue initiating entity and dialogue responding entity shall always include its own E.164 Global Title as Calling Party Address);
   - the translation type field will be coded "00000000" (Not used);
   - Routing indicator = 0 (Routing on Global Title).

If ANSI T1.112 SCCP is used, the format and coding of address parameters carried by the SCCP for that purpose shall comply with ANSI specification T1.112 with the following restrictions:

1) Intra-PLMN addressing

For communication between entities within the same PLMN, a MAP SSN shall always be included in the called and calling party addresses. All other aspects of SCCP addressing are network specific.

2) Inter-PLMN addressing

a) Called Party Address

- SSN indicator = 1 (MAP SSN always included);
- Global title indicator = 0010 (Global title includes translation type);
- the Translation Type (TT) field will be coded as follows:

  TT = 9, if IMSI is included,

  TT = 14, if MSISDN is included,

  Or TT = 10, if Network Element is included. (If TT=10, then Number Portability GTT is not invoked, if TT=14, then Number Portability GTT may be invoked.)

- Routing indicator = 0 (Routing on global title);

b) Calling Party Address

- SSN indicator = 1 (MAP SSNs always included);
- Point code indicator = 0;
- Global title indicator = 0010 (Global title includes translation type);

  TT = 9, if IMSI is included,

  TT = 14, if MSISDN is included,

  Or TT = 10, if Network Element is included. (If TT=10, then Number Portability GTT is not invoked, if TT=14, then Number Portability GTT may be invoked.)

Routing indicator = 0 (Routing on Global Title).

If a Global Title translation is required for obtaining routeing information, one of the numbering plans E.164, E.212 and E.214 is applicable.

- E.212 numbering plan

  When CCITT or ITU-T SCCP is used, an E.212 number must not be included as Global Title in an SCCP UNITDATA message. The translation of an E.212 number into a Mobile Global Title is applicable in a dialogue initiating VLR, SGSN or GGSN if the routeing information towards the HLR is derived from the subscriber's IMSI. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used as a Global Title to address the HLR. When an MS moves from one VLR service area to another, the new VLR may derive the address of the previous VLR from the Location Area Identification provided by the MS in the location registration request. The PLMN where the previous VLR is located is identified by the E.212 numbering plan elements of the Location Area Identification, ie the Mobile Country Code (MCC) and the Mobile Network Code (MNC).

- E.214 and E.164 numbering plans

  When CCITT or ITU-T SCCP is used, , only address information belonging to either E.214 or E.164 numbering plan is allowed to be included as Global Title in the Called and Calling Party Address. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used as a Global Title to address the HLR.

  If the Calling Party Address associated with the dialogue initiating message contains a Global Title, the sending network entity shall include its E.164 entity number.

  When receiving an SCCP UNITDATA message, SCCP shall accept either of the valid numbering plans in the Called Party Address and in the Calling Party Address.

When CCITT or ITU-T SCCP is used and an N-UNITDATA-REQUEST primitive from TC is received, SCCP shall accept an E.164 number or an E.214 number in the Called Address and in the Calling Address. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used instead of E.214 number.

The following subclauses describe the method of SCCP addressing appropriate for each entity both for the simple intra-PLMN case and where an inter-PLMN communication is required. The following entities are considered:

- the Mobile-services Switching Centre (MSC);
- the Home location Register (HLR);
- the Visitor Location Register (VLR);
- the Gateway Mobile-services Switching Centre (GMSC);
- the GSM Service Control Function (gsmSCF);
- the Interworking Mobile-services Switching Centre (IWMSC);
- the Shared Inter Working Function (SIWF);
- the Serving GPRS Support Node (SGSN);
- the Gateway GPRS Support Node (GGSN);
- ~~the Serving Mobile Location Center (SMLC);~~
- the Gateway Mobile Location Center (GMLC).
-

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

6.1.3.10 The Gateway MSC (GMSC) for Short Message Service

The GMSC provides interworking with the network to access the Short Message Service Centre, the mobile network and routing of Send Routing Info For SM. The GMSC has on E.164 address known in the HLR, SGSN or MSC

~~6.1.3.10A The Serving Mobile Location Center (SMLC)~~

~~There are several instances where an SMLC needs to be addressed.~~

~~6.1.3.10A.1 Registration (LMU)~~

~~When an LMU needs to register with a controlling SMLC, it may derive the identity of the SMLC from pre-administered data. The identity will be represented in this case by an international E.164 address.~~

~~6.1.3.10A.2 Instigation of Positioning (MSC)~~

~~When an MSC needs to instigate procedures to obtain location information for a target MS, it derives the identity of the SMLC for this MS from the MS's serving cell site. The identity of the SMLC shall be represented by either an SS7 signalling point code or an international E.164 address.~~

6.1.3.10B The Gateway Mobile Location Center (GMLC)

The GMLC initiates location requests on behalf of external clients. The E.164 address of the GMLC is provided to an HLR when the GMLC requests a serving MSC address from the HLR for a target MS. The E.164 address of the GMLC is also provided to a serving MSC when the GMLC requests the location of a target MS served by this MSC.

6.1.3.11 Summary table

The following tables summarize the SCCP address used for invoke operations. As a principle, within a PLMN either an SPC or a GT may be used (network operation option), whereas when addressing an entity outside the PLMN the GT must be used. The address type mentioned in the table (e.g. MSISDN) is used as GT or to derive the SPC.

For a response, the originating address passed in the invoke is used as SCCP Called Party Adress. For extra-PLMN addressing the own E.164 entity address is used as SCCP Calling Party Address; for intra-PLMN addressing an SPC derived from the entity number may be used instead. When using an SPC, the SPC may be taken directly from MTP.

Table 6.1/1

to from	fixed net work	HLR	VLR	MSC	EIR	gsmSCF	SIWF	SGSN	GGSN
fixed network	---	E:GT T:MSISDN	---	---	---	---	---	---	---
home location register	---	---	I:SPC/GT E:GT T:VLR NUMBER	---	---	I:SPC/GT E:GT T:gsmSCF NUMBER	---	I:SPC/GT E:GT T:SGSN NUMBER	I:SPC/GT E:GT T:GGSN NUMBER
visitor location register	---	I:SPC/GT E:GT T:MGT (outside World Zone 1)/MSISDN (World Zone 1/)HLR NUMBER (note)	I:SPC/GT E:GT T:VLR NUMBER	---	---	---	---	---	---
mobile-services switching centre	---	I:SPC/GT E:GT T:MSISDN	I:SPC/GT E:GT T:VLR NUMBER	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	I:SPC/GT E:GT T:gsmSCF NUMBER	I:SPC/GT E:GT T:SIWF NUMBER	I:SPC/GT E:GT T:SGSN NUMBER	---
gsm Service Control Function	---	I:SPC/GT E:GT T:MSISDN	---	---	---	---	---	---	---
Shared Inter Working Function	---	---	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---
Serving GPRS Support Node	---	I:SPC/GT E:GT T:MGT/ MSISDN/HLR NUMBER	---	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	---	---	---	---
Gateway GPRS Support Node	---	I:SPC/GT E:GT T:MGT	---	---	---	---	---	---	---
~~**Serving Mobile Location Centre**~~	~~---~~	~~---~~	~~I:SPC/GT (E:GT) T:VLR NUMBER~~	~~I:SPC/GT (E:GT) T:MSC NUMBER~~	~~---~~	~~---~~	~~---~~	~~---~~	~~---~~
Gateway Mobile Location Center	---	I:SPC/GT E:GT T:MSISDN, MGT (outside World Zone 1) or IMSI (World Zone 1) (note)	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---

I: Intra-PLMN E: Extra(Inter)-PLMN T: Address Type
GT: Global Title MGT: E.214 Mobile Global Title SPC: Signalling Point Code

NOTE: For initiating the location updating procedure and an authentication information retrieval from the HLR preceding it, the VLR has to derive the HLR address from the IMSI of the MS. The result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).. When continuing the established update location dialogue (as with any other dialogue) the VLR must derive the routeing information towards the HLR from the Calling Party Address received with the first responding CONTINUE message until the dialogue terminating message is received.
For transactions invoked by the VLR after update location completion, the VLR may derive the information for addressing the HLR from addresses received in the course of the update location procedure (MSISDN or HLR number) or from the IMSI.

When invoking the Restore Data procedure and an authentication information retrieval from the HLR preceding it, the VLR must derive the information for addressing the HLR from the address information received in association with the roaming number request. This may be either the IMSI received as a parameter of the MAP message requesting the Roaming Number or the Calling Party Address associated with the MAP message requesting the Roaming Number.
The gsmSCF shall be addressed using more than one Global Title number. The first Global Title number is used to address a gsmSCF for MAP. The second Global Title number is used to address a gsmSCF for CAP.
For querying the HLR to obtain the VMSC address to support location services, the GMLC has to derive the HLR address from either the MSISDN or IMSI of the target MS. When using the IMSI, the result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).

~~Inter-PLMN signalling from an SMLC to MSC is not defined in GSM 03.71; hence, the type of addressing is not significant.~~

Table 6.1/2

to from	~~SMLC~~	GMLC
fixed network	~~---~~	---
home location register	~~---~~	---
visitor location register	~~I:SPC/GT (E:GT) T:MLC NUMBER~~	---
mobile-services switching centre	~~I:SPC/GT (E:GT) T:MLC NUMBER~~	---
gsm Service Control Function	~~---~~	---
Shared Inter Working Function	~~---~~	---
Serving GPRS Support Node	~~---~~	---
Gateway GPRS Support Node	~~---~~	---
~~**Serving Mobile Location Centre**~~	~~---~~	~~---~~
Gateway Mobile Location Center	~~---~~	

I: Intra-PLMN E: Extra(Inter)-PLMN T: Address Type
GT: Global Title MGT: E.214 Mobile Global Title SPC: Signalling Point Code

~~NOTE: Inter-PLMN signalling from an MSC to SMLC is not defined in GSM 03.71; hence, the type of addressing is not significant.~~

7 General on MAP services

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

7.6 Definition of parameters

Following is an alphabetic list of parameters used in the common MAP-services in subclause 7.3:

Application context name	7.3.1	Refuse reason	7.3.1
Destination address	7.3.1	Release method	7.3.2
Destination reference	7.3.1	Responding address	7.3.1
Diagnostic information	7.3.4	Result	7.3.1
Originating address	7.3.1	Source	7.3.5
Originating reference	7.3.1	Specific information	7.3.1/7.3.2/7.3.4
Problem diagnostic	7.3.6	User reason	7.3.4
Provider reason	7.3.5		

Following is an alphabetic list of parameters contained in this clause:

External Signal Information	7.6.9.4
Forwarded-to number	7.6.2.22
Forwarded-to subaddress	7.6.2.23
Forwarding feature	7.6.4.16
Forwarding information	7.6.4.15
Forwarding Options	7.6.4.6
GGSN address	7.6.2.40
GGSN number	7.6.2.41
GMSC CAMEL Subscription Info	7.6.3.34
GPRS Node Indicator	7.6.8.14
GPRS Subscription Data	7.6.3.46
GPRS Subscription Data Withdraw	7.6.3.45
GPRS Support Indicator	7.6.8.15
Group Id	7.6.2.33
GSM bearer capability	7.6.3.6
Guidance information	7.6.4.22
Handover number	7.6.2.21
High Layer Compatibility	7.6.3.43
HLR Id	7.6.2.15
HLR number	7.6.2.13
HO-Number Not Required	7.6.6.7
IMEI	7.6.2.3
IMSI	7.6.2.1
Inter CUG options	7.6.3.27
Intra CUG restrictions	7.6.3.28
SS-Event	7.6.4.42
SS-Event-Data	7.6.4.43
SS-Info	7.6.4.24
SS-Status	7.6.4.2
Stored location area Id	7.6.2.5
Subscriber State	7.6.3.30
Subscriber Status	7.6.3.7
Supported CAMEL Phases	7.6.3.36
Suppress T-CSI	7.6.3.33
Suppression of Announcement	7.6.3.32
Target cell Id	7.6.2.8
Target location area Id	7.6.2.7
Target MSC number	7.6.2.12
Teleservice	7.6.4.39
TMSI	7.6.2.2
Trace reference	7.6.10.2
Trace type	7.6.10.3
User error	7.6.1.4
USSD Data Coding Scheme	7.6.4.36
USSD String	7.6.4.37
UU Data	7.6.5.12
UUS CF Interaction	7.6.5.13
VBS Data	7.6.3.40
VGCS Data	7.6.3.39
VLR CAMEL Subscription Info	7.6.3.35
VLR number	7.6.2.14
VPLMN address allowed	7.6.3.48
Zone Code	7.6.2.28

7.6.1 Common parameters

The following set of parameters are used in several MAP service-primitives:

7.6.1.4 User error

This parameter can take values as follows:

NOTE: The values are grouped in order to improve readability; the grouping has no other significance.

a) Generic error:

- system failure, i.e. a task cannot be performed because of a problem in another entity. The type of entity or network resource may be indicated by use of the network resource parameter;
- data missing, i.e. an optional parameter required by the context is missing;
- unexpected data value, i.e. the data type is formally correct but its value or presence is unexpected in the current context;
- resource limitation;
- initiating release, i.e. the receiving entity has started the release procedure;
- facility not supported, i.e. the requested facility is not supported by the PLMN;
- incompatible terminal, i.e. the requested facility is not supported by the terminal.

b) Identification or numbering problem:

- unknown subscriber, i.e. no such subscription exists;
- number changed, i.e. the subscription does not exist for that number any more;
- unknown MSC;

- unidentified subscriber, i.e. if the subscriber is not contained in the database and it has not or cannot be established whether or not a subscription exists;
- unallocated roaming number;
- unknown equipment;
- unknown location area.

c) Subscription problem:

- roaming not allowed, i.e. a location updating attempt is made in an area not covered by the subscription;
- illegal subscriber, i.e. illegality of the access has been established by use of authentication procedure;
- bearer service not provisioned;
- teleservice not provisioned;
- illegal equipment, i.e. the IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

d) Handover problem:

- no handover number available;
- subsequent handover failure, i.e. handover to a third MSC failed for some reason.

e) Operation and maintenance problem:

- tracing buffer full, i.e. tracing cannot be performed because the tracing capacity is exceeded.

f) Call set-up problem:

- no roaming number available, i.e. a roaming number cannot be allocated because all available numbers are in use;
- absent subscriber, i.e. the subscriber has activated the detach service or the system detects the absence condition. This error may be qualified to indicate whether the subscriber was IMSI detached, in a restricted area or did not respond to paging;
- busy subscriber. This error may be qualified to indicate that the subscriber was busy due to CCBS and that CCBS is possible;
- no subscriber reply;
- forwarding violation, i.e. the call has already been forwarded the maximum number of times that is allowed;
- CUG reject, i.e. the call does not pass a CUG check; additional information may also be given in order to indicate rejection due to e.g. incoming call barred or non-CUG membership.
- call barred. Optionally, additional information may be included for indicating either that the call meets a barring condition set by the subscriber or that the call is barred for operator reasons. In case of barring of Mobil Terminating Short Message, the additional information may indicate a barring condition due to « unauthorised Message Originator».
- optimal routeing not allowed, i.e. the entity which sends the error does not support optimal routeing, or the HLR will not accept an optimal routeing interrogation from the GMSC, or the call cannot be optimally routed because it would contravene optimal routeing constraints.
- forwarding failed, i.e. the GMSC interrogated the HLR for forwarding information but the HLR returned an error.

g) Supplementary services problem:

- call barred;
- illegal SS operation;

- SS error status;
- SS not available;
- SS subscription violation;
- SS incompatibility;
- negative password check;
- password registration failure;
- Number of Password Attempts;
- USSD Busy;
- Unknown Alphabet.
- short term denial;
- long term denial.

For definition of these errors see GSM 04.80.

h) Short message problem:

- SM delivery failure with detailed reason as follows:
  - memory capacity exceeded;
  - MS protocol error;
  - MS not equipped;
  - unknown service centre (SC);
  - SC congestion;
  - invalid SME address;
  - subscriber is not an SC subscriber;
  - and possibly detailed diagnostic information, coded as specified in TS GSM 03.40, under SMS-SUBMIT-REPORT and SMS-DELIVERY-REPORT. If the SM entity which returns the SM Delivery Failure error includes detailed diagnostic information, it shall be forwarded in the MAP_MO_FORWARD_SHORT_MESSAGE and in the MAP_MT_FORWARD_SHORT_MESSAGE response.
- message waiting list full, i.e. no further SC address can be added to the message waiting list;
- Subscriber busy for MT SMS, i.e. the mobile terminated short message transfer cannot be completed because:
  - another mobile terminated short message transfer is going on and the delivery node does not support message buffering; or
  - another mobile terminated short message transfer is going on and it is not possible to buffer the message for later delivery; or
  - the message was buffered but it is not possible to deliver the message before the expiry of the buffering time defined in GSM 03.40;
- Absent Subscriber SM, i.e. the mobile terminated short message transfer cannot be completed because the network cannot contact the subscriber. Diagnostic information regarding the reason for the subscriber's absence may be included with this error.

i) Location services problem:

- Unauthorized Requesting Network
- Unauthorized LCS Client with detailed reason as follows
- Unauthorzied Privacy Class
- Unauthoized Call Unrelated External Client
- Unauthorized Call Related External Client
- Privacy override not applicable
- Position method failure with detailed reason as follows:
    - Congestion
    - Insufficient resources
    - Insufficient Measurement Data
    - Inconsistent Measurement Data
    - Location procedure not completed
    - Location procedure not supported by target MS
    - QoS not attainable

~~- Position method failure with restart allowed~~

~~- LMU Unknown or Offline~~

~~- Traffic channel establishment failure~~

- Unknown or unreachable LCS Client

7.6.1.5 All Information Sent

This parameter indicates to the receiving entity when the sending entity has sent all necessary information.

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

7.6.3 Subscriber management parameters

7.6.3.58 LSA Information Withdraw

This parameter indicates that LSA information shall be deleted from the VLR or the SGSN.

7.6.3.59 LMU Indicator

This parameter indicates the presence of an LMU.

7.6.3.60 LCS Information

This parameter defines the LCS related information for an MS subscriber and contains the following components:

- ~~HPLMN~~ GMLC List (see subclause 7.6.3.61)
- LCS Privacy Exception List (see subclause 7.6.3.62)

- MO-LR List (see subclause 7.6.3.65A)

7.6.3.61 ~~HPLMN~~ GMLC List

This parameter contains the addresses of all GMLCs ~~in the MS subscriber's HPLMN~~ that are permitted to issue a non-call related MT-LR location request for this MS. Usage of this parameter is defined in GSM 03.71.

7.6.3.62 LCS Privacy Exception List

This parameter defines the classes of LCS Client that are allowed to locate any target MS. For each class, the following information is provided:

- SS-Code (see subclause 7.6.4.1);
- a list of LCS privacy exception parameters (see subclause 7.6.3.63).

7.6.3.63 LCS Privacy Exception Parameters

This parameter gives the status of each LCS privacy exception class and any additional parameters relevant to this class. The parameter contains the following information:

- provisioned SS-Status (see subclause 7.6.3.17);
- privacy verification by MS user (see subclause 7.6.3.65B)
- external client List (see subclause 7.6.3.64);
- internal client List (see subclause 7.6.3.65)

7.6.3.64 External Client List

This parameter is only applicable to the non-call related privacy class and gives the identities of the external clients that are allowed to locate a target MS for a non-call related MT-LR. Each identity is an international (e.g.E.164) address. For each identified external client, GMLC restrictions may be defined. It may also be indicated if the MS shall be notified of a non-restricted MT-LR from each identified LCS client.and, if so, whether notification only or notification with privacy verification shall apply. Usage of this parameter is defined in GSM 03.71.

7.6.3.65 Internal Client List

This parameter is only applicable to the PLMN operator privacy class and gives the identities of the internal PLMN operator clients that are allowed to locate a target MS for an NI-LR or MT-LR. Usage of this parameter is defined in GSM 03.71.

7.6.3.65A MO-LR List

This parameter defines the classes of MO-LR for which a subscription exists for a particular MS. For each class, the following information is provided:

- SS-Code (see subclause 7.6.4.1);

7.6.3.65B Privacy Verification By MS User

This parameter is applicable to the non-call related privacy class and indicates whether the MS user shall be notified for a non-call related MT-LR from any value added LCS client when the MT-LR is restricted and be enabled to accept or override the restriction.

7.6.3.65C GMLC List Withdraw

This parameter indicates whether the subscriber's LCS GMLC list shall be deleted from the VLR. The parameter does not apply to, and shall be ignored if received by, an SGSN.

7.6.4 Supplementary services parameters

7.6.4.1 SS-Code

This parameter may refer to one supplementary service or a set of supplementary services as defined in TS GSM 02.04. For MAP Release '98~~'97~~ this includes:

- Calling Line Identification Presentation service (CLIP);
- Calling Line Identification Restriction service (CLIR);
- Connected Line Identification Presentation service (COLP);
- Connected Line Identification Restriction service (COLR);
- Calling Name Presentation (CNAP)
- All Call Forwarding services;
- Call Waiting (CW);
- Call Hold (HOLD);
- Multi-Party service (MPTY);
- Closed User Group (CUG);
- All Charging services;
- All Call Restriction services;
- Explicit Call Transfer service (ECT);
- enhanced Multi-Level Precedence and Pre-emption service (eMLPP);
- Completion of Calls to Busy Subscriber, originating side (CCBS-A);
- Completion of Calls to Busy Subscriber, destination side (CCBS-B);~~.~~
- All LCS privacy exceptions (see subclause 7.6.4.44);~~.~~
- Mobile Originating Location Request (MO-LR) (see subclause 7.6.4.44A).

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

7.6.4.42 SS-event

This parameter indicates the Supplementary Service for which an invocation notification is sent towards the gsmSCF. It can indicate one of the following services:

- Explicit Call Transfer (ECT)
- Call Deflection (CD)
- Multi-Party call (MPTY)

7.6.4.43 SS-event data

This parameter contains additional information related to Supplementary Service invocation. Depending on the service invoked it can contain the following information:

ECT A list with all Called Party Numbers involved.

CDThe called Party number involved.

7.6.4.44 LCS Privacy Exceptions

Distinct SS codes are assigned to the following classes of LCS client in a target MS subscriber's privacy exception list.

- Universal Class
- Call related value added class
- Non-Call related value added class
- PLMN operator class

7.6.4.44A Mobile Originating Location Request (MO-LR)

Distinct SS codes are assigned to the following classes of MO-LR:

- Basic Self Location
- Autonomous Self Location
- Transfer to Third Party

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

7.6.11 Location Service Parameters

7.6.11.1 Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

~~7.6.11.2 Report Error Indication~~

~~If present, this parameter requests an LCS Information Report error message from a serving MSC when an LCS Information message from an SMLC cannot be transferred to a target LMU.~~

~~7.6.11.3 LCS Cause~~

~~This parameter contains the reason why LCS data could not be transferred to an LMU.~~

7.6.11.4 LCS Client ID

This parameter provides information related to the identity of an LCS client.

7.6.11.5 LCS Event

This parameter identifies an event associated with the triggering of a location estimate.

7.6.11.6 LCS MLC Data

This parameter provides the identities of any authorized~~home~~ GMLCs for a target MS. Only these GMLCs are allowed to send a location request for an external client when location requests are restricted to these GMLCs~~home PLMN~~.

7.6.11.7 LCS Priority

This parameter gives the priority of the location request.

7.6.11.8 LCS QoS

This parameter defines the Quality of Service (QoS) for any location request. It is composed of the following elements.

1) Response Time

   Indicates the category of response time – ~~"no delay",~~ "low delay" or "delay tolerant".

2) Horizontal Accuracy

   Indicates the required horizontal accuracy of the location estimate.

3) Vertical Coordinate

   Indicates if a vertical coordinate is required (in addition to horizontal coordinates)

4) Vertical Accuracy

   Indicates the required vertical accuracy of the location estimate (inclusion is optional).

~~7.6.11.9 LCS APDU~~

~~This parameter carries LCS related data between an SMLC and a BSC or LMU. For data transfer to or from an LMU, it is identical to the Facility Information Element defined in GSM 04.71. For data transfer to or from a BSC, it is identical to the LCS Information parameter defined in GSM 08.71.~~

~~7.6.11.10 LMU List~~

~~This parameter defines a list of LMUs sharing the same SMLC.~~

7.6.11.11 Location Estimate

This parameter gives an estimate of the location of an MS in universal coordinates and the accuracy of the estimate.

7.6.11.12 Location Type

This parameter indicates the type of location estimate required by the LCS client. Possible location estimate types include:

- current location
- current or last known location
- initial location for an emergency services call

7.6.11.13 NA-ESRD

This parameter only applies to location for an emergency services call in North America and gives the North American Emergency Services Routing Digits.

7.6.11.14 NA-ESRK

This parameter only applies to location for an emergency services call in North America and gives the North American Emergency Services Routing Key.

~~7.6.11.15 Positioning Data~~

~~This parameter provides data on the positioning process for possible use in billing in location method evaluation. The data includes the following for each position method attempt:~~

- ~~positioning method~~
- ~~positioning result (success, failure)~~
- ~~positioning duration~~
- ~~resources used~~

7.6.11.16 Privacy Override

This parameter indicates if MS privacy is overridden by the LCS client when the GMLC and VMSC for an MR-LR are in the same country.

~~7.6.11.17 Radio Channel Type~~

~~This parameter identifies the type of radio channel currently assigned to or to be assigned to the target MS.~~

~~7.6.11.18 Registration Type~~

~~This parameter distinguishes LMU registration in an SMLC from LMU deregistration.~~

~~7.6.11.19 Release Forbidden~~

~~This parameter indicates if an LMU is forbidden to release a signaling channel to the serving MSC.~~

8 Mobility services

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

8.8 Subscriber management services

8.8.1 MAP-INSERT-SUBSCRIBER-DATA service

8.8.1.2 Service primitives

Table 8.8/1: MAP-INSERT-SUBSCRIBER-DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
MSISDN	C	C(=)		
Category	C	C(=)		
Subscriber Status	C	C(=)		
Bearer service List	C	C(=)	C	C(=)
Teleservice List	C	C(=)	C	C(=)
Forwarding information List	C	C(=)		
Call barring information List	C	C(=)		
CUG information List	C	C(=)		
SS-Data List	C	C(=)		
eMLPP Subscription Data	C	C(=)		
Operator Determined Barring General data	C	C(=)	C	C(=)
Operator Determined Barring HPLMN data	C	C(=)		
Roaming Restriction Due To Unsupported Feature	C	C(=)		
Regional Subscription Data	C	C(=)		
VLR CAMEL Subscription Info	C	C(=)		
Voice Broadcast Data	C	C(=)		
Voice Group Call Data	C	C(=)		
Network access mode	C	C(=)		
GPRS Subscription Data	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
North American Equal Access preferred Carrier Id List	U	C(=)		
LSA Information	C	C(=)		
SS-Code List			C	C(=)
LMU Identifier	C	C(=)		
LCS Information	C	C(=)		
Regional Subscription Response			C	C(=)
Supported CAMEL Phases			C	C (=)
User error			U	C(=)
Provider error				O

8.8.1.3 Parameter use

North American Equal Access preferred Carrier Id List

A list of the preferred carrier identity codes that are subscribed to.

When the VLR receives this parameter from the HLR, it shall replace the previously stored preferred carrier identity codes with the received ones. It is not possible to delete all the preferred carrier identity codes from the VLR using this service. To delete all the preferred carrier identity codes from the VLR, the HLR shall use the MAP_CANCEL_LOCATION service.

LSA Information

If included in the ISD request, this parameter contains a list of localised service area identities a user might have subscribed to together with the priority of each localised service area; see subclause 7.6. The access right outside these localised service areas is also indicated. In all cases mentioned below, the LSA information shall only include LSA Data applicable to the VPLMN where the Subscriber is located. The VLR number, received in the MAP-UPDATE_LOCATION primitive, or the SGSN number, received in the MAP_UPDATE_GPRS_LOCATION primitive, can be used, alongside data stored in the HLR, to determine the LSA Data applicable to the VPLMN.

At restoration, location updating or GPRS location updating the HLR shall include the complete set of applicable LSA Information.

When there is a change in LSA data the HLR shall include at least the new and/or modified LSA data.

When there is a change in the access right outside the localised service areas the HLR shall include the LSA only access indicator.

When the SGSN or the VLR receives LSA information within a dialogue it shall check if the received data has to be considered as the entire LSA information. If so, it shall replace the stored LSA information with the received data set, otherwise it shall replace the data only for the modified LSA data (if any) and/or access right, and add the new LSA data (if any) to the stored LSA Information.

If the entire LSA information is received, it shall always include the LSA only access indicator value together with the LSA data applicable for the PLMN (if any).

If LSA Information is omitted in the Insert Subscriber Data operation the SGSN or the VLR shall keep the previously stored LSA Information.

If the SGSN or the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. This parameter is used by the VLR and the SGSN.

LMU Identifier

This parameter indicates the presence of an LMU. This parameter is used only by the VLR and shall be ignored if received by an SGSN.

LCS Information

This parameter provides the following LCS related information for an MS subscriber:

- list of GMLCs in the HPLMN
- privacy exception list
- MO-LR list

At restoration and location updating, the HLR shall include the complete LCS data of the subscriber.

When there is a change in LCS subscriber data the HLR shall include at least the new and/or modified LCS data. LCS data that is not modified need not be included.

The VLR shall keep any previously stored LCS Information that is not included in an Insert Subscriber Data operation.

If the VLR detects that there is overlapping in the LCS information received within a dialogue, it shall send the error Unexpected Data Value.

This parameter is used only by the VLR and shall be ignored if received by an SGSN.

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

8.8.2 MAP-DELETE-SUBSCRIBER-DATA service

8.8.2.2 Service primitives

Table 8.8/2: MAP-DELETE-SUBSCRIBER-DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Basic service List	C	C(=)		
SS-Code List	C	C(=)		
Roaming Restriction Due To Unsupported Feature	C	C(=)		
Camel Subscription Info Withdraw	C	C(=)		
Regional Subscription Data	C	C(=)		
VBS Group Indication	C	C(=)		
VGCS Group Indication	C	C(=)		
GPRS Subscription Data Withdraw	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
LSA Information Withdraw	C	C(=)		
Regional Subscription Response			C	C(=)
GMLC List Withdraw	C	C(=)		
User error			C	C(=)
Provider error				O

8.8.2.3 Parameter use

All parameters are described in subclause 7.6. The following clarifications are applicable:

Basic service List

A list of Extensible Basic service parameters (Extensible Basic service is defined in subclause 7.6). It is used when one, several or all basic services are to be withdrawn from the subscriber. If the VLR or the SGSN receives a value for an Extensible Basic Service which it does not support, it shall ignore that value. This parameter is used by the VLR and by the SGSN.

SS-Code List

A list of SS-Code parameters (SS-Code is defined in subclause 7.6). It is used when several or all supplementary services are to be withdrawn from the subscriber.

There are three possible options:

- deletion of basic service(s);

  The parameter Basic service List is only included.

- deletion of supplementary service(s);

  The parameter SS-Code List is only included.

- deletion of basic and supplementary services;

  Both Basic service List and SS-Code List are included.

This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Roaming Restriction Due To Unsupported Feature

This parameter is used if Roaming Restriction Due To Unsupported Feature is deleted from the subscriber data. This may occur if unsupported features or services are removed from the subscriber data in the HLR.

If this parameter is sent the VLR shall check if the current Location Area is possibly allowed now. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

CAMEL Subscription Info Withdraw

This parameter is used to indicate that CAMEL Subscription Info shall be deleted from the VLR. All CAMEL Subscription Info for the subscriber shall be deleted. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Regional Subscription Identifier

Contains one single Zone Code (as defined subclause 7.6) and is used if all Zone Codes shall be deleted from the subscriber data. When all the Zone Codes are deleted, the VLR or the SGSN shall check for its location areas whether they are allowed or not. If the whole MSC area is restricted, VLR will report it to HLR by returning the Regional Subscription Response "MSC Area Restricted". If the whole SGSN area is restricted, SGSN will report it to HLR by returning the Regional Subscription Response "SGSN Area Restricted".

The binary coding of the Zone Code value received in a Delete Subscriber Data request shall not be checked by the VLR or by the SGSN.

Note that support of this parameter is a network operator option and it shall not be sent to networks which do not support Regional Subscription.

If Regional Subscription is not supported by the VLR or by the SGSN, the request for deletion of Zone Codes is refused by sending the Regional Subscription Response "Regional Subscription Not Supported" to the HLR.

If no Zone Codes are stored in the respective subscriber data record, the request for deleting all Zone Code information shall be ignored and no Regional Subscription Response shall be returned. This parameter is used by the VLR and by the SGSN.

VBS Group Indication

Contains an indication (flag) which is used if all Group Id's shall be deleted from the subscriber data for the Voice Broadcast teleservice.

If VBS is not supported in the VLR or no Group Ids are stored for VBS in the respective subscriber record, the request for deletion of all Group Ids shall be ignored. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

VGCS Group Indication

Contains an indication (flag) which is used if all Group Id's shall be deleted from the subscriber data for the Voice Group Call teleservice. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

If VGCS is not supported in the VLR or no Group Ids are stored for VGCS in the respective subscriber record, the request for deletion of all Group Ids shall be ignored.

GPRS Subscription Data Withdraw

This parameter is used to indicate whether all GPRS Subscription Data for the subscriber shall be deleted or if only a subset of the stored GPRS Subscription Data for the subscriber shall be deleted. In the latter case only those PDP context whose identifiers are included in the subsequent identifier list will be deleted. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

Roaming Restricted In SGSN Due To Unsupported Feature

This parameter is used if Roaming Restricted In SGSN Due To Unsupported Feature is deleted from the GPRS subscriber data. This may occur if unsupported features or services are removed from the GPRS subscriber data in the HLR.

If this parameter is sent the SGSN shall check if the current Location Area is possibly allowed now. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

LSA Information Withdraw

This parameter is used to indicate whether all LSA Information for the subscriber shall be deleted or if only a subset of the stored LSA Information for the subscriber shall be deleted. In the latter case only the LSA data whose LSA identities are included in the subsequent LSA data list will be deleted. This parameter is used by the VLR and the SGSN.

Regional Subscription Response

If included in the Delete Subscriber Data response this parameter indicates one of:

- MSC Area Restricted
- SGSN Area Restricted;
- Regional Subscription Not Supported.

This parameter is used by the VLR and by the SGSN.

GMLC List Withdraw

This parameter indicates that the subscriber's LCS GMLC List shall be deleted from the VLR.

This parameter is used only by the VLR and shall be ignored if received by an SGSN.

User error

Only one of the following values is applicable:

- Unidentified subscriber;
- Data missing;
- Unexpected data value.

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

13A Location Service Management Services

13A.1 MAP-SEND-ROUTING-INFO-FOR-LCS Service

13A.1.1 Definition

This service is used between the GMLC and the HLR to retrieve the routing information needed for routing a location service request to the servicing VMSC. The MAP-SEND-ROUTING-INFO-FOR-LCS is a confirmed service using the primitives from table A.1/1.

13A.1.2 Service Primitives

The service primitives are shown in table 13A.1/1.

Table 13A.1/1: MAP-SEND-ROUTING-INFO-FOR-LCS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MLC Number	M	M(=)		
MSISDN	C	C(=)	C	C(=)
IMSI	C	C(=)	C	C(=)
LMSI			C	C(=)
MSC Number			C	C(=)
User error			C	C(=)
Provider error				O

13A.1.3 Parameter Use

Invoke id:

See definition in subclause 7.6.1.

MLC Number:

See definition in subclause 7.6.2.

MSISDN:

See definition in subclause 7.6.2. The request shall carry either the IMSI or MSISDN. The response shall carry whichever of these was not included in the request (see GSM 03.71 for details).

IMSI:

See definition in subclause 7.6.2.

LMSI:

See definition in subclause 7.6.2. It is an operator option to provide this parameter from the VLR; it is mandatory for the HLR to include the LMSI in a successful response, if the VLR has used the LMSI.

MSC Number:

See definition in subclause 7.6.2. This parameter is provided in a successful response.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Absent Subscriber;
- Facility Not Supported;
- System failure;
- Unexpected Data Value;
- Data missing;
- Unauthorized requesting network

Provider error:

For definition of provider errors see subclause 7.6.1.

13A.2 MAP-PROVIDE-SUBSCRIBER-LOCATION Service

13A.2.1 Definition

This service is used by a GMLC to request the location of a target MS from the visited MSC at any time. This is a confirmed service using the primitives from table 13A.2/1.

13A.2.2 Service Primitives

Table 13A.2/1: Provide_Subscriber_Location

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Location Type	M	M(=)		
MLC Number	M	M(=)		
LCS Client ID	M	M(=)		
Privacy Override	U	C(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
LMSI	C	C(=)		
LCS Priority	C	C(=)		
LCS QoS	C	C(=)		
~~NA-ESRK~~	~~C~~	~~C(=)~~		
IMEI	U~~C~~	C(=)		
Location Estimate			M	M(=)

Age of Location Estimate			C	C(=)
User error			C	C(=)
Provider error				O

13A.2.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Location Type

This parameter identifies the type of location information requested

MLC Number

This is the E.164 number of the requesting GMLC.

LCS Client ID

This parameter provides information related to the identity of an LCS client.

Privacy Override

This parameter indicates if MS privacy is overridden by the LCS client when the GMLC and VMSC for an MR-LR are in the same country.

IMSI

The IMSI is provided to identify the target MS. At least one of the IMSI or~~,~~ MSISDN ~~or NA-ESRK~~ is mandatory.

MSISDN

The MSISDN is provided to identify the target MS. At least one of the IMSI or~~,~~ MSISDN ~~or NA-ESRK~~ is mandatory.

LMSI

The LMSI shall be provided if previously supplied by the HLR

LCS Priority

This parameter indicates the priority of the location request.

LCS QoS

This parameter indicates the required quality of service in terms of response time and accuracy.

~~NA-ESRK~~

~~This parameter only applies to North America and provides a North American Emergency Service Routing Key.~~

IMEI

Inclusion of the IMEI is optional~~The IMEI shall be provided if available when the target MS is identified by an NA-ESRK~~.

Location Estimate

This parameter provides the location estimate.

Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

User error

This parameter is sent by the responder when the location request has failed or cannot proceed and if present, takes one of the following values defined in section 7.6.1.

- System Failure;
- Data Missing;
- Unexpected Data Value;
- ~~Unknown Subscriber~~
- Facility Not Supported;
- Unidentified Subscriber;
- Illegal Subscriber;
- Illegal Equipment;
- Absent Subscriber (diagnostic information may also be provided);
- Unauthorized requesting network;
- Unauthorized LCS Client with detailed reason;
- Position method failure with detailed reason.

Provider error

These are defined in subclause 7.6.1.

13A.3 MAP-SUBSCRIBER-LOCATION-REPORT Service

13A.3.1 Definition

This service is used by a VMSC to provide the location of a target MS to a GMLC when a request for location is either implicitly administered or made at some earlier time. This is a confirmed service using the primitives from table 13A.3/1.

13A.3.2 Service Primitives

Table 13A.3/1: Subscriber_Location_Report

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
LCS Event	M	M(=)		
LCS Client ID	M	M(=)		
MSC Number	M	M(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
NA-ESRD	C	C(=)		

NA-ESRK	C	C(=)		
IMEI	~~C~~U	C(=)		
Location Estimate	C	C(=)		
Age of Location Estimate	C	C(=)		
LMSI	U	C(=)		
User error			C	C(=)
Provider error				O

13A.3.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

LCS Event

This parameter indicates the event that triggered the Subscriber Location Report.

LCS Client ID

This parameter provides information related to the identity of the recipient LCS client.

MSC Number:

See definition in subclause 7.6.2. This parameter provides the address of the visited MSC for target MS.

IMSI

The IMSI shall be provided if available to the VMSC

MSISDN

The MSISDN shall be provided if available to the VMSC

NA-ESRD

If the target MS has originated an emergency service call in North America, the NA-ESRD shall be provided by the VMSC if available.

NA-ESRK

If the target MS has originated an emergency service call in North America, the NA-ESRK shall~~may~~ be provided by the VMSC if assigned~~available~~.

IMEI

Inclusion of the IMEI is optional~~If the target MS has originated an emergency service call in North America, the IMEI may be provided by the VMSCV~~.

Location Estimate

This parameter provides the location estimate. The absence of this parameter implies that a location estimate was not available or could not be successfully obtained.

Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

LMSI

The LMSI may be provided if assigned by the VLR.

User error

This parameter is sent by the responder when the received message contains an error, cannot be forwarded or stored for an LCS client or cannot be accepted for some other reason and if present, takes one of the following values defined in section 7.6.1.

- System Failure;
- Data Missing;
- Unexpected Data Value;
- Resource Limitation;
- Unknown Subscriber;
- Unauthorized requesting network;
- Unknown or unreachable LCS Client.

Provider error

These are defined in subclause 7.6.1.

~~13A.4 MAP-PERFORM -LOCATION Service~~

~~13A.4.1 Definition~~

~~This service is used by a serving MSC to request location information from an SMLC for a target MS. This is a confirmed service using the primitives from table 13A.4/1.~~

~~13A.4.2 Service Primitives~~

~~Table 13A.4/1: Perform_Location~~

~~Parameter name~~	~~Request~~	~~Indication~~	~~Response~~	~~Confirm~~
~~Invoke id~~	~~M~~	~~M(=)~~	~~M(=)~~	~~M(=)~~
~~Global cell Id~~	~~M~~	~~M(=)~~		
~~Radio Channel Type~~	~~C~~	~~C(=)~~		
~~LCS Priority~~	~~C~~	~~C(=)~~		
~~LCS QoS~~	~~C~~	~~C(=)~~		
~~LCS-APDU~~	~~C~~	~~C(=)~~		
~~Location Estimate~~			~~C~~	~~C(=)~~
~~Positioning Data~~			~~C~~	~~C(=)~~
~~User error~~			~~C~~	~~C(=)~~
~~Provider error~~				~~O~~

13A.4.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Global cell Id

This is the current cell location of the MS being located.

Radio Channel Type

This parameter gives the type of radio channel currently assigned to the MS.

LCS Priority

This parameter indicates the priority of the location request.

LCS QoS

This is the Quality of Service required for the location request in terms of response time and accuracy.

LCS APDU

This parameter contains LCS related information (e.g. Timing Advance) received from the BSC.

Location Estimate

This parameter gives an estimate of the MS location and the accuracy of the estimate.

Positioning Data

This parameter provides data on the positioning process including the result and resources used.

User error

This parameter is sent by the SMLC when the location request has failed or cannot proceed and if present, takes one of the following values defined in section 7.6.1.

- System Failure
- Data Missing;
- Unexpected Data Value
- Position method failure with detailed reason (restart not allowed)
- Position method failure with restart allowed

Provider error

These are defined in subclause 7.6.1.

13A.5 MAP-LCS-Registration Service

13A.5.1 Definition

This service is used by a VLR to register or deregister an LMU in an SMLC. This is a confirmed service using the primitives from table 13A.5/1.

13A.5.2 Service Primitives

Table 13A.5/1: LCS Registration

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	U	C(=)		
Registration Type	M	M(=)		
MSC Number	C	C(=)		
User error			C	C(=)
Provider error				O

13A.5.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of the LMU.

LMSI

The LMSI of the LMU shall be provided by the MSC if assigned in the VLR and if the registration type indicates registration.

Registration Type

The registration type distinguishes registration and deregistration.

MSC Number

This is the E.164 number of the MSC serving the LMU. Inclusion of the MSC number is mandatory if the registration type indicates registration.

User error

This parameter is sent by the SMLC when the registration procedure has failed and, if present, takes one of the following values defined in section 7.6.1.

- LMU unknown or offline;
- system failure;
- unexpected Data Value;
- Data Missing

Provider error

These are defined in subclause 7.6.1.

13A.6 MAP-LCS-INFORMATION-REQUEST Service

13A.6.1 Definition

This service is used by an SMLC to transfer LCS related data to an MSC for onward transfer to an LMU or serving BSC. This is an unconfirmed service using the primitives from table 13A.6/1.

13A.6.2 Service Primitives

Table 13A.6/1: LCS Information Request

Parameter name	Request	Indication
Invoke id	M	M(=)
IMSI	C	C(=)
LMSI	C	C(=)
MLC Number	U	C(=)
Release Forbidden	U	C(=)
Report Error Indication	U	C(=)
LCS-APDU	C	C(=)

13A.6.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of an LMU. Inclusion of the IMSI is mandatory when the destination for the LCS data is an LMU, For other destinations, an IMSI shall not be included.

LMSI

When the destination is an LMU, the LMSI of the LMU shall be provided by the SMLC if previously supplied by the MSC.

MLC Number

This parameter contains the E.164 address for the SMLC. The inclusion of this parameter is optional.

Release Forbidden

This parameter is applicable only when the destination is an LMU. It indicates if an LMU is forbidden to release a signaling channel to the MSC.

Report Error Indication

If present, this parameter requests an LCS Information Report error message from the serving MSC if the LCS Information Request message cannot be transferred to the required destination.

LCS-APDU

This parameter contains the LCS data to be sent on by the MSC to the required destination. For transfer to an LMU, the content of the data is defined in GSM 04.71 For transfer to a BSC, it is defined in GSM 08.71.

13A.7 MAP-LCS-INFORMATION-REPORT Service

13A.7.1 Definition

This service is used by an MSC to transfer LCS related data to an SMLC that was received from or intended for an LMU or BSC. This is an unconfirmed service using the primitives from table 13A.7/1. The message shall be transferred

to the SMLC using SCCP class 1.

13A.7.2 Service Primitives

Table 13A.7/1: LCS Information Report

Parameter name	Request	Indication
Invoke id	M	M(=)
IMSI	C	C(=)
LMSI	U	C(=)
LCS Cause	C	C(=)
LCS-APDU	C	C(=)

13A.7.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of the LMU. Inclusion of the IMSI is mandatory for data transfer related to an LMU. An IMSI shall not be included for other types of data transfer.

LMSI

For data transfer related to an LMU, the MSC may include the LMSI if available in the VLR.

LCS Cause

This parameter contains the reason why LCS data received by the MSC in an LCS Information Request could not be transferred to its intended destination. This parameter shall be included if and only if the MSC is returning LCS data to the SMLC that could not be transferred to the intended destination.

LCS-APDU

This parameter contains the LCS data received from or intended for an LMU or BSC. The content of this parameter is defined in GSM 04.71 for an LMU and in GSM 08.71 for a BSC.

13A.8 MAP-LCS-RESET Service

13A.8.1 Definition

This service is used by an SMLC after either a restart or discovery of inconsistent data to request that a VLR instigate a reset for either all LMUs that are served by the VLR or just certain specific LMUs. This is an unconfirmed service using the primitives from table 13A.8/1.

13A.8.2 Service Primitives

Table 13A.8/1: LCS Reset

Parameter name	Request	Indication
Invoke id	M	M(=)

MLC number	M	M(=)
LMU List	U	C(=)

13A.8.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

MLC

This is the E.164 address for the SMLC.

LMU List

This is a list of LMUs sharing the same SMLC.

13A.9 MAP-LCS-ASSIGN-TRAFFIC-CHANNEL Service

13A.9.1 Definition

This service is used by an SMLC to request assignment of a traffic channel to the target MS by the visited MSC. This is a confirmed service using the primitives from table 13A.9/1.

13A.9.2 Service primitives

Table 13A.9/1: LCS Assign Traffic Channel

Parameter name	**Request**	**Indication**	**Response**	**Confirm**
Invoke id	M	M(=)	M(=)	M(=)
Radio Channel Type	M	M(=)		
User error			C	C(=)
Provider error				O

13A.9.3 Parameter definition and use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Radio Channel Type

This parameter defines the type of traffic channel to be assigned.

User error

This parameter is sent by the MSC when the required type of traffic channel cannot be assigned and, if present, takes one of the following values defined in section 7.6.1.

- Traffic channel establishment failure;
- system failure;
- unexpected Data Value;

~~— data missing;~~

~~Provider error~~

~~These are defined in subclause 7.6.1.~~

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

16 Mapping on to TC services

16.2 Service specific procedures

Specific services are mapped to TC component handling services.

16.2.1 Directly mapped parameters

The Invoke Id parameter of the MAP request and indication primitive is directly mapped on to the Invoke Id parameter of the component handling primitives.

16.2.2 Use of other parameters of component handling primitives

16.2.2.4 Operation

When mapping a request primitive on to a Remote Operations PDU (invoke), the MAP PM shall set the operation code according to the mapping described in table 16.2/1.

When mapping a response primitive on to a Remote Operations service, the MAP PM shall set the operation code of the TC-RESULT-L/NL primitive (if required) to the same value as the one received at invocation time.

Table 16.2/1: Mapping of MAP specific services on to MAP operations

MAP-SERVICE	operation
MAP-ACTIVATE-SS	activateSS
MAP-ACTIVATE-TRACE-MODE	activateTraceMode
MAP-ALERT-SERVICE-CENTRE	alertServiceCentre
MAP-ANY-TIME-INTERROGATION	anyTimeInterrogaton
MAP-CANCEL-LOCATION	cancelLocation
MAP-CHECK-IMEI	checkIMEI
MAP-DEACTIVATE-SS	deactivateSS
MAP-DEACTIVATE-TRACE-MODE	deactivateTraceMode
MAP-DELETE-SUBSCRIBER-DATA	deleteSubscriberData
MAP-ERASE-CC-ENTRY	eraseCC-Entry
MAP-ERASE-SS	eraseSS
MAP-FAILURE-REPORT	failureReport
MAP-FORWARD-ACCESS-SIGNALLING	forwardAccessSignalling
MAP-FORWARD-CHECK-SS-INDICATION	forwardCheckSsIndication
MAP-FORWARD-GROUP-CALL-SIGNALLING	forwardGroupCallSignalling
MAP-MT-FORWARD-SHORT-MESSAGE	mt-forwardSM
MAP-MO-FORWARD-SHORT-MESSAGE	mo-forwardSM
MAP-GET-PASSWORD	getPassword
MAP-INFORM-SERVICE-CENTRE	informServiceCentre
MAP-INSERT-SUBSCRIBER-DATA	insertSubscriberData
MAP-INTERROGATE-SS	interrogateSs
~~MAP-LCS-ASSIGN-TRAFFIC-CHANNEL~~	~~lcsAssignTrafficChannel~~
~~MAP_LCS_INFORMATION_REPORT~~	~~lcsInformationReport~~
~~MAP_LCS_INFORMATION_REQUEST~~	~~lcsInformationRequest~~
~~MAP_LCS_REGISTRATION~~	~~lcsRegistration~~
~~MAP_LCS_RESET~~	~~lcsReset~~
MAP-NOTE-MS-PRESENT-FOR-GPRS	noteMsPresentForGprs
~~MAP-PERFORM-LOCATION~~	~~performLocation~~
MAP-PREPARE-GROUP-CALL	prepareGroupCall
MAP-PREPARE-HANDOVER	prepareHandover
MAP-PREPARE-SUBSEQUENT-HANDOVER	prepareSubsequentHandover
MAP-PROCESS-ACCESS-SIGNALLING	processAccessSignalling
MAP-PROCESS-GROUP-CALL-SIGNALLING	processGroupCallSignalling
MAP-PROCESS-UNSTRUCTURED-SS-REQUEST	processUnstructuredSS-Request
MAP-PROVIDE-ROAMING-NUMBER	provideRoamingNumber
MAP-PROVIDE-SIWFS-NUMBER	provideSIWFSNumber
MAP-PROVIDE-SUBSCRIBER-LOCATION	provideSubscriberLocation
MAP-PROVIDE-SUBSCRIBER-INFO	provideSubscriberInfo
MAP-PURGE-MS	purgeMS
MAP-READY-FOR-SM	readyForSM
MAP-REGISTER-CC-ENTRY	registerCC-Entry
MAP-REGISTER-PASSWORD	registerPassword
MAP-REGISTER-SS	registerSS
MAP-REMOTE-USER-FREE	remoteUserFree
MAP-REPORT-SM-DELIVERY-STATUS	reportSmDeliveryStatus
MAP-RESET	reset
MAP-RESTORE-DATA	restoreData
MAP-SEND_GROUP-CALL_END_SIGNAL	sendGroupCallEndSignal
MAP-SEND-END-SIGNAL	sendEndSignal
MAP-SEND-AUTHENTICATION-INFO	sendAuthenticationInfo
MAP-SEND-IMSI	sendIMSI
MAP-SEND-IDENTIFICATION	sendIdentification
MAP-SEND-ROUTING-INFO-FOR-SM	sendRoutingInfoForSM
MAP-SEND-ROUTING-INFO-FOR-GPRS	sendRoutingInfoForGprs
MAP-SEND-ROUTING-INFO-FOR-LCS	sendRoutingInfoForLCS
MAP-SEND-ROUTING-INFORMATION	sendRoutingInfo
MAP-SET-REPORTING-STATE	setReportingState
MAP-SIWFS-SIGNALLING-MODIFY	SIWFSSignallingModify
MAP-STATUS-REPORT	statusReport
MAP-SUBSCRIBER-LOCATION-REPORT	subscriberLocationReport
MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION	ss-Invocation-Notification

MAP-UNSTRUCTURED-SS-NOTIFY	unstructuredSS-Notify
MAP-UNSTRUCTURED-SS-REQUEST	unstructuredSS-Request
MAP-UPDATE-GPRS-LOCATION	updateGprsLocation
MAP-UPDATE-LOCATION	updateLocation

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

17 Abstract syntax of the MAP protocol

17.1 General

17.1.6 Application Contexts

The following informative table lists the latest versions of the Application Contexts used in this specification, with the operations used by them and, where applicable, whether or not the operation description is exactly the same as for previous versions. Information in sections 17.6 & 17.7 relates only to the ACs in this table.

AC Name	AC Version	Operations Used	Comments *
locationCancellationContext	v3	cancelLocation	
equipmentMngtContext	v2	checkIMEI	
imsiRetrievalContext	v2	sendIMSI	
infoRetrievalContext	v2	sendAuthenticationInfo	
interVlrInfoRetrievalContext	v2	sendIdentification	
handoverControlContext	v2	prepareHandover forwardAccessSignalling sendEndSignal processAccessSignalling prepareSubsequentHandover	
mwdMngtContext	v3	readyForSM	
msPurgingContext	v3	purgeMS	
shortMsgAlertContext	v2	alertServiceCentre	
resetContext	v2	reset	
networkUnstructuredSsContext	v2	processUnstructuredSS-Request unstructuredSS-Request unstructuredSS-Notify	
tracingContext	v3	activateTraceMode deactivateTraceMode	
networkFunctionalSsContext	v2	registerSS eraseSS activateSS deactivateSS registerPassword interrogateSS getPassword	
shortMsgMO-RelayContext	v3	mo-forwardSM	
shortMsgMT-RelayContext	v3	mt-forwardSM	
shortMsgGatewayContext	v3	sendRoutingInfoForSM reportSM-DeliveryStatus InformServiceCentre	the syntax of this operation has been extended in comparison with release 96 version
networkLocUpContext	v3	updateLocation forwardCheckSs-Indication restoreData insertSubscriberData activateTraceMode	the syntax is the same in v1 & v2
gprsLocationUpdateContext	v3	updateGprsLocation insertSubscriberData activateTraceMode	
subscriberDataMngtContext	v3	insertSubscriberData	

		deleteSubscriberData	
roamingNumberEnquiryContext	v3	provideRoamingNumber	
locationInfoRetrievalContext	v3	sendRoutingInfo	
gprsNotifyContext	v3	noteMsPresentForGprs	
gprsLocationInfoRetrievalContext	v3	sendRoutingInfoForGprs	
failureReportContext	v3	failureReport	
callControlTransferContext	v4	resumeCallHandling	
subscriberInfoEnquiryContext	v3	provideSubscriberInfo	
anyTimeEnquiryContext	v3	anyTimeInterrogation	
ss-InvocationNotificationContext	v3	ss-InvocationNotification	
sIWFSAllocationContext	v3	provideSIWFSNumber sIWFSSignallingModify	
groupCallControlContext	v3	prepareGroupCall processGroupCallSignalling forwardGroupCallSignalling sendGroupCallEndSignal	
reportingContext	v3	setReportingState statusReport remoteUserFree	
callCompletionContext	v3	registerCC-Entry eraseCC-Entry	
~~locationSvcLMUControlContext~~	~~v3~~	~~lcsRegistrationlcsReset~~	
~~locationSvcDataTransferContext~~	~~v3~~	~~lcsInformationRequest~~ ~~lcsInformationReport~~	
locationSvcEnquiryContext	v3	provideSubscriberLocation subscriberLocationReport	
locationSvcGatewayContext	v3	sendRoutingInfoForLCS	
~~locationSvcPositioningContext~~	~~v3~~	~~lcsAssignTrafficChannel~~ ~~lcsInformationRequest~~ ~~lcsInformationReport~~ ~~performLocation~~	

NOTE (*): The syntax of the operations is not the same as in previous versions unless explicitly stated

17.2 Operation packages

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

17.2.2 Packages specifications

17.2.2.43 Call Completion

This operation package includes the operations required for procedures between VLR and HLR for subscriber control of call completion services.

```
CallCompletionPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is HLR if Consumer is VLR
    CONSUMER INVOKES {
         registerCC-Entry,
         eraseCC-Entry}
```

This package is v3 only.

17.2.2.44 Location service gateway services

This operation package includes the operations required for location service gateway procedures between GMLC and HLR.

```
LocationSvcGatewayPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is HLR if Consumer is GMLC
    CONSUMER INVOKES {
         sendRoutingInfoForLCS}
```

This package is v3 only.

17.2.2.45 Location service enquiry

This operation package includes the operations required for the location service enquiry procedures between GMLC and MSC.

```
LocationSvcEnquiryPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is MSC if Consumer is GMLC
    CONSUMER INVOKES {
         provideSubscriberLocation}
    SUPPLIER INVOKES {
         subscriberLocationReport}
```

This package is v3 only.

~~17.2.2.46 Location service Positioning~~

~~This operation package includes the operations required for the location service positioning procedures between MSC and SMLC.~~

```
LocationSvcPositioningPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is SMLC if Consumer is MSC
    CONSUMER INVOKES {
         performLocation,
         lcsInformationReport}
    SUPPLIER INVOKES {
         lcsAssignTrafficChannel,              lcsInformationRequest}
```

~~This package is v3 only.~~

~~17.2.2.47 Location service LMU Control~~

~~This operation package includes the operations required for the location service LMU control procedures between MSC and SMLC.~~

```
LocationSvcLMUControlPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is SMLC if Consumer is VLR
    CONSUMER INVOKES {
         lcsRegistration }
    SUPPLIER INVOKES {
         LcsReset}
```

~~This package is v3 only.~~

~~17.2.2.48 Location service Data Transfer~~

~~This operation package includes the operations required for the location service data transfer procedures between MSC and SMLC when performed in stand alone mode.~~

```
LocationSvcDataTransferPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is MSC if Consumer is SMLC
    CONSUMER INVOKES {
         lcsInformationRequest}
    SUPPLIER INVOKES {
         lcsInformationReport}
```

~~This package is v3 only.~~

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

17.3 Application contexts

17.3.2 Application context definitions

17.3.2.38 Call Completion

This application context is used between VLR and the HLR for subscriber control of call completion services.

```
callCompletionContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          CallCompletionPackage-v3}
::= {map-ac callCompletion(8) version3(3)}
```

This application-context is v3 only.

17.3.2.39 Location Service Gateway

This application context is used for location service gateway procedures.

```
locationSvcGatewayContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is GMLC
     INITIATOR CONSUMER OF {
          locationSvcGatewayPackage-v3}
::= {map-ac locationSvcGateway(37) version3(3)}
```

17.3.2.40 Location Service Enquiry

This application context is used for location service enquiry procedures.

```
locationSvcEnquiryContext-v3 APPLICATION-CONTEXT
     -- Responder is MSC if Initiator is GMLC
     INITIATOR CONSUMER OF {
          locationSvcEnquiryPackage-v3}
::= {map-ac locationScvEnquiry(38) version3 (3)}
```

~~17.3.2.41 Location Service Positioning~~

~~This application context is used for location service positioning procedures.~~

```
locationSvcPositioningContext-v3 APPLICATION-CONTEXT
     -- Responder is SMLC if Initiator is MSC
     INITIATOR CONSUMER OF {
          locationSvcPositioningPackage-v3}
::= {map-ac locationSvcPositioning(39) version3(3)}
```

~~17.3.2.42 Location Service LMU Control~~

~~This application context is used for location service LMU control procedures.~~

```
locationSvcLMUControlContext-v3 APPLICATION-CONTEXT
     -- Responder is SMLC if Initiator is VLR
     INITIATOR CONSUMER OF {
          locationSvcLMUControlPackage-v3}
::= {map-ac locationSvcLMUControl(40) version3(3)}
```

~~17.3.2.43 Location Service Data Transfer~~

~~This application context is used for location service data transfer procedures.~~

```
locationSvcDataTransferContext-v3 APPLICATION-CONTEXT
     -- Responder is MSC if Initiator is SMLC
     INITIATOR CONSUMER OF {
          locationSvcDataTransferPackage-v3}
::= {map-ac locationSvcDataTransfer(41) version3(3)}
```

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

17.3.3 ASN.1 Module for application-context-names

The following ASN.1 module summarizes the application-context-name assigned to MAP application-contexts.

```
MAP-ApplicationContexts {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ApplicationContexts (2) version5 (5)}

DEFINITIONS

::=
```

```
BEGIN

-- EXPORTS everything

IMPORTS
   gsm-NetworkId,
   ac-Id
FROM MobileDomainDefinitions {
   ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
   mobileDomainDefinitions (0) version1 (1)}
;

-- application-context-names

map-ac  OBJECT IDENTIFIER ::= {gsm-NetworkId ac-Id}

networkLocUpContext-v3  OBJECT IDENTIFIER ::=
     {map-ac networkLocUp(1) version3(3)}

locationCancellationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationCancel(2) version3(3)}

roamingNumberEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac roamingNbEnquiry(3) version3(3)}

locationInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locInfoRetrieval(5) version3(3)}

resetContext-v2  OBJECT IDENTIFIER ::=
     {map-ac reset(10) version2(2)}

handoverControlContext-v2  OBJECT IDENTIFIER ::=
     {map-ac handoverControl(11) version2(2)}

equipmentMngtContext-v2  OBJECT IDENTIFIER ::=
     {map-ac equipmentMngt(13) version2(2)}

infoRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac infoRetrieval(14) version2(2)}

interVlrInfoRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac interVlrInfoRetrieval(15) version2(2)}

subscriberDataMngtContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberDataMngt(16) version3(3)}

tracingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac tracing(17) version3(3)}

networkFunctionalSsContext-v2  OBJECT IDENTIFIER ::=
     {map-ac networkFunctionalSs(18) version2(2)}

networkUnstructuredSsContext-v2  OBJECT IDENTIFIER ::=
     {map-ac networkUnstructuredSs(19) version2(2)}

shortMsgGatewayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgGateway(20) version3(3)}

shortMsgMO-RelayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgMO-Relay(21) version3(3)}

shortMsgAlertContext-v2  OBJECT IDENTIFIER ::=
     {map-ac shortMsgAlert(23) version2(2)}

mwdMngtContext-v3  OBJECT IDENTIFIER ::=
     {map-ac mwdMngt(24) version3(3)}

shortMsgMT-RelayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgMT-Relay(25) version3(3)}

imsiRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac imsiRetrieval(26) version2(2)}

```

```
msPurgingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac msPurging(27) version3(3)}

subscriberInfoEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberInfoEnquiry(28) version3(3)}

anyTimeInfoEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac anyTimeInfoEnquiry(29) version3(3)}

callControlTransferContext-v4  OBJECT IDENTIFIER ::=
     {map-ac callControlTransfer(6) version4(4)}

ss-InvocationNotificationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac ss-InvocationNotification(36) version3(3)}

sIWFSAllocationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac sIWFSAllocation(12) version3(3)}

groupCallControlContext-v3  OBJECT IDENTIFIER ::=
     {map-ac groupCallControl(31) version3(3)}

gprsLocationUpdateContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsLocationUpdate(32) version3(3)}

gprsLocationInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsLocationInfoRetrieval(33) version3(3)}

failureReportContext-v3  OBJECT IDENTIFIER ::=
     {map-ac failureReport(34) version3(3)}

gprsNotifyContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsNotify(35) version3(3)}

reportingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac reporting(7) version3(3)}

callCompletionContext-v3  OBJECT IDENTIFIER ::=
     {map-ac callCompletion(8) version3(3)}

locationSvcGatewayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcGateway(37) version3(3)}

locationSvcEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcEnquiry(38) version3(3)}

locationSvcPositioningContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcPositioning(39) version3(3)}

locationSvcLMUControlContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcLMUControl(40) version3(3)}

locationSvcDataTransferContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationSvcDataTransfer(41) version3(3)}


-- The following Object Identifiers are reserved for application-
-- contexts existing in previous versions of the protocol
```

```
-- AC Name & Version                    Object Identifier
--
-- networkLocUpContext-v1               map-ac networkLocUp (1)                 version1 (1)
-- networkLocUpContext-v2               map-ac networkLocUp (1)                 version2 (2)
-- locationCancellationContext-v1       map-ac locationCancellation (2)         version1 (1)
-- locationCancellationContext-v2       map-ac locationCancellation (2)         version2 (2)
-- roamingNumberEnquiryContext-v1       map-ac roamingNumberEnquiry (3)         version1 (1)
-- roamingNumberEnquiryContext-v2       map-ac roamingNumberEnquiry (3)         version2 (2)
-- locationInfoRetrievalContext-v1      map-ac locationInfoRetrieval (5)        version1 (1)
-- locationInfoRetrievalContext-v2      map-ac locationInfoRetrieval (5)        version2 (2)
-- resetContext-v1                      map-ac reset (10)                       version1 (1)
-- handoverControlContext-v1            map-ac handoverControl (11)             version1 (1)
-- equipmentMngtContext-v1              map-ac equipmentMngt (13)               version1 (1)
-- infoRetrievalContext-v1              map-ac infoRetrieval (14)               version1 (1)
-- subscriberDataMngtContext-v1         map-ac subscriberDataMngt (16)          version1 (1)
-- subscriberDataMngtContext-v2         map-ac subscriberDataMngt (16)          version2 (2)
-- tracingContext-v1                    map-ac tracing (17)                     version1 (1)
-- tracingContext-v2                    map-ac tracing (17)                     version2 (2)
-- networkFunctionalSsContext-v1        map-ac networkFunctionalSs (18)         version1 (1)
-- shortMsgGatewayContext-v1            map-ac shortMsgGateway (20)             version1 (1)
-- shortMsgGatewayContext-v2            map-ac shortMsgGateway (20)             version2 (2)
-- shortMsgRelayContext-v1              map-ac shortMsgRelay (21)               version1 (1)
-- shortMsgAlertContext-v1              map-ac shortMsgAlert (23)               version1 (1)
-- mwdMngtContext-v1                    map-ac mwdMngt (24)                     version1 (1)
-- mwdMngtContext-v2                    map-ac mwdMngt (24)                     version2 (2)
-- shortMsgMT-RelayContext-v2           map-ac shortMsgMT-Relay (25)            version2 (2)
-- msPurgingContext-v2                  map-ac msPurging (27)                   version2 (2)
-- callControlTransferContext-v3        map-ac callControlTransferContext (6)   version3 (3)


END
```

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

17.5 MAP operation and error codes

```
MAP-Protocol {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Protocol (4) version5 (5)}

DEFINITIONS

::=

BEGIN

IMPORTS
   UpdateLocation,
   CancelLocation,
   PurgeMS,
   SendIdentification,
   UpdateGprsLocation,
   PrepareHandover,
   SendEndSignal,
   ProcessAccessSignalling,
   ForwardAccessSignalling,
   PrepareSubsequentHandover,
   SendAuthenticationInfo,
   CheckIMEI,
   InsertSubscriberData,
   DeleteSubscriberData,
   Reset,
   ForwardCheckSS-Indication,
   RestoreData,
   ProvideSubscriberInfo,
   AnyTimeInterrogation,
   SendRoutingInfoForGprs,
   FailureReport,
   NoteMsPresentForGprs


FROM MAP-MobileServiceOperations {
```

```
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-MobileServiceOperations (5)
    version5 (5)}

    ActivateTraceMode,
    DeactivateTraceMode,
    SendIMSI
FROM MAP-OperationAndMaintenanceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
    version5 (5)}

    SendRoutingInfo,
    ProvideRoamingNumber,
    ResumeCallHandling,
    ProvideSIWFSNumber,
    SIWFSSignallingModify,
    SetReportingState,
    StatusReport,
    RemoteUserFree
FROM MAP-CallHandlingOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-CallHandlingOperations (7)
    version5 (5)}

    RegisterSS,
    EraseSS,
    ActivateSS,
    DeactivateSS,
    InterrogateSS,
    ProcessUnstructuredSS-Request,
    UnstructuredSS-Request,
    UnstructuredSS-Notify,
    RegisterPassword,
    GetPassword,
    SS-InvocationNotification,
    RegisterCC-Entry,
    EraseCC-Entry
FROM MAP-SupplementaryServiceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-SupplementaryServiceOperations (8)
    version5 (5)}

    SendRoutingInfoForSM,
    MO-ForwardSM,
    MT-ForwardSM,
    ReportSM-DeliveryStatus,
    AlertServiceCentre,
    InformServiceCentre,
    ReadyForSM
FROM MAP-ShortMessageServiceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-ShortMessageServiceOperations (9)
    version5 (5)}

    PrepareGroupCall,
    ProcessGroupCallSignalling,
    ForwardGroupCallSignalling,
    SendGroupCallEndSignal
FROM MAP-Group-Call-Operations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-Group-Call-Operations (22)
    version5 (5)}

    LCSAssignTrafficChannel,
    LCSInformationReport,
    LCSInformationRequest,
    LCSRegistration,
    LCSReset,
    ProvideSubscriberLocation,
    PerformLocation,
    SendRoutingInfoForLCS,
    SubscriberLocationReport
FROM MAP-LocationServiceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-LocationServiceOperations (24)
    version5 (5)}

    SystemFailure,
```

```
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   NumberChanged,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,
   RoamingNotAllowed,
   IllegalSubscriber,
   IllegalEquipment,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,
   TracingBufferFull,
   OR-NotAllowed,
   NoRoamingNumberAvailable,
   AbsentSubscriber,
   BusySubscriber,
   NoSubscriberReply,
   CallBarred,
   ForwardingViolation,
   ForwardingFailed,
   CUG-Reject,
   ATI-NotAllowed,
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-SubscriptionViolation,
   SS-Incompatibility,
   UnknownAlphabet,
   USSD-Busy,
   PW-RegistrationFailure,
   NegativePW-Check,
   NumberOfPW-AttemptsViolation,
   SubscriberBusyForMT-SMS,
   SM-DeliveryFailure,
   MessageWaitingListFull,
   AbsentSubscriberSM,
   ResourceLimitation,
   NoGroupCallNumberAvailable,
   ShortTermDenial,
   LongTermDenial,
   IncompatibleTerminal,
   UnauthorizedRequestingNetwork,
   UnauthorizedLCSClient,
   PositionMethodFailure,
   PositionMethodFailureWithRestart,
   LMUUnknownOrOffline,
   TrafficChannelEstablishmentFailure,
   UnknownOrUnreachableLCSClient

FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version5 (5)}
;


-- location registration operation codes

updateLocation  UpdateLocation ::= localValue 2
cancelLocation  CancelLocation ::= localValue 3
purgeMS  PurgeMS ::= localValue 67
sendIdentification  SendIdentification ::= localValue 55


-- handover operation codes

prepareHandover  PrepareHandover ::= localValue 68
sendEndSignal  SendEndSignal ::= localValue 29
processAccessSignalling  ProcessAccessSignalling ::= localValue 33
forwardAccessSignalling  ForwardAccessSignalling ::= localValue 34
prepareSubsequentHandover  PrepareSubsequentHandover ::=
     localValue 69


-- authentication operation codes

```

```
sendAuthenticationInfo  SendAuthenticationInfo ::= localValue 56


-- IMEI MANAGEMENT operation codes

checkIMEI  CheckIMEI ::= localValue 43


-- subscriber management operation codes

insertSubscriberData  InsertSubscriberData ::= localValue 7
deleteSubscriberData  DeleteSubscriberData ::= localValue 8


-- fault recovery operation codes

reset  Reset ::= localValue 37
forwardCheckSS-Indication  ForwardCheckSS-Indication ::=
     localValue 38
restoreData  RestoreData ::= localValue 57


-- operation and maintenance operation codes

activateTraceMode  ActivateTraceMode ::= localValue 50
deactivateTraceMode  DeactivateTraceMode ::= localValue 51
sendIMSI  SendIMSI ::= localValue 58


-- call handling operation codes

sendRoutingInfo  SendRoutingInfo ::= localValue 22
provideRoamingNumber  ProvideRoamingNumber ::= localValue 4
resumeCallHandling  ResumeCallHandling ::= localValue 6
provideSIWFSNumber  ProvideSIWFSNumber ::= localValue 31
sIWFSSignallingModify  SIWFSSignallingModify ::= localValue 32
setReportingState  SetReportingState ::= localValue 73
statusReport StatusReport ::= localValue 74
remoteUserFree RemoteUserFree ::= localValue 75


-- supplementary service handling operation codes

registerSS  RegisterSS ::= localValue 10
eraseSS  EraseSS ::= localValue 11
activateSS  ActivateSS ::= localValue 12
deactivateSS  DeactivateSS ::= localValue 13
interrogateSS  InterrogateSS ::= localValue 14
processUnstructuredSS-Request  ProcessUnstructuredSS-Request ::=
     localValue 59
unstructuredSS-Request  UnstructuredSS-Request ::= localValue 60
unstructuredSS-Notify  UnstructuredSS-Notify ::= localValue 61
registerPassword  RegisterPassword ::= localValue 17
getPassword  GetPassword ::= localValue 18
registerCC-Entry  RegisterCC-Entry ::= localValue 76
eraseCC-Entry  EraseCC-Entry ::= localValue 77


-- short message service operation codes

sendRoutingInfoForSM  SendRoutingInfoForSM ::= localValue 45
mo-forwardSM  MO-ForwardSM ::= localValue 46
mt-forwardSM  MT-ForwardSM ::= localValue 44
reportSM-DeliveryStatus  ReportSM-DeliveryStatus ::= localValue 47
informServiceCentre  InformServiceCentre ::= localValue 63
alertServiceCentre  AlertServiceCentre ::= localValue 64
readyForSM  ReadyForSM ::= localValue 66


-- provide subscriber info operation codes

provideSubscriberInfo  ProvideSubscriberInfo ::= localValue 70


-- any time interrogation operation codes

anyTimeInterrogation  AnyTimeInterrogation ::= localValue 71
```

```
-- supplementary service invocation notification operation codes

ss-InvocationNotification  SS-InvocationNotification ::= localValue 72


--Group Call operation codes

prepareGroupCall  PrepareGroupCall ::= localValue 39
sendGroupCallEndSignal  SendGroupCallEndSignal ::= localValue 40
processGroupCallSignalling  ProcessGroupCallSignalling ::= localValue 41
forwardGroupCallSignalling  ForwardGroupCallSignalling ::= localValue 42


-- gprs location updating operation codes

updateGprsLocation  UpdateGprsLocation ::= localValue 23

-- gprs location information retrieval operation codes

sendRoutingInfoForGprs  SendRoutingInfoForGprs ::= localValue 24

-- failure reporting operation codes

failureReport  FailureReport ::= localValue 25

-- GPRS notification operation codes

noteMsPresentForGprs  NoteMsPresentForGprs ::= localValue 26

-- Location service operation codes

lcsAssignTrafficChannel  LCSAssignTrafficChannel ::= localValue 78
lcsInformationReport  LCSInformationReport ::= localValue 79
lcsInformationRequest  LCSInformationRequest ::= localValue 80
lcsRegistration  LCSRegistration ::= localValue 81
lcsReset  LCSReset ::= localValue 82
provideSubscriberLocation  ProvideSubscriberLocation ::= localValue 83
performLocation  PerformLocation ::= localValue 84
sendRoutingInfoForLCS  SendRoutingInfoForLCS ::= localValue 85
subscriberLocationReport  SubscriberLocationReport ::= localValue 86


-- generic error codes

systemFailure  SystemFailure ::= localValue 34
dataMissing  DataMissing ::= localValue 35
unexpectedDataValue  UnexpectedDataValue ::= localValue 36
facilityNotSupported  FacilityNotSupported ::= localValue 21
incompatibleTerminal  IncompatibleTerminal ::= localValue 28
resourceLimitation  ResourceLimitation ::= localValue 51


-- identification and numbering error codes

unknownSubscriber  UnknownSubscriber ::= localValue 1
numberChanged  NumberChanged ::= localValue 44
unknownMSC  UnknownMSC ::= localValue 3
unidentifiedSubscriber  UnidentifiedSubscriber ::= localValue 5
unknownEquipment  UnknownEquipment ::= localValue 7


-- subscription error codes

roamingNotAllowed  RoamingNotAllowed ::= localValue 8
illegalSubscriber  IllegalSubscriber ::= localValue 9
illegalEquipment  IllegalEquipment ::= localValue 12
bearerServiceNotProvisioned  BearerServiceNotProvisioned ::=
     localValue 10
teleserviceNotProvisioned  TeleserviceNotProvisioned ::=
     localValue 11


-- handover error codes
```

```
noHandoverNumberAvailable  NoHandoverNumberAvailable ::=
     localValue 25
subsequentHandoverFailure  SubsequentHandoverFailure ::=
     localValue 26

-- operation and maintenance error codes

tracingBufferFull  TracingBufferFull ::= localValue 40


-- call handling error codes

noRoamingNumberAvailable  NoRoamingNumberAvailable ::= localValue 39
absentSubscriber  AbsentSubscriber ::= localValue 27
busySubscriber  BusySubscriber ::= localValue 45
noSubscriberReply  NoSubscriberReply ::= localValue 46
callBarred  CallBarred ::= localValue 13
forwardingFailed  ForwardingFailed ::= localValue 47
or-NotAllowed  OR-NotAllowed ::= localValue 48
forwardingViolation  ForwardingViolation ::= localValue 14
cug-Reject  CUG-Reject ::= localValue 15


-- any time interrogation error codes
ati-NotAllowed  ATI-NotAllowed ::= localValue 49


-- Group Call error codes
noGroupCallNumberAvailable  NoGroupCallNumberAvailable ::= localValue 50


-- supplementary service error codes

illegalSS-Operation  IllegalSS-Operation ::= localValue 16
ss-ErrorStatus  SS-ErrorStatus ::= localValue 17
ss-NotAvailable  SS-NotAvailable ::= localValue 18
ss-SubscriptionViolation  SS-SubscriptionViolation ::= localValue 19
ss-Incompatibility  SS-Incompatibility ::= localValue 20
unknownAlphabet  UnknownAlphabet ::= localValue 71
ussd-Busy  USSD-Busy ::= localValue 72
pw-RegistrationFailure  PW-RegistrationFailure ::= localValue 37
negativePW-Check  NegativePW-Check ::= localValue 38
numberOfPW-AttemptsViolation  NumberOfPW-AttemptsViolation ::=
     localValue 43
shortTermDenial  ShortTermDenial ::= localValue 29
longTermDenial  LongTermDenial ::= localValue 30


-- short message service error codes

subscriberBusyForMT-SMS  SubscriberBusyForMT-SMS ::= localValue 31
sm-DeliveryFailure  SM-DeliveryFailure ::= localValue 32
messageWaitingListFull  MessageWaitingListFull ::= localValue 33
absentsubscriberSM  AbsentSubscriberSM ::= localValue 6

-- location service error codes

unauthorizedRequestingNetwork  UnauthorizedRequestingNetwork::= localValue 52
unauthorizedLCSClient  UnauthorizedLCSClient ::= localValue 53
positionMethodFailure  PositionMethodFailure ::= localValue 54
positionMethodFailureWithRestart  PositionMethodFailureWithRestart ::= localValue 55
lmuUnknownOrOffline  LMUUnknownOrOffline ::= localValue 56
trafficChannelEstablishmentFailure  TrafficChannelEstablishmentFailure ::= localValue 57
unknownOrUnreachableLCSClient  UnknownOrUnreachableLCSClient ::= localValue 58


-- The following operation codes are reserved for operations
-- existing in previous versions of the protocol
```

```
-- Operation Name                    AC used                                          Oper. Code
--
-- sendParameters                    map-ac infoRetrieval (14) version1 (1)           localValue 9
-- processUnstructuredSS-Data        map-ac networkFunctionalSs (18) version1 (1)     localValue 19
-- performHandover                   map-ac handoverControl (11) version1 (1)         localValue 28
-- performSubsequentHandover         map-ac handoverControl (11) version1 (1)         localValue 30
-- noteInternalHandover              map-ac handoverControl (11) version1 (1)         localValue 35
-- noteSubscriberPresent             map-ac mwdMngt (24) version1 (1)                 localValue 48
-- alertServiceCentreWithoutResult   map-ac shortMsgAlert (23) version1 (1)           localValue 49
-- traceSubscriberActivity           map-ac handoverControl (11) version1 (1)         localValue 52
-- beginSubscriberActivity           map-ac networkFunctionalSs (18) version1 (1)     localValue 54

-- The following error codes are reserved for errors
-- existing in previous versions of the protocol

-- Error Name                        AC used                                          Error Code
--
-- unknownBaseStation                map-ac handoverControl (11) version1 (1)         localValue 2
-- invalidTargetBaseStation          map-ac handoverControl (11) version1 (1)         localValue 23
-- noRadioResourceAvailable          map-ac handoverControl (11) version1 (1)         localValue 24


END
```

17.6 MAP operation and error types

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

17.6.6 Errors

```
MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version5 (5)}

DEFINITIONS

::=

BEGIN

EXPORTS

   -- generic errors
   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   IncompatibleTerminal,
   ResourceLimitation,

   -- identification and numbering errors
   UnknownSubscriber,
   NumberChanged,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,

   -- subscription errors
   RoamingNotAllowed,
   IllegalSubscriber,
   IllegalEquipment,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,

   -- handover errors
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,

   -- operation and maintenance errors
   TracingBufferFull,

   -- call handling errors
   OR-NotAllowed,
```

```
    NoRoamingNumberAvailable,
    BusySubscriber,
    NoSubscriberReply,
    AbsentSubscriber,
    CallBarred,
    ForwardingViolation,
    ForwardingFailed,
    CUG-Reject,

    -- any time interrogation errors
    ATI-NotAllowed,

    -- supplementary service errors
    IllegalSS-Operation,
    SS-ErrorStatus,
    SS-NotAvailable,
    SS-SubscriptionViolation,
    SS-Incompatibility,
    UnknownAlphabet,
    USSD-Busy,
    PW-RegistrationFailure,
    NegativePW-Check,
    NumberOfPW-AttemptsViolation,
    ShortTermDenial,
    LongTermDenial,

    -- short message service errors
    SubscriberBusyForMT-SMS,
    SM-DeliveryFailure,
    MessageWaitingListFull,
    AbsentSubscriberSM,

    -- Group Call errors
    NoGroupCallNumberAvailable,

    -- location service errors
    UnauthorizedRequestingNetwork,
    UnauthorizedLCSClient,
    PositionMethodFailure,
    PositionMethodFailureWithRestart,
    LMUUnknownOrOffline,
    TrafficChannelEstablishmentFailure,
    UnknownOrUnreachableLCSClient

;

IMPORTS
    ERROR
FROM TCAPMessages {
    ccitt recommendation q 773 modules (2) messages (1) version2 (2)}

    SS-Status
FROM MAP-SS-DataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-SS-DataTypes (14) version5 (5)}

    SS-IncompatibilityCause,
    PW-RegistrationFailureCause,
    SM-DeliveryFailureCause,
    SystemFailureParam,
    DataMissingParam,
    UnexpectedDataParam,
    FacilityNotSupParam,
    UnknownSubscriberParam,
    NumberChangedParam,
    UnidentifiedSubParam,
    RoamingNotAllowedParam,
    IllegalSubscriberParam,
    IllegalEquipmentParam,
    BearerServNotProvParam,
    TeleservNotProvParam,
    TracingBufferFullParam,
    NoRoamingNbParam,
    OR-NotAllowedParam,
    AbsentSubscriberParam,
    BusySubscriberParam,
    NoSubscriberReplyParam,
    CallBarredParam,
    ForwardingViolationParam,
```

```
   ForwardingFailedParam,
   CUG-RejectParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam,
   UnauthorizedRequestingNetwork-Param,
   UnauthorizedLCSClient-Param,
   PositionMethodFailure-Param,
   PositionMethodFailureWithRestart-Param,
   LMUUnknownOrOffline-Param,
   TrafficChannelEstablishmentFailure-Param,
   UnknownOrUnreachableLCSClient-Param


FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version5 (5)}
;


-- generic errors

SystemFailure ::= ERROR
    PARAMETER
         systemFailureParam              SystemFailureParam
         -- optional

DataMissing ::= ERROR
    PARAMETER
         dataMissingParam                DataMissingParam
         -- optional
         -- dataMissingParam must not be used in version <3

UnexpectedDataValue ::= ERROR
    PARAMETER
         unexpectedDataParam             UnexpectedDataParam
         -- optional
         -- unexpectedDataParam must not be used in version <3

FacilityNotSupported ::= ERROR
    PARAMETER
         facilityNotSupParam             FacilityNotSupParam
         -- optional
         -- facilityNotSupParam must not be used in version <3

IncompatibleTerminal ::= ERROR
    PARAMETER
         incompatibleTerminalParam       IncompatibleTerminalParam
         -- optional

ResourceLimitation ::= ERROR
    PARAMETER
         resourceLimitationParam         ResourceLimitationParam
         -- optional

-- identification and numbering errors

UnknownSubscriber ::= ERROR
    PARAMETER
         unknownSubscriberParam          UnknownSubscriberParam
         -- optional
         -- unknownSubscriberParam must not be used in version <3

NumberChanged ::= ERROR
    PARAMETER
         numberChangedParam              NumberChangedParam
         -- optional

UnknownMSC ::= ERROR
```

```
UnidentifiedSubscriber ::= ERROR
    PARAMETER
        unidentifiedSubParam            UnidentifiedSubParam
        -- optional
        -- unidentifiedSubParam must not be used in version <3

UnknownEquipment ::= ERROR


-- subscription errors

RoamingNotAllowed ::= ERROR
    PARAMETER
        roamingNotAllowedParam          RoamingNotAllowedParam

IllegalSubscriber ::= ERROR
    PARAMETER
        illegalSubscriberParam          IllegalSubscriberParam
        -- optional
        -- illegalSubscriberParam must not be used in version <3

IllegalEquipment ::= ERROR
    PARAMETER
        illegalEquipmentParam           IllegalEquipmentParam
        -- optional
        -- illegalEquipmentParam must not be used in version <3

BearerServiceNotProvisioned ::= ERROR
    PARAMETER
        bearerServNotProvParam          BearerServNotProvParam
        -- optional
        -- bearerServNotProvParam must not be used in version <3

TeleserviceNotProvisioned ::= ERROR
    PARAMETER
        teleservNotProvParam            TeleservNotProvParam
        -- optional
        -- teleservNotProvParam must not be used in version <3


-- handover errors

NoHandoverNumberAvailable ::= ERROR

SubsequentHandoverFailure ::= ERROR


-- operation and maintenance errors

TracingBufferFull ::= ERROR
    PARAMETER
        tracingBufferFullParam          TracingBufferFullParam
        -- optional


-- call handling errors

NoRoamingNumberAvailable ::= ERROR
    PARAMETER
        noRoamingNbParam                NoRoamingNbParam
        -- optional

AbsentSubscriber ::= ERROR
    PARAMETER
        absentSubscriberParam           AbsentSubscriberParam
        -- optional

     -- absentSubscriberParam must not be used in version <3

BusySubscriber ::= ERROR
    PARAMETER
        busySubscriberParam             BusySubscriberParam
        -- optional
```

```
NoSubscriberReply ::= ERROR
     PARAMETER
          noSubscriberReplyParam          NoSubscriberReplyParam
          -- optional

CallBarred ::= ERROR
     PARAMETER
          callBarredParam                 CallBarredParam
          -- optional

ForwardingViolation ::= ERROR
     PARAMETER
          forwardingViolationParam        ForwardingViolationParam
          -- optional

ForwardingFailed ::= ERROR
     PARAMETER
          forwardingFailedParam           ForwardingFailedParam
          -- optional

CUG-Reject ::= ERROR
     PARAMETER
          cug-RejectParam                 CUG-RejectParam
          -- optional

OR-NotAllowed ::= ERROR
     PARAMETER
          or-NotAllowedParam              OR-NotAllowedParam
          -- optional


-- any time interrogation errors
ATI-NotAllowed ::= ERROR
     PARAMETER
          ati-NotAllowedParam             ATI-NotAllowedParam
          -- optional


-- supplementary service errors

IllegalSS-Operation ::= ERROR

SS-ErrorStatus ::= ERROR
     PARAMETER
          ss-Status                       SS-Status
          -- optional

SS-NotAvailable ::= ERROR

SS-SubscriptionViolation ::= ERROR

SS-Incompatibility ::= ERROR
     PARAMETER
          ss-IncompatibilityCause         SS-IncompatibilityCause
          -- optional

UnknownAlphabet ::= ERROR

USSD-Busy ::= ERROR

PW-RegistrationFailure ::= ERROR
     PARAMETER
          pw-RegistrationFailureCause     PW-RegistrationFailureCause

NegativePW-Check ::= ERROR

NumberOfPW-AttemptsViolation ::= ERROR

ShortTermDenial ::= ERROR
     PARAMETER
          shortTermDenialParam                ShortTermDenialParam
          -- optional
```

```
LongTermDenial ::= ERROR
     PARAMETER
          longTermDenialParam                 LongTermDenialParam
          -- optional

-- short message service errors

SubscriberBusyForMT-SMS ::= ERROR
     PARAMETER
          subBusyForMT-SMS-Param          SubBusyForMT-SMS-Param
          -- optional

SM-DeliveryFailure ::= ERROR
     PARAMETER
          sm-DeliveryFailureCause         SM-DeliveryFailureCause

MessageWaitingListFull ::= ERROR
     PARAMETER
          messageWaitListFullParam        MessageWaitListFullParam
          -- optional

AbsentSubscriberSM ::= ERROR
     PARAMETER
          absentSubscriberSM-Param        AbsentSubscriberSM-Param
          -- optional

-- Group Call errors

NoGroupCallNumberAvailable ::= ERROR
     PARAMETER
          noGroupCallNbParam              NoGroupCallNbParam
          -- optional

-- location service errors

UnauthorizedRequestingNetwork ::= ERROR
     PARAMETER
          unauthorizedRequestingNetwork-Param  UnauthorizedRequestingNetwork-Param
          -- optional

UnauthorizedLCSClient ::= ERROR
     PARAMETER
          unauthorizedLCSClient-Param     UnauthorizedLCSClient-Param
          -- optional

PositionMethodFailure ::= ERROR
     PARAMETER
          positionMethodFailure-Param     PositionMethodFailure-Param
          -- optional

PositionMethodFailureWithRestart ::= ERROR
     PARAMETER
          positionMethodFailureWithRestart-Param    PositionMethodFailureWithRestart-Param
          -- optional

LMUUnknownOrOffline ::= ERROR
     PARAMETER
          lmuUnknownOrOffline-Param        LMUUnknownOrOffline-Param
          -- optional

TrafficChannelEstablishmentFailure ::= ERROR
     PARAMETER
          trafficChannelEstablishmentFailure   TrafficChannelEstablishmentFailure-Param
          -- optional

UnknownOrUnreachableLCSClient ::= ERROR
     PARAMETER
          unknownOrUnreachableLCSClient-Param   UnknownOrUnreachableLCSClient-Param
          -- optional

END
```

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

17.6.8 Location service operations

```
MAP-LocationServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LocationServiceOperations (24)
   version5 (5)}

DEFINITIONS

::=

BEGIN

EXPORTS
   LCSAssignTrafficChannel,
   LCSInformationReport,
   LCSInformationRequest,
   LCSRegistration,
   LCSReset,
   ProvideSubscriberLocation,
   PerformLocation,
   SendRoutingInfoForLCS,
   SubscriberLocationReport
;

IMPORTS
   OPERATION
FROM TCAPMessages {
   ccitt recommendation q 773 modules (2) messages (1) version2 (2)}

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   AbsentSubscriber,
   UnauthorizedRequestingNetwork,
   UnauthorizedLCSClient,
   PositionMethodFailure,
   PositionMethodFailureWithRestart,
   ResourceLimitation,
   LMUUnknownOrOffline,
   TrafficChannelEstablishmentFailure,
   UnknownOrUnreachableLCSClient
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version5 (5)}

   LCSAssignTrafficChannel-Arg,
   LCSAssignTrafficChannel-Res,
   LCSInformationReport-Arg,
   LCSInformationRequest-Arg,
   LCSRegistration-Arg,
   LCSRegistration-Res,
   LCSReset-Arg,
   RoutingInfoForLCS-Arg,
   RoutingInfoForLCS-Res,
   ProvideSubscriberLocation-Arg,
   ProvideSubscriberLocation-Res,
   PerformLocation-Arg,
   PerformLocation-Res,
   SubscriberLocationReport-Arg,
   SubscriberLocationReport-Res
FROM MAP-LCS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LCS-DataTypes (25) version5 (5)}
;

```

```
SendRoutingInfoForLCS ::= OPERATION                --Timer m
    ARGUMENT
        routingInfoForLCS-Arg           RoutingInfoForLCS-Arg
    RESULT
        routingInfoForLCS-Res           RoutingInfoForLCS-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        FacilityNotSupported,
        UnknownSubscriber,
        AbsentSubscriber,
        UnauthorizedRequestingNetwork }
```

```
ProvideSubscriberLocation ::= OPERATION        --Timer ml
    ARGUMENT
        provideSubscriberLocation-Arg   ProvideSubscriberLocation-Arg
    RESULT
        provideSubscriberLocation-Res   ProvideSubscriberLocation-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        FacilityNotSupported,
        UnknownSubscriber,
        UnidentifiedSubscriber,
        IllegalSubscriber,
        IllegalEquipment,
        AbsentSubscriber,
        UnauthorizedRequestingNetwork,
        UnauthorizedLCSClient,
        PositionMethodFailure }
```

```
SubscriberLocationReport ::= OPERATION         --Timer m
    ARGUMENT
        subscriberLocationReport-Arg    SubscriberLocationReport-Arg
    RESULT
        subscriberLocationReport-Res    SubscriberLocationReport-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        ResourceLimitation,
        UnknownSubscriber,
        UnauthorizedRequestingNetwork,
        UnknownOrUnreachableLCSClient}
```

```
PerformLocation ::= OPERATION                  --Timer ml
    ARGUMENT
        performLocation-Arg             PerformLocation-Arg
    RESULT
        performLocation-Res             PerformLocation-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        PositionMethodFailure,
        PositionMethodFailureWithRestart }
```

```
LCSRegistration ::= OPERATION                  --Timer m
    ARGUMENT
        lcsRegistration-Arg             LCSRegistration-Arg
    RESULT
        lcsRegistration-Res             LCSRegistration-Res
    ERRORS {
        SystemFailure,
        LMUUnknownOrOffline,
        DataMissing,
        UnexpectedDataValue }
```

```
LCSInformationRequest ::= OPERATION            --Timer s
    ARGUMENT
        lcsInformationRequest-Arg       LCSInformationRequest-Arg
```

```
LCSInformationReport ::= OPERATION             --Timer s
    ARGUMENT
        lcsInformationReport-Arg        LCSInformationReport-Arg
```

```
LCSReset ::= OPERATION                              --Timer s
    ARGUMENT
        lcsReset-Arg                        LCSReset-Arg

LCSAssignTrafficChannel ::= OPERATION               --Timer m
    ARGUMENT
        lcsAssignTrafficChannel-Arg     LCSAssignTrafficChannel-Arg
    RESULT
        lcsAssignTrafficChannel-Res     LCSAssignTrafficChannel-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        TrafficChannelEstablishmentFailure }

END
```

17.7 MAP constants and data types

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

17.7.1 Mobile Service data types

```
MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version5 (5)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- location registration types
   UpdateLocationArg,
   UpdateLocationRes,
   CancelLocationArg,
   CancelLocationRes,
   PurgeMS-Arg,
   PurgeMS-Res,
   SendIdentificationRes,
   UpdateGprsLocationArg,
   UpdateGprsLocationRes,



   -- handover types
   PrepareHO-Arg,
   PrepareHO-Res,
   PrepareSubsequentHO-Arg,

   -- authentication management types
   SendAuthenticationInfoArg,
   SendAuthenticationInfoRes,

   -- security management types
   EquipmentStatus,
   Kc,

   -- subscriber management types
   InsertSubscriberDataArg,
   InsertSubscriberDataRes,
   DeleteSubscriberDataArg,
   DeleteSubscriberDataRes,
   SubscriberData,
   ODB-Data,
   SubscriberStatus,
   ZoneCodeList,
   maxNumOfZoneCodes,
   O-CSI,
```

```
    O-BcsmCamelTDPCriteriaList,
    SS-CSI,
    ServiceKey,
    DefaultCallHandling,
    CamelCapabilityHandling,
    BasicServiceCriteria,
    SupportedCamelPhases,
    maxNumOfCamelTDPData,
    CUG-Index,
    CUG-Interlock,
    InterCUG-Restrictions,
    IntraCUG-Options,

    -- fault recovery types
    ResetArg,
    RestoreDataArg,
    RestoreDataRes,

    -- subscriber information enquiry types
    ProvideSubscriberInfoArg,
    ProvideSubscriberInfoRes,
    SubscriberInfo,
    LocationInformation,
    SubscriberState,

    -- any time information enquiry types
    AnyTimeInterrogationArg,
    AnyTimeInterrogationRes,

    -- gprs location information retrieval types
    SendRoutingInfoForGprsArg,
    SendRoutingInfoForGprsRes,

    -- failure reporting types
    FailureReportArg,
    FailureReportRes,

    -- gprs notification types
    NoteMsPresentForGprsArg,
    NoteMsPresentForGprsRes


;

IMPORTS
    maxNumOfSS,
    SS-SubscriptionOption,
    SS-List
FROM MAP-SS-DataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-SS-DataTypes (14) version5 (5)}

    SS-Code
FROM MAP-SS-Code {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-SS-Code (15) version5 (5)}

    Ext-BearerServiceCode
FROM MAP-BS-Code {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-BS-Code (20) version5 (5)}

    Ext-TeleserviceCode
FROM MAP-TS-Code {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-TS-Code (19) version5 (5)}


    ISDN-AddressString,
    maxISDN-AddressLength,
    ISDN-SubaddressString,
    ExternalSignalInfo,
    IMSI,
    HLR-List,
    LMSI,
    Identity,
    GlobalCellId,
    CellIdOrLAI,
    Ext-BasicServiceCode,
```

```
    NAEA-PreferredCI,
    EMLPP-Info,
    SubscriberIdentity,
    AgeOfLocationInformation,
    LCSClientExternalID,
    LCSClientInternalID



FROM MAP-CommonDataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-CommonDataTypes (18) version5 (5)}

    ExtensionContainer
FROM MAP-ExtensionDataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version5 (5)}

    AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-ER-DataTypes (17) version5 (5)}


;


-- location registration types

UpdateLocationArg ::= SEQUENCE {
     imsi                              IMSI,

     msc-Number                        [1] ISDN-AddressString,
     vlr-Number                        ISDN-AddressString,
     lmsi                              [10] LMSI OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ... ,
     vlr-Capability                    [6] VLR-Capability                OPTIONAL }

VLR-Capability ::= SEQUENCE{
     supportedCamelPhases              [0] SupportedCamelPhases          OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     … }


UpdateLocationRes ::= SEQUENCE {
     hlr-Number                        ISDN-AddressString,

     extensionContainer                ExtensionContainer                OPTIONAL,
     ... ,
     solsaSupportIndicator             [2]  NULL                         OPTIONAL }

CancelLocationArg ::= [3] SEQUENCE {
     identity                          Identity,
     cancellationType                  CancellationType                  OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}


CancellationType ::= ENUMERATED {
     updateProcedure                   (0),
     subscriptionWithdraw              (1),
     ...}


CancelLocationRes ::= SEQUENCE {
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}

PurgeMS-Arg ::= [3] SEQUENCE {
     imsi                              IMSI,
     vlr-Number                        [0] ISDN-AddressString            OPTIONAL,
     sgsn-Number                       [1]  ISDN-AddressString           OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}
```

```
PurgeMS-Res ::= SEQUENCE {
    freezeTMSI                  [0]  NULL                   OPTIONAL,
    freezeP-TMSI                [1]  NULL                   OPTIONAL,
    extensionContainer          ExtensionContainer          OPTIONAL,
    ...}

SendIdentificationRes ::= SEQUENCE {
    imsi                        IMSI,
    authenticationSetList       AuthenticationSetList       OPTIONAL,
    ...}

AuthenticationSetList ::= SEQUENCE SIZE (1..5) OF
                            AuthenticationSet

AuthenticationSet ::= SEQUENCE {
    rand                        RAND,
    sres                        SRES,
    kc                          Kc,
    ...}

RAND ::= OCTET STRING (SIZE (16))

SRES ::= OCTET STRING (SIZE (4))

Kc ::= OCTET STRING (SIZE (8))

-- gprs location registration types

UpdateGprsLocationArg ::= SEQUENCE {
    imsi                        IMSI,
    sgsn-Number                 ISDN-AddressString,
    sgsn-Address                GSN-Address,
    extensionContainer          ExtensionContainer          OPTIONAL,
    ... ,
    sgsn-Capability             [0] SGSN-Capability         OPTIONAL }

SGSN-Capability ::= SEQUENCE{
    solsaSupportIndicator       NULL                        OPTIONAL,
    extensionContainer          [1] ExtensionContainer      OPTIONAL,
    ... }

GSN-Address ::= OCTET STRING (SIZE (5..17))
    -- Octets are coded according to TS GSM 03.03

UpdateGprsLocationRes ::= SEQUENCE {
    hlr-Number                  ISDN-AddressString,
    extensionContainer          ExtensionContainer          OPTIONAL,
    ...}

-- handover types

PrepareHO-Arg ::= SEQUENCE {
    targetCellId                GlobalCellId                OPTIONAL,
    ho-NumberNotRequired        NULL                        OPTIONAL,
    bss-APDU                    ExternalSignalInfo          OPTIONAL,
    ...}

PrepareHO-Res ::= SEQUENCE {
    handoverNumber              ISDN-AddressString          OPTIONAL,
    bss-APDU                    ExternalSignalInfo          OPTIONAL,
    ...}

PrepareSubsequentHO-Arg ::= SEQUENCE {
    targetCellId                GlobalCellId,
    targetMSC-Number            ISDN-AddressString,
    bss-APDU                    ExternalSignalInfo,
    ...}

-- authentication management types

SendAuthenticationInfoArg ::= IMSI

SendAuthenticationInfoRes ::= AuthenticationSetList
```

```
-- security management types

EquipmentStatus ::= ENUMERATED {
     whiteListed  (0),
     blackListed  (1),
     greyListed  (2)}


-- subscriber management types

InsertSubscriberDataArg ::= SEQUENCE {
     imsi                                [0] IMSI                          OPTIONAL,
     COMPONENTS OF                       SubscriberData,
     extensionContainer                  [14] ExtensionContainer           OPTIONAL,
     ... ,
     naea-PreferredCI                    [15] NAEA-PreferredCI             OPTIONAL,
     -- naea-PreferredCI is included at the discretion of the HLR operator.
     gprsSubscriptionData                [16] GPRSSubscriptionData         OPTIONAL,
     roamingRestrictedInSgsnDueToUnsupportedFeature [23]                   NULL
                                                                           OPTIONAL,
     networkAccessMode                   [24] NetworkAccessMode            OPTIONAL,
     lsaInformation                      [25] LSAInformation               OPTIONAL,
     lmu-Indicator                       [21] NULL                         OPTIONAL,
     lcsInformation                      [22] LCSInformation               OPTIONAL
      }
     -- If the Network Access Mode parameter is sent, it shall be present only in
     -- the first sequence if the seqmentation is used

LCSInformation ::= SEQUENCE {
     ~~hplmn-GMLC~~gmlc-List                 [0]  ~~HPLMN-~~GMLC-List              OPTIONAL,
     lcs-PrivacyExceptionList            [1]  LCS-PrivacyExceptionList     OPTIONAL,
     molr-List                           [2]  MOLR-List                    OPTIONAL,
...}

~~HPLMN-GMLC-List~~ ::= SEQUENCE SIZE (1..maxNumOfGMLC) OF
                                         ISDN-AddressString
     -- if segmentation is used, the complete GMLC-List shall be sent in one segment

maxNumOfGMLC  INTEGER ::= 5


NetworkAccessMode ::= ENUMERATED {
     bothMSCAndSGSN                      (0),
     onlyMSC                             (1),
     onlySGSN                            (2),
     ...}
     -- if unknown values are received in NetworkAccessMode
     -- they shall be discarded.

GPRSDataList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                         PDP-Context

maxNumOfPDP-Contexts  INTEGER ::= 50

PDP-Context ::= SEQUENCE {
     pdp-ContextId                       ContextId,
     pdp-Type                            [16] PDP-Type,
     pdp-Address                         [17] PDP-Address                  OPTIONAL,
     qos-Subscribed                      [18] QoS-Subscribed,
     vplmnAddressAllowed                 [19] NULL OPTIONAL,
     apn                                 [20] APN  ,
     extensionContainer                  [21] ExtensionContainer           OPTIONAL,
     ...}

ContextId ::= INTEGER (1..maxNumOfPDP-Contexts)


GPRSSubscriptionData ::= SEQUENCE {
     completeDataListIncluded            NULL                              OPTIONAL,

          -- If segmentation is used, completeDataListIncluded may only be present in the
          -- first segment.
     gprsDataList                        [1]  GPRSDataList,
     extensionContainer                  [2] ExtensionContainer            OPTIONAL,
     ...}
```

```
APN ::=  OCTET STRING (SIZE (2..63))
         -- Octets are coded according to TS GSM 03.03
```

```
PDP-Type ::= OCTET STRING (SIZE (2))
-- Octets are coded according to TS GSM 09.60
```

```
PDP-Address ::= OCTET STRING (SIZE (1..16))
-- Octets are coded according to TS GSM 09.60

-- The possible size values are:
-- 1-7 octets  X.25 address type
--  4  octets  IPv4 address type
-- 16  octets  Ipv6 address type
```

```
QoS-Subscribed ::= OCTET STRING (SIZE (3))
    -- Octets are coded according to TS GSM 04.08.
```

```
LSAOnlyAccessIndicator ::= ENUMERATED {
    accessOutsideLSAsAllowed  (0),
    accessOutsideLSAsRestricted (1)}
```

```
LSADataList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
                                    LSAData
```

```
maxNumOfLSAs  INTEGER ::= 20
```

```
LSAData ::= SEQUENCE {
    lsaIdentity                     [0] LSAIdentity,
    lsaPriority                     [1] LSAPriority,
    lsaActiveModeIndicator          [2] NULL                        OPTIONAL,
    lsaActiveModeSupportIndicator   [3] NULL                        OPTIONAL,
    extensionContainer              [4] ExtensionContainer          OPTIONAL,
    ...}
```

```
LSAInformation ::= SEQUENCE {
    completeDataListIncluded        NULL                            OPTIONAL,

        -- If segmentation is used, completeDataListIncluded may only be present in the
        -- first segment.
    lsaOnlyAccessIndicator          [1]  LSAOnlyAccessIndicator     OPTIONAL,
    lsaDataList                     [2]  LSADataList                OPTIONAL,
    extensionContainer              [3] ExtensionContainer          OPTIONAL,
    ...}
```

```
LSAIdentity ::= OCTET STRING (SIZE (3))
-- Octets are coded according to TS GSM 03.03
```

```
LSAPriority ::= OCTET STRING (SIZE (1))
-- Octets are coded according to TS GSM 08.08
```

```
SubscriberData ::= SEQUENCE {
    msisdn                              [1] ISDN-AddressString          OPTIONAL,
    category                            [2] Category                    OPTIONAL,
    subscriberStatus                    [3] SubscriberStatus            OPTIONAL,
    bearerServiceList                   [4] BearerServiceList           OPTIONAL,
    -- The exception handling for reception of unsupported / not allocated
    -- bearerServiceCodes is defined in section 6.8.1
    teleserviceList                     [6] TeleserviceList             OPTIONAL,
    -- The exception handling for reception of unsupported / not allocated
    -- teleserviceCodes is defined in section 6.8.1
    provisionedSS                       [7] Ext-SS-InfoList             OPTIONAL,
    odb-Data                            [8] ODB-Data                    OPTIONAL,
    roamingRestrictionDueToUnsupportedFeature  [9] NULL                 OPTIONAL,
    regionalSubscriptionData            [10] ZoneCodeList               OPTIONAL,
    vbsSubscriptionData                 [11] VBSDataList                OPTIONAL,
    vgcsSubscriptionData                [12] VGCSDataList               OPTIONAL,
    vlrCamelSubscriptionInfo            [13] VlrCamelSubscriptionInfo   OPTIONAL
    }
```

```
Category ::= OCTET STRING (SIZE (1))
     -- The internal structure is defined in CCITT Rec Q.763.

SubscriberStatus ::= ENUMERATED {
     serviceGranted  (0),
     operatorDeterminedBarring  (1)}

BearerServiceList ::= SEQUENCE SIZE (1..maxNumOfBearerServices) OF
                                        Ext-BearerServiceCode

maxNumOfBearerServices  INTEGER ::= 50

TeleserviceList ::= SEQUENCE SIZE (1..maxNumOfTeleservices) OF
                                        Ext-TeleserviceCode

maxNumOfTeleservices  INTEGER ::= 20

ODB-Data ::= SEQUENCE {
     odb-GeneralData                    ODB-GeneralData,
     odb-HPLMN-Data                     ODB-HPLMN-Data                  OPTIONAL,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}

ODB-GeneralData ::= BIT STRING {
     allOG-CallsBarred  (0),
     internationalOGCallsBarred  (1),
     internationalOGCallsNotToHPLMN-CountryBarred  (2),
     interzonalOGCallsBarred (6),
     interzonalOGCallsNotToHPLMN-CountryBarred (7),
     interzonalOGCallsAndInternationalOGCallsNotToHPLMN-CountryBarred (8),
     premiumRateInformationOGCallsBarred  (3),
     premiumRateEntertainementOGCallsBarred  (4),
     ss-AccessBarred  (5),
     allECT-Barred (9),
     chargeableECT-Barred (10),
     internationalECT-Barred (11),
     interzonalECT-Barred (12),
     doublyChargeableECT-Barred (13),
     multipleECT-Barred (14)} (SIZE (15..32))
     -- exception handling: reception of unknown bit assignments in the
     -- ODB-GeneralData type shall be treated like unsupported ODB-GeneralData

ODB-HPLMN-Data ::= BIT STRING {
     plmn-SpecificBarringType1  (0),
     plmn-SpecificBarringType2  (1),
     plmn-SpecificBarringType3  (2),
     plmn-SpecificBarringType4  (3)} (SIZE (4..32))
     -- exception handling: reception of unknown bit assignments in the
     -- ODB-HPLMN-Data type shall be treated like unsupported ODB-HPLMN-Data

Ext-SS-InfoList ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                                        Ext-SS-Info

Ext-SS-Info ::= CHOICE {
     forwardingInfo                     [0] Ext-ForwInfo,
     callBarringInfo                    [1] Ext-CallBarInfo,
     cug-Info                           [2] CUG-Info,
     ss-Data                            [3] Ext-SS-Data,
     emlpp-Info                         [4] EMLPP-Info}


Ext-ForwInfo ::= SEQUENCE {
     ss-Code                            SS-Code,
     forwardingFeatureList              Ext-ForwFeatureList,
     extensionContainer                 [0] ExtensionContainer          OPTIONAL,
     ...}

Ext-ForwFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                        Ext-ForwFeature
```

```
Ext-ForwFeature ::= SEQUENCE {
    basicService                        Ext-BasicServiceCode              OPTIONAL,
    ss-Status [4] Ext-SS-Status,
    forwardedToNumber                   [5] ISDN-AddressString            OPTIONAL,
    -- When this data type is sent from an HLR which supports CAMEL Phase 2
    -- to a VLR that supports CAMEL Phase 2 the VLR shall not check the
    -- format of the number
    forwardedToSubaddress               [8] ISDN-SubaddressString         OPTIONAL,
    forwardingOptions                   [6] Ext-ForwOptions               OPTIONAL,
    noReplyConditionTime                [7] Ext-NoRepCondTime             OPTIONAL,
    extensionContainer                  [9] ExtensionContainer            OPTIONAL,
    ...}
```

```
Ext-SS-Status ::= OCTET STRING (SIZE (1..5))

    -- OCTET 1:
    --
    -- bits 8765: 0000 (unused)
    -- bits 4321: Used to convey the "P bit","R bit","A bit" and "Q bit",
    --            representing supplementary service state information
    --            as defined in TS GSM 03.11

    -- bit 4: "Q bit"

    -- bit 3: "P bit"

    -- bit 2: "R bit"

    -- bit 1: "A bit"

    -- OCTETS 2-5: reserved for future use. They shall be discarded if
    -- received and not understood.
```

```
Ext-ForwOptions ::= OCTET STRING (SIZE (1..5))

    -- OCTET 1:

    --  bit 8: notification to forwarding party
    --   0  no notification
    --   1  notification

    --  bit 7: redirecting presentation
    --   0 no presentation
    --   1  presentation

    --  bit 6: notification to calling party
    --   0  no notification
    --   1  notification

    --  bit 5: 0 (unused)

    --  bits 43: forwarding reason
    --   00  ms not reachable
    --   01  ms busy
    --   10  no reply
    --   11  unconditional

    -- bits 21: 00 (unused)

    -- OCTETS 2-5: reserved for future use. They shall be discarded if
    -- received and not understood.
```

```
Ext-NoRepCondTime ::= INTEGER (1..100)
    -- Only values 5-30 are used.
    -- Values in the ranges 1-4 and 31-100 are reserved for future use
    -- If received:
    --       values 1-4 shall be mapped on to value 5
    --       values 31-100 shall be mapped on to value 30
```

```
Ext-CallBarInfo ::= SEQUENCE {
    ss-Code                             SS-Code,
    callBarringFeatureList              Ext-CallBarFeatureList,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}
```

```
Ext-CallBarFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                    Ext-CallBarringFeature

Ext-CallBarringFeature ::= SEQUENCE {
    basicService                    Ext-BasicServiceCode            OPTIONAL,
    ss-Status [4] Ext-SS-Status,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

CUG-Info ::= SEQUENCE {
    cug-SubscriptionList            CUG-SubscriptionList,
    cug-FeatureList                 CUG-FeatureList                 OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}

CUG-SubscriptionList ::= SEQUENCE SIZE (0..maxNumOfCUG) OF
                                    CUG-Subscription

CUG-Subscription ::= SEQUENCE {
    cug-Index CUG-Index,
    cug-Interlock                   CUG-Interlock,
    intraCUG-Options                IntraCUG-Options,
    basicServiceGroupList           Ext-BasicServiceGroupList       OPTIONAL,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}

CUG-Index ::= INTEGER (0..32767)
    -- The internal structure is defined in ETS 300 138.

CUG-Interlock ::= OCTET STRING (SIZE (4))

IntraCUG-Options ::= ENUMERATED {
    noCUG-Restrictions  (0),
    cugIC-CallBarred  (1),
    cugOG-CallBarred  (2)}

maxNumOfCUG  INTEGER ::= 10

CUG-FeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                    CUG-Feature

Ext-BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups)          OF
                                    Ext-BasicServiceCode

maxNumOfExt-BasicServiceGroups  INTEGER ::= 32

CUG-Feature ::= SEQUENCE {
    basicService                    Ext-BasicServiceCode            OPTIONAL,
    preferentialCUG-Indicator       CUG-Index OPTIONAL,
    interCUG-Restrictions           InterCUG-Restrictions,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

InterCUG-Restrictions ::= OCTET STRING (SIZE (1))

    -- bits 876543: 000000 (unused)
    -- Exception handling:
    -- bits 876543 shall be ignored if received and not understood

    -- bits 21
    --   00  CUG only facilities
    --   01  CUG with outgoing access
    --   10  CUG with incoming access
    --   11  CUG with both outgoing and incoming access
```

```
Ext-SS-Data ::= SEQUENCE {
    ss-Code                         SS-Code,
    ss-Status [4] Ext-SS-Status,
    ss-SubscriptionOption           SS-SubscriptionOption           OPTIONAL,
    basicServiceGroupList           Ext-BasicServiceGroupList       OPTIONAL,
    extensionContainer              [5] ExtensionContainer          OPTIONAL,
    ...}

LCS-PrivacyExceptionList ::= SEQUENCE SIZE (1..maxNumOfPrivacyClass) OF
                                    LCS-PrivacyClass

maxNumOfPrivacyClass  INTEGER ::= 4

LCS-PrivacyClass ::= SEQUENCE {
    ss-Code                         SS-Code,
    ss-Status                       Ext-SS-Status,
    privacyVerificationByMSuser     [0] NULL                        OPTIONAL,
    -- privacyVerificationByMSUser is expected only for SS-code = callunrelated
    externalClientList              [10] ExternalClientList         OPTIONAL,
    -- externalClientList is expected only for SS-code = callunrelated
    plmnClientList                  [21] PLMNClientList             OPTIONAL,
    -- plmnClientList is expected only for SS-code - plmn
    extensionContainer              [32] ExtensionContainer         OPTIONAL,
    ...}
    -- if segmentation is used, the complete LCS-PrivacyClass shall be sent in one segment

ExternalClientList ::= SEQUENCE SIZE (01..maxNumOfExternalClient) OF
                                    ExternalClient

maxNumOfExternalClient  INTEGER ::= 5

PLMNClientList ::= SEQUENCE SIZE (1..maxNumOfPLMNClient) OF
                                    LCSClientInternalID

maxNumOfPLMNClient  INTEGER ::= 5

ExternalClient ::= SEQUENCE {
    clientIdentity                  LCSClientExternalID,
    gmlc-Restriction                [0] GMLC-Restriction            OPTIONAL,
    notificationToMSUser            [1] NotificationToMSUser        OPTIONAL,
    extensionContainer              [21] ExtensionContainer         OPTIONAL,
    ... }

GMLC-Restriction ::= ENUMERATED {
    hplmngmlc-List                      (0),
    home-Country                    (1)}

NotificationToMSUser ::= ENUMERATED {
    notification                    (0),
    notificationWithPrivacyVerification  (1)}

MOLR-List ::= SEQUENCE SIZE (1..maxNumOfMOLR-Class) OF
                                    MOLR-Class

maxNumOfMOLR-Class  INTEGER ::= 3

MOLR-Class ::= SEQUENCE {
    ss-Code                         SS-Code,
    ss-Status                       Ext-SS-Status,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}

ZoneCodeList ::= SEQUENCE SIZE (1..maxNumOfZoneCodes)
                                    OF ZoneCode

ZoneCode ::= OCTET STRING (SIZE (2))
    -- internal structure is defined in TS GSM 03.03

maxNumOfZoneCodes  INTEGER ::= 10
```

```
InsertSubscriberDataRes ::= SEQUENCE {
     teleserviceList                    [1] TeleserviceList              OPTIONAL,
     bearerServiceList                  [2] BearerServiceList            OPTIONAL,
     ss-List                            [3] SS-List                      OPTIONAL,
     odb-GeneralData                    [4] ODB-GeneralData              OPTIONAL,
     regionalSubscriptionResponse       [5]
               RegionalSubscriptionResponse        OPTIONAL,
     supportedCamelPhases               [6] SupportedCamelPhases         OPTIONAL,
     extensionContainer                 [7] ExtensionContainer           OPTIONAL,
     ...}

RegionalSubscriptionResponse ::= ENUMERATED {
     networkNode-AreaRestricted         (0),
     tooManyZoneCodes                   (1),
     zoneCodesConflict                  (2),
     regionalSubscNotSupported          (3)}

DeleteSubscriberDataArg ::= SEQUENCE {
     imsi                               [0] IMSI,
     basicServiceList                   [1] BasicServiceList             OPTIONAL,
     -- The exception handling for reception of unsupported/not allocated
     -- basicServiceCodes is defined in section 6.8.2
     ss-List                            [2] SS-List                      OPTIONAL,
     roamingRestrictionDueToUnsupportedFeature [4] NULL                  OPTIONAL,
     regionalSubscriptionIdentifier     [5] ZoneCode                     OPTIONAL,
     vbsGroupIndication                 [7] NULL                         OPTIONAL,
     vgcsGroupIndication                [8] NULL   OPTIONAL,
     camelSubscriptionInfoWithdraw      [9] NULL   OPTIONAL,
     extensionContainer                 [6] ExtensionContainer OPTIONAL,
     ...,
     gprsSubscriptionDataWithdraw       [10] GPRSSubscriptionDataWithdraw OPTIONAL,
     roamingRestrictedInSgsnDueToUnsuppportedFeature [11] NULL           OPTIONAL,
     lsaInformationWithdraw             [12] LSAInformationWithdraw      OPTIONAL,
     gmlc-ListWithdraw                  [13] NULL                        OPTIONAL }
EDITORIAL NOTE: gmlc-ListWithdraw ASN.1 tag for Release 99 is 14
GPRSSubscriptionDataWithdraw ::= CHOICE {
     allGPRSData                        NULL,
     contextIdList                      ContextIdList}

ContextIdList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                        ContextId

LSAInformationWithdraw ::= CHOICE {
     allLSAData                         NULL,
     lsaIdentityList                    LSAIdentityList }

LSAIdentityList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
                                        LSAIdentity

BasicServiceList ::= SEQUENCE SIZE (1..maxNumOfBasicServices) OF
                                        Ext-BasicServiceCode

maxNumOfBasicServices  INTEGER ::= 70

DeleteSubscriberDataRes ::= SEQUENCE {
     regionalSubscriptionResponse       [0]
                                        RegionalSubscriptionResponse     OPTIONAL,
     extensionContainer                 ExtensionContainer               OPTIONAL,
     ...}

VlrCamelSubscriptionInfo ::= SEQUENCE {
     o-CSI                              [0] O-CSI                        OPTIONAL,
     extensionContainer                 [1] ExtensionContainer           OPTIONAL,
     ...,
     ss-CSI                             [2]  SS-CSI                      OPTIONAL,
     o-BcsmCamelTDP-CriteriaList        [4] O-BcsmCamelTDPCriteriaList   OPTIONAL,
     tif-CSI                            [3]  NULL                        OPTIONAL
     }

SS-CSI ::= SEQUENCE {
     ss-CamelData                       SS-CamelData,
     extensionContainer                 ExtensionContainer               OPTIONAL,
     ...}
```

```
SS-CamelData  ::= SEQUENCE {
     ss-EventList                        SS-EventList,
     gsmSCF-Address                      ISDN-AddressString,
     extensionContainer                  [0] ExtensionContainer            OPTIONAL,
     ...
     }

SS-EventList  ::= SEQUENCE SIZE (1..maxNumOfCamelSSEvents) OF SS-Code
     -- Actions for the following SS-Code values are defined in CAMEL Phase 2:
     -- ect                              SS-Code ::= '00110001'B
     -- multiPTY                         SS-Code ::= '01010001'B
     -- cd                               SS-Code ::= '00100100'B
     -- all other SS codes shall be ignored

maxNumOfCamelSSEvents INTEGER ::= 10

O-CSI ::= SEQUENCE {
     o-BcsmCamelTDPDataList              O-BcsmCamelTDPDataList,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     camelCapabilityHandling             [0] CamelCapabilityHandling       OPTIONAL
     }

O-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDPData
--- O-BcsmCamelTDPDataList shall not contain more than one instance of
--- O-BcsmCamelTDPData containing the same value for o-BcsmTriggerDetectionPoint.
--- For CAMEL Phase 2, this means that only one instance of O-BcsmCamelTDPData is allowed
--- with o-BcsmTriggerDetectionPoint being equal to DP2.

maxNumOfCamelTDPData  INTEGER ::= 10

O-BcsmCamelTDPData ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint         O-BcsmTriggerDetectionPoint,
     serviceKey                          ServiceKey,
     gsmSCF-Address                      [0] ISDN-AddressString,
     defaultCallHandling                 [1] DefaultCallHandling,
     extensionContainer                  [2] ExtensionContainer            OPTIONAL,
     ...
     }

ServiceKey ::= INTEGER (0..2147483647)

O-BcsmTriggerDetectionPoint ::= ENUMERATED {
     collectedInfo (2),
     ... }
-- exception handling:
-- For O-BcsmCamelTDPData sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- O-BcsmCamelTDPDatasequence.

O-BcsmCamelTDPCriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDP-Criteria

O-BcsmCamelTDP-Criteria ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint         O-BcsmTriggerDetectionPoint,
     destinationNumberCriteria           [0] DestinationNumberCriteria     OPTIONAL,
     basicServiceCriteria                [1] BasicServiceCriteria          OPTIONAL,
     callTypeCriteria                    [2] CallTypeCriteria              OPTIONAL,
     ... }

DestinationNumberCriteria  ::= SEQUENCE {
     matchType [0] MatchType,
     destinationNumberList               [1] DestinationNumberList         OPTIONAL,
     destinationNumberLengthList         [2] DestinationNumberLengthList   OPTIONAL,
     ... }

DestinationNumberList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumbers) OF
                                         ISDN-AddressString
-- The receiving entity shall not check the format of a number in
-- the dialled number list

DestinationNumberLengthList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumberLengths) OF
                                             INTEGER(1..maxNumOfISDN-AddressDigits)
```

```
BasicServiceCriteria   ::= SEQUENCE SIZE(1..maxNumOfCamelBasicServiceCriteria) OF
     Ext-BasicServiceCode

maxNumOfISDN-AddressDigits  INTEGER ::= 15

maxNumOfCamelDestinationNumbers  INTEGER ::= 10

maxNumOfCamelDestinationNumberLengths  INTEGER ::= 3

maxNumOfCamelBasicServiceCriteria  INTEGER ::= 5

CallTypeCriteria       ::= ENUMERATED {
     forwarded                          (0),
     notForwarded                       (1)}

MatchType       ::= ENUMERATED {
     inhibiting                         (0),
     enabling                           (1)}


DefaultCallHandling ::= ENUMERATED {
     continueCall (0) ,
     releaseCall (1) ,
     ...}
-- exception handling:
-- reception of values in range 2-31 shall be treated as "continueCall"
-- reception of values greater than 31 shall be treated as "releaseCall"

CamelCapabilityHandling ::= INTEGER(1..16)
-- value 1 = CAMEL phase 1,
-- value 2 = CAMEL phase 2:
-- reception of values greater than 2 shall be treated as CAMEL phase 2

SupportedCamelPhases ::= BIT STRING {
     phase1 (0),
     phase2 (1) } (SIZE (1..16))


-- gprs location information retrieval types

SendRoutingInfoForGprsArg ::= SEQUENCE {
     imsi                               [0] IMSI,
     ggsn-Address                       [1] GSN-Address              OPTIONAL,
     extensionContainer                 [2] ExtensionContainer       OPTIONAL,
     ...}

SendRoutingInfoForGprsRes ::= SEQUENCE {
     sgsn-Address                       [0] GSN-Address,
     ggsn-Address                       [1]  GSN-Address             OPTIONAL,
     mobileNotReachableReason           [2]  AbsentSubscriberDiagnosticSM    OPTIONAL,
     extensionContainer                 [3] ExtensionContainer       OPTIONAL,
     ...}

-- failure report types

FailureReportArg ::= SEQUENCE {
     imsi                               [0] IMSI,
     ggsn-Number                        [1] ISDN-AddressString       ,
     ggsn-Address                       [2] GSN-Address              OPTIONAL,
     extensionContainer                 [3] ExtensionContainer       OPTIONAL,
     ...}

FailureReportRes ::= SEQUENCE {
     extensionContainer                 [0] ExtensionContainer       OPTIONAL,
     ...}

-- gprs notification types

NoteMsPresentForGprsArg ::= SEQUENCE {
     imsi                               [0] IMSI,
     sgsn-Address                       [1] GSN-Address              OPTIONAL,
     ggsn-Address                       [2] GSN-Address              OPTIONAL,
     extensionContainer                 [3] ExtensionContainer       OPTIONAL,
     ...}
```

```
NoteMsPresentForGprsRes ::= SEQUENCE {
    extensionContainer                      [0] ExtensionContainer      OPTIONAL,
    ...}


-- fault recovery types

ResetArg ::= SEQUENCE {
    hlr-Number                          ISDN-AddressString,
    hlr-List                            HLR-List                    OPTIONAL,
    ...}

RestoreDataArg ::= SEQUENCE {
    imsi                                IMSI,
    lmsi                                LMSI                        OPTIONAL,
    extensionContainer                  ExtensionContainer          OPTIONAL,
    ... ,
    vlr-Capability                      [6] VLR-Capability          OPTIONAL }

RestoreDataRes ::= SEQUENCE {
    hlr-Number                          ISDN-AddressString,
    msNotReachable                      NULL                        OPTIONAL,
    extensionContainer                  ExtensionContainer          OPTIONAL,
    ...}

-- VBS/VGCS types
VBSDataList ::= SEQUENCE SIZE (1..maxNumOfVBSGroupIds) OF
                                        VoiceBroadcastData

VGCSDataList ::= SEQUENCE SIZE (1..maxNumOfVGCSGroupIds) OF
                                        VoiceGroupCallData

maxNumOfVBSGroupIds  INTEGER ::= 50

maxNumOfVGCSGroupIds  INTEGER ::= 50

VoiceGroupCallData  ::= SEQUENCE {
    groupId                             GroupId,
    extensionContainer                  ExtensionContainer          OPTIONAL,
    ...}

VoiceBroadcastData ::= SEQUENCE {
    groupid                             GroupId,
    broadcastInitEntitlement            NULL                        OPTIONAL,
    extensionContainer                  ExtensionContainer          OPTIONAL,
    ...}

GroupId  ::= OCTET STRING (SIZE (3))
    -- Refers to the Group Identification as specified in GSM TS 03.03
    -- and 03.68/ 03.69

-- provide subscriber info types

ProvideSubscriberInfoArg ::= SEQUENCE {
    imsi     [0] IMSI,
    lmsi     [1] LMSI                   OPTIONAL,
    requestedInfo                       [2] RequestedInfo,
    extensionContainer                  [3] ExtensionContainer      OPTIONAL,
    ...}

ProvideSubscriberInfoRes ::= SEQUENCE {
    subscriberInfo                      SubscriberInfo,
    extensionContainer                  ExtensionContainer          OPTIONAL,
    ...}

SubscriberInfo ::= SEQUENCE {
    locationInformation                 [0] LocationInformation     OPTIONAL,
    subscriberState                     [1] SubscriberState         OPTIONAL,
    extensionContainer                  [2] ExtensionContainer      OPTIONAL,
    ...}
```

```
RequestedInfo ::= SEQUENCE {
     locationInformation                [0] NULL                              OPTIONAL,
     subscriberState                    [1] NULL                              OPTIONAL,
     extensionContainer                 [2] ExtensionContainer                OPTIONAL,
     ...}

LocationInformation ::= SEQUENCE {
     ageOfLocationInformation           AgeOfLocationInformation              OPTIONAL,
     geographicalInformation            [0] GeographicalInformation           OPTIONAL,
     vlr-number                         [1] ISDN-AddressString                OPTIONAL,
     locationNumber                     [2] LocationNumber                    OPTIONAL,
     cellIdOrLAI                        [3] CellIdOrLAI                       OPTIONAL,
     extensionContainer                 [4] ExtensionContainer                OPTIONAL,
     ...}

GeographicalInformation ::= OCTET STRING (SIZE (8))
-- Refers to geographical Information defined in GSM 03.32.
-- Only the description of an ellipsoid point with uncertainty circle
--as specified in GSM 03.32 is allowed to be used
-- The internal structure according to GSM 03.32 is as follows:
--        Type of shape (ellipsoid point with uncertainty circle)          1 octet
--        Degrees of Latitude                                              3 octets
--        Degrees of Longitude                                             3 octets
--        Uncertainty code                                                 1 octet

LocationNumber ::= OCTET STRING (SIZE (2..10))
     -- the internal structure is defined in CCITT Rec Q.763

SubscriberState ::= CHOICE {
     assumedIdle                        [0] NULL,
     camelBusy [1] NULL,
     netDetNotReachable                 NotReachableReason,
     notProvidedFromVLR                 [2] NULL}

NotReachableReason ::= ENUMERATED {
     msPurged (0),
     imsiDetached (1),
     restrictedArea (2),
     notRegistered (3)}

-- any time interrogation info types

AnyTimeInterrogationArg ::= SEQUENCE {
     subscriberIdentity                 [0] SubscriberIdentity,
     requestedInfo                      [1] RequestedInfo,
     gsmSCF-Address                     [3] ISDN-AddressString,
     extensionContainer                 [2] ExtensionContainer                OPTIONAL,
     ...}

AnyTimeInterrogationRes ::= SEQUENCE {
     subscriberInfo                     SubscriberInfo,
     extensionContainer                 ExtensionContainer                    OPTIONAL,
     ...}


END
```

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

17.7.5 Supplementary service codes

```
MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version5 (5)}

DEFINITIONS

::=

BEGIN

```

```
SS-Code ::= OCTET STRING (SIZE (1))
     -- This type is used to represent the code identifying a single
     -- supplementary service, a group of supplementary services, or
     -- all supplementary services. The services and abbreviations
     -- used are defined in TS GSM 02.04. The internal structure is
     -- defined as follows:
     --
     -- bits 87654321: group (bits 8765), and specific service
     -- (bits 4321)

allSS                                   SS-Code ::= '00000000'B
     -- reserved for possible future use
     -- all SS

allLineIdentificationSS                 SS-Code ::= '00010000'B
     -- reserved for possible future use
     -- all line identification SS
clip                                    SS-Code ::= '00010001'B
     -- calling line identification presentation
clir                                    SS-Code ::= '00010010'B
     -- calling line identification restriction
colp                                    SS-Code ::= '00010011'B
     -- connected line identification presentation
colr                                    SS-Code ::= '00010100'B
     -- connected line identification restriction
mci                                     SS-Code ::= '00010101'B
     -- reserved for possible future use
     -- malicious call identification

allNameIdentificationSS                 SS-Code ::= '00011000'B
     -- all name identification SS
cnap                                    SS-Code ::= '00011001'B
     -- calling name presentation

     -- SS-Codes '00011010'B to '00011111'B are reserved for future
     -- NameIdentification Supplementary Service use.

allForwardingSS                         SS-Code ::= '00100000'B
     -- all forwarding SS
cfu                                     SS-Code ::= '00100001'B
     -- call forwarding unconditional
allCondForwardingSS                     SS-Code ::= '00101000'B
     -- all conditional forwarding SS
cfb                                     SS-Code ::= '00101001'B
     -- call forwarding on mobile subscriber busy
cfnry                                   SS-Code ::= '00101010'B
     -- call forwarding on no reply
cfnrc                                   SS-Code ::= '00101011'B
     -- call forwarding on mobile subscriber not reachable
cd                                      SS-Code ::= '00100100'B
     -- call deflection

allCallOfferingSS                       SS-Code ::= '00110000'B
     -- reserved for possible future use
     -- all call offering SS includes also all forwarding SS
ect                                     SS-Code ::= '00110001'B
          -- explicit call transfer
mah                                     SS-Code ::= '00110010'B
     -- reserved for possible future use
     -- mobile access hunting

allCallCompletionSS                     SS-Code ::= '01000000'B
     -- reserved for possible future use
     -- all Call completion SS
cw                                      SS-Code ::= '01000001'B
     -- call waiting
hold                                    SS-Code ::= '01000010'B
     -- call hold
ccbs-A                                  SS-Code ::= '01000011'B
     -- completion of call to busy subscribers, originating side
ccbs-B                                  SS-Code ::= '01000100'B
     -- completion of call to busy subscribers, destination side
     -- this SS-Code is used only in InsertSubscriberData
```

```
allMultiPartySS                         SS-Code ::= '01010000'B
     -- reserved for possible future use
     -- all multiparty SS
multiPTY                                SS-Code ::= '01010001'B
     -- multiparty

allCommunityOfInterest-SS               SS-Code ::= '01100000'B
     -- reserved for possible future use
     -- all community of interest SS
cug                                     SS-Code ::= '01100001'B
     -- closed user group

allChargingSS                           SS-Code ::= '01110000'B
     -- reserved for possible future use
     -- all charging SS
aoci                                    SS-Code ::= '01110001'B
     -- advice of charge information
aocc                                    SS-Code ::= '01110010'B
     -- advice of charge charging

allAdditionalInfoTransferSS             SS-Code ::= '10000000'B
     -- reserved for possible future use
     -- all additional information transfer SS
uus1                                    SS-Code ::= '10000001'B
     -- UUS1 user-to-user signalling
uus2                                    SS-Code ::= '10000010'B
     -- UUS2 user-to-user signalling
uus3                                    SS-Code ::= '10000011'B
     -- UUS3 user-to-user signalling

allBarringSS                            SS-Code ::= '10010000'B
     -- all barring SS
barringOfOutgoingCalls                  SS-Code ::= '10010001'B
     -- barring of outgoing calls
baoc                                    SS-Code ::= '10010010'B
     -- barring of all outgoing calls
boic                                    SS-Code ::= '10010011'B
     -- barring of outgoing international calls
boicExHC                                SS-Code ::= '10010100'B
     -- barring of outgoing international calls except those directed
     -- to the home PLMN
barringOfIncomingCalls                  SS-Code ::= '10011001'B
     -- barring of incoming calls
baic                                    SS-Code ::= '10011010'B
     -- barring of all incoming calls
bicRoam                                 SS-Code ::= '10011011'B
     -- barring of incoming calls when roaming outside home PLMN
     -- Country

allPLMN-specificSS                      SS-Code ::= '11110000'B
plmn-specificSS-1                       SS-Code ::= '11110001'B
plmn-specificSS-2                       SS-Code ::= '11110010'B
plmn-specificSS-3                       SS-Code ::= '11110011'B
plmn-specificSS-4                       SS-Code ::= '11110100'B
plmn-specificSS-5                       SS-Code ::= '11110101'B
plmn-specificSS-6                       SS-Code ::= '11110110'B
plmn-specificSS-7                       SS-Code ::= '11110111'B
plmn-specificSS-8                       SS-Code ::= '11111000'B
plmn-specificSS-9                       SS-Code ::= '11111001'B
plmn-specificSS-A                       SS-Code ::= '11111010'B
plmn-specificSS-B                       SS-Code ::= '11111011'B
plmn-specificSS-C                       SS-Code ::= '11111100'B
plmn-specificSS-D                       SS-Code ::= '11111101'B
plmn-specificSS-E                       SS-Code ::= '11111110'B
plmn-specificSS-F                       SS-Code ::= '11111111'B

allCallPrioritySS                       SS-Code ::= '10100000'B
     -- reserved for possible future use
     -- all call priority SS
emlpp                                   SS-Code ::= '10100001'B
     -- enhanced Multilevel Precedence Pre-emption (EMLPP) service
```

```
allLCSPrivacyException                  SS-Code ::= '10110000'B
     -- all LCS Privacy Exception Classes
universal                               SS-Code ::= '10110001'B
     -- allow location by any LCS client
callrelated                             SS-Code ::= '10110010'B
     -- allow location by any value added LCS client to which a call
     -- is established from the target MS
callunrelated                           SS-Code ::= '10110011'B
     -- allow location by designated external value added LCS clients
plmnoperator                            SS-Code ::= '10110100'B
     -- allow location by designated PLMN operator LCS clients

allMOLR-SS                              SS-Code ::= '10110000'B
     -- all Mobile Originating Location Request Classes
basicSelfLocation                       SS-Code ::= '10110001'B
     -- allow an MS to request its own location
autonomousSelfLocation                  SS-Code ::= '10110010'B
     -- allow an MS to perform self location without interaction
     -- with the PLMN for a predetermined period of time
transferToThirdParty                    SS-Code ::= '10110011'B
     -- allow an MS to request transfer of its location to another LCS client
EDITORIAL NOTE: the above MOLR codes have just been assigned

END
```

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

17.7.7 Error data types

```
MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version5 (5)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoamingNotAllowedParam,
   CallBarredParam,
   CUG-RejectParam,
   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   OR-NotAllowedParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   AbsentSubscriberDiagnosticSM,
```

```
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam,
   UnauthorizedRequestingNetwork-Param,
   UnauthorizedLCSClient-Param,
   PositionMethodFailure-Param,
   PositionMethodFailureWithRestart-Param,
   LMUUnknownOrOffline-Param,
   TrafficChannelEstablishmentFailure-Param,
   UnknownOrUnreachableLCSClient-Param


;

IMPORTS
   SS-Status
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version5 (5)}

   SignalInfo,
   BasicServiceCode,
   NetworkResource
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version5 (5)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version5 (5)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version5 (5)}
;

RoamingNotAllowedParam ::= SEQUENCE {
    roamingNotAllowedCause              RoamingNotAllowedCause,
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ...}

RoamingNotAllowedCause ::= ENUMERATED {
    plmnRoamingNotAllowed  (0),
    operatorDeterminedBarring  (3)}

CallBarredParam ::= CHOICE {
    callBarringCause                    CallBarringCause,
    -- call BarringCause must not be used in version 3
    extensibleCallBarredParam           ExtensibleCallBarredParam
    -- extensibleCallBarredParam must not be used in version <3
    }

CallBarringCause ::= ENUMERATED {
    barringServiceActive  (0),
    operatorBarring  (1)}

ExtensibleCallBarredParam ::= SEQUENCE {
    callBarringCause                    CallBarringCause                OPTIONAL,
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ... ,
    unauthorisedMessageOriginator       [1] NULL                        OPTIONAL }

CUG-RejectParam ::= SEQUENCE {
    cug-RejectCause                     CUG-RejectCause                 OPTIONAL,
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ...}

CUG-RejectCause ::= ENUMERATED {
    incomingCallsBarredWithinCUG  (0),
    subscriberNotMemberOfCUG  (1),
    requestedBasicServiceViolatesCUG-Constraints  (5),
    calledPartySS-InteractionViolation  (7)}
```

```
SS-IncompatibilityCause ::= SEQUENCE {
     ss-Code                              [1] SS-Code                          OPTIONAL,
     basicService                         BasicServiceCode                     OPTIONAL,
     ss-Status [4] SS-Status              OPTIONAL,
     ...}

PW-RegistrationFailureCause ::= ENUMERATED {
     undetermined  (0),
     invalidFormat  (1),
     newPasswordsMismatch  (2)}


SM-EnumeratedDeliveryFailureCause ::= ENUMERATED {
     memoryCapacityExceeded  (0),
     equipmentProtocolError  (1),
     equipmentNotSM-Equipped  (2),
     unknownServiceCentre  (3),
     sc-Congestion  (4),
     invalidSME-Address  (5),
     subscriberNotSC-Subscriber  (6)}

SM-DeliveryFailureCause ::= SEQUENCE {
     sm-EnumeratedDeliveryFailureCause    SM-EnumeratedDeliveryFailureCause,
     diagnosticInfo                       SignalInfo                           OPTIONAL,
     extensionContainer                   ExtensionContainer                   OPTIONAL,
     ...}

AbsentSubscriberSM-Param ::= SEQUENCE {
     absentSubscriberDiagnosticSM         AbsentSubscriberDiagnosticSM      OPTIONAL,
     -- AbsentSubscriberDiagnosticSM can be either for non-GPRS
     -- or for GPRS
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...,
     additionalAbsentSubscriberDiagnosticSM    [0]  AbsentSubscriberDiagnosticSM OPTIONAL }
     -- if received, additionalAbsentSubscriberDiagnosticSM
     -- is for GPRS and absentSubscriberDiagnosticSM is
     -- for non-GPRS

AbsentSubscriberDiagnosticSM ::= INTEGER (0..255)
     -- AbsentSubscriberDiagnosticSM values are defined in ETS 300 536 (GSM 03.40)

SystemFailureParam ::= CHOICE {
     networkResource                      NetworkResource,
     -- networkResource must not be used in version 3
     extensibleSystemFailureParam         ExtensibleSystemFailureParam
     -- extensibleSystemFailureParam must not be used in version <3
     }

ExtensibleSystemFailureParam ::= SEQUENCE {
     networkResource                      NetworkResource                   OPTIONAL,
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}

DataMissingParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}

UnexpectedDataParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}

FacilityNotSupParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}

OR-NotAllowedParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}

UnknownSubscriberParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...,
     unknownSubscriberDiagnostic          UnknownSubscriberDiagnostic       OPTIONAL}
```

```
UnknownSubscriberDiagnostic ::= ENUMERATED {
     imsiUnknown  (0),
     gprsSubscriptionUnknown  (1),
     ...}
     -- if unknown values are received in
     -- unknownSubscriberDiagnostic they shall be discarded
```

```
NumberChangedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
UnidentifiedSubParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
IllegalSubscriberParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
IllegalEquipmentParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
BearerServNotProvParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
TeleservNotProvParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
TracingBufferFullParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
NoRoamingNbParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
AbsentSubscriberParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     absentSubscriberReason              [0] AbsentSubscriberReason        OPTIONAL}
```

```
AbsentSubscriberReason ::= ENUMERATED {
     imsiDetach (0),
     restrictedArea (1),
     noPageResponse (2),
     ...}
-- exception handling: at reception of other values than the ones listed the
-- AbsentSubscriberReason shall be ignored.
```

```
BusySubscriberParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     ccbs-Possible                       [0] NULL                          OPTIONAL,
     ccbs-Busy [1] NULL                       OPTIONAL}
```

```
NoSubscriberReplyParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ForwardingViolationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ForwardingFailedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
ATI-NotAllowedParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
SubBusyForMT-SMS-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ... ,
     gprsConnectionSuspended             NULL     OPTIONAL }
     -- If GprsConnectionSuspended is not understood it shall
     -- be discarded

MessageWaitListFullParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

ResourceLimitationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

NoGroupCallNbParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

IncompatibleTerminalParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

ShortTermDenialParam ::= SEQUENCE {
     ...}

LongTermDenialParam ::= SEQUENCE {
     ...}

UnauthorizedRequestingNetwork-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

UnauthorizedLCSClient-Param ::= SEQUENCE {
     unauthorizedLCSClient-Diagnostic    [0] UnauthorizedLCSClient-Diagnostic  OPTIONAL,
     extensionContainer                  [1] ExtensionContainer                OPTIONAL,
     ... }

UnauthorizedLCSClient-Diagnostic ::= ENUMERATED {
     noAdditionalInformation (0),
     clientNotInMSPrivacyExceptionList (1),
     callToClientNotSetup (2),
     privacyOverrideNotApplicable (3),
     disallowedByLocalRegulatoryRequirements (4),
     ... }
--   exception handling:
--   any unrecognized value shall be ignored

PositionMethodFailure-Param ::= SEQUENCE {
     positionMethodFailure-Diagnostic    [0] PositionMethodFailure-Diagnostic  OPTIONAL,
     extensionContainer                  [1] ExtensionContainer                OPTIONAL,
     ... }

PositionMethodFailure-Diagnostic ::= ENUMERATED {
     congestion  (0),
     insufficientResources  (1),
     insufficientMeasurementData  (2),
     inconsistentMeasurementData  (3),
     locationProcedureNotCompleted  (4),
     locationProcedureNotSupportedByTargetMS  (5),
     qoSNotAttainable  (6),
     ... }
--   exception handling:
--   any unrecognized value shall be ignored

PositionMethodFailureWithRestart-Param ::= SEQUENCE {
          extensionContainer             ExtensionContainer                OPTIONAL,
     ... }

LMUUnknownOrOffline-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}
```

```
TrafficChannelEstablishmentFailure-Param ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

UnknownOrUnreachableLCSClient-Param ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}


END
```

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

17.7.8 Common data types

```
MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version5 (5)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- general data types and values
   AddressString,
   ISDN-AddressString,
   maxISDN-AddressLength,
   ISDN-SubaddressString,
   ExternalSignalInfo,
   Ext-ExternalSignalInfo,
   SignalInfo,
   maxSignalInfoLength,
   AlertingPattern,

   -- data types for numbering and identification
   IMSI,
   TMSI,
   Identity,
   SubscriberId,
   IMEI,
   HLR-List,
   LMSI,
   GlobalCellId,
   NetworkResource,
   NAEA-PreferredCI,
   NAEA-CIC,
   ASCI-CallReference,
   SubscriberIdentity,

   -- data types for CAMEL
   CellIdOrLAI,

   -- data types for subscriber management
   BasicServiceCode,
   Ext-BasicServiceCode,
   EMLPP-Info,
   EMLPP-Priority,

   -- data types for geographic location
   AgeOfLocationInformation,
   LCSClientExternalID,
   LCSClientInternalID
;

IMPORTS
   TeleserviceCode,
   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
```

```
   gsm-Network (1) modules (3) map-TS-Code (19) version5 (5)}

   BearerServiceCode,
   Ext-BearerServiceCode
FROM MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version5 (5)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version5 (5)}
;


-- general data types

TBCD-STRING ::= OCTET STRING
     -- This type (Telephony Binary Coded Decimal String) is used to
     -- represent several digits from 0 through 9, *, #, a, b, c, two
     -- digits per octet, each digit encoded 0000 to 1001 (0 to 9),
     -- 1010 (*), 1011 (#), 1100 (a), 1101 (b) or 1110 (c); 1111 used
     -- as filler when there is an odd number of digits.

     -- bits 8765 of octet n encoding digit 2n
     -- bits 4321 of octet n encoding digit 2(n-1) +1

AddressString ::= OCTET STRING (SIZE (1..maxAddressLength))
     -- This type is used to represent a number for addressing
     -- purposes. It is composed of
     --   a)   one octet for nature of address, and numbering plan
     --        indicator.
     --   b)   digits of an address encoded as TBCD-String.

     -- a)     The first octet includes a one bit extension indicator, a
     --        3 bits nature of address indicator and a 4 bits numbering
     --        plan indicator, encoded as follows:

     -- bit 8: 1  (no extension)

     -- bits 765: nature of address indicator
     --   000  unknown
     --   001  international number
     --   010  national significant number
     --   011  network specific number
     --   100  subscriber number
     --   101  reserved
     --   110  abbreviated number
     --   111  reserved for extension

     -- bits 4321: numbering plan indicator
     --   0000  unknown
     --   0001  ISDN/Telephony Numbering Plan (Rec CCITT E.164)
     --   0010  spare
     --   0011  data numbering plan (CCITT Rec X.121)
     --   0100  telex numbering plan (CCITT Rec F.69)
     --   0101  spare
     --   0110  land mobile numbering plan (CCITT Rec E.212)
     --   0111  spare
     --   1000  national numbering plan
     --   1001  private numbering plan
     --   1111  reserved for extension

     --   all other values are reserved.

     -- b)     The following octets representing digits of an address
     --        encoded as a TBCD-STRING.

maxAddressLength  INTEGER ::= 20

ISDN-AddressString ::=
              AddressString (SIZE (1..maxISDN-AddressLength))
     -- This type is used to represent ISDN numbers.

maxISDN-AddressLength  INTEGER ::= 9
```

```
ISDN-SubaddressString ::=
            OCTET STRING (SIZE (1..maxISDN-SubaddressLength))
    -- This type is used to represent ISDN subaddresses.
    -- It is composed of
    --   a)   one octet for type of subaddress and odd/even indicator.
    --   b)   20 octets for subaddress information.

    --   a)   The first octet includes a one bit extension indicator, a
    --        3 bits type of subaddress and a one bit odd/even indicator,
    --        encoded as follows:

    --   bit 8: 1  (no extension)

    --   bits 765: type of subaddress
    --        000  NSAP (X.213/ISO 8348 AD2)
    --        010  User Specified
    --        All other values are reserved

    --   bit 4: odd/even indicator
    --        0  even number of address signals
    --        1  odd number of address signals
    --        The odd/even indicator is used when the type of subaddress
    --        is "user specified" and the coding is BCD.

    --   bits 321: 000 (unused)

    --   b) Subaddress information.
    --   The NSAP X.213/ISO8348AD2 address shall be formatted as specified
    --   by octet 4 which contains the Authority and Format Identifier
    --   (AFI). The encoding is made according to the "preferred binary
    --   encoding" as defined in X.213/ISO834AD2. For the definition
    --   of this type of subaddress, see CCITT Rec I.334.

    --   For User-specific subaddress, this field is encoded according
    --   to the user specification, subject to a maximum length of 20
    --   octets. When interworking with X.25 networks BCD coding should
    --   be applied.

maxISDN-SubaddressLength  INTEGER ::= 21

ExternalSignalInfo ::= SEQUENCE {
    protocolId                      ProtocolId,
    signalInfo                      SignalInfo,
    -- Information about the internal structure is given in
    -- subclause 7.6.9.
    extensionContainer              ExtensionContainer              OPTIONAL,
    -- extensionContainer must not be used in version 2
    ...}

SignalInfo ::= OCTET STRING (SIZE (1..maxSignalInfoLength))

maxSignalInfoLength  INTEGER ::= 200
    -- This NamedValue represents the theoretical maximum number of
    -- octets which are available to carry a single data type,
    -- without requiring segmentation to cope with the network layer
    -- service. However, the actual maximum size available for a data
    -- type may be lower, especially when other information elements
    -- have to be included in the same component.

ProtocolId ::= ENUMERATED {
    gsm-0408  (1),
    gsm-0806  (2),
    gsm-BSSMAP  (3),
    -- Value 3 is reserved and must not be used
    ets-300102-1  (4)}

Ext-ExternalSignalInfo ::= SEQUENCE {
    ext-ProtocolId                  Ext-ProtocolId,
    signalInfo                      SignalInfo,
    -- Information about the internal structure is given in
    -- subclause 7.6.9.10
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
Ext-ProtocolId ::= ENUMERATED {
     ets-300356  (1),
     ...,
     gsm-0471 (2),
     -- Value 2 refers to the smlc-lmu messages defined in GSM 04.71
     gsm-0871  (3)
     -- Value 3 refers to the SMLC-BSC messages defined in GSM 08.71
      }
-- exception handling:
-- For Ext-ExternalSignalInfo sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- Ext-ExternalSignalInfo sequence.
```

```
AlertingPattern ::= OCTET STRING (SIZE (1) )
     -- This type is used to represent Alerting Pattern

     --   bits 8765 : 0000 (unused)

     --   bits 43 : type of Pattern
     --        00 level
     --        01 category
     --        10 category
     --        all other values are reserved.

     --   bits 21 : type of alerting

alertingLevel-0   AlertingPattern ::= '00000000'B
alertingLevel-1   AlertingPattern ::= '00000001'B
alertingLevel-2   AlertingPattern ::= '00000010'B
     -- all other values of Alerting level are reserved
     -- Alerting Levels are defined in GSM 02.07

alertingCategory-1   AlertingPattern ::= '00000100'B
alertingCategory-2   AlertingPattern ::= '00000101'B
alertingCategory-3   AlertingPattern ::= '00000110'B
alertingCategory-4   AlertingPattern ::= '00000111'B
alertingCategory-5   AlertingPattern ::= '00001000'B
     -- all other values of Alerting Category are reserved
     -- Alerting categories are defined in GSM 02.07
```

```
-- data types for numbering and identification
```

```
IMSI ::= TBCD-STRING (SIZE (3..8))
     -- digits of MCC, MNC, MSIN are concatenated in this order.
```

```
Identity ::= CHOICE {
     imsi                                IMSI,
     imsi-WithLMSI                       IMSI-WithLMSI}
```

```
IMSI-WithLMSI ::= SEQUENCE {
     imsi                                IMSI,
     lmsi                                LMSI,
     -- a special value 00000000 indicates that the LMSI is not in use
     ...}
```

```
ASCI-CallReference ::= TBCD-STRING (SIZE (1..8))
     -- digits of VGCS/VBC-area,Group-ID are concatenated in this order.
```

```
TMSI ::= OCTET STRING (SIZE (1..4))
```

```
SubscriberId ::= CHOICE {
     imsi                                [0] IMSI,
     tmsi                                [1] TMSI}
```

```
IMEI ::= TBCD-STRING (SIZE (8))
     --   Refers to International Mobile Station Equipment Identity
     --   and Software Version Number (SVN) defined in TS GSM 03.03.
     --   If the SVN is not present the last octet shall contain the
     --   digit 0 and a filler.
     --   If present the SVN shall be included in the last octet.
```

```
HLR-Id ::= IMSI
     -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
     -- MSIN) forming HLR Id defined in TS GSM 03.03.
```

```
HLR-List ::= SEQUENCE SIZE (1..maxNumOfHLR-Id) OF
                                        HLR-Id

maxNumOfHLR-Id  INTEGER ::= 50

LMSI ::= OCTET STRING (SIZE (4))

GlobalCellId ::= OCTET STRING (SIZE (5..7))
     -- Refers to Cell Global Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS GSM 04.08
     -- octets 6 and 7                   Cell Identity (CI) according to TS GSM 04.08

NetworkResource ::= ENUMERATED {
     plmn  (0),
     hlr  (1),
     vlr  (2),
     pvlr  (3),
     controllingMSC  (4),
     vmsc  (5),
     eir  (6),
     rss  (7)}

NAEA-PreferredCI ::= SEQUENCE {
     naea-PreferredCIC                  [0] NAEA-CIC,
     extensionContainer                 [1] ExtensionContainer          OPTIONAL,
     ...}

NAEA-CIC ::= OCTET STRING (SIZE (3))
     -- The internal structure is defined by the Carrier Identification
     -- parameter in ANSI T1.113.3. Carrier codes between “000” and “999” may
     -- be encoded as 3 digits using “000” to “999” or as 4 digits using
     -- “0000” to “0999”. Carrier codes between “1000” and “9999” are encoded
     -- using 4 digits.

SubscriberIdentity ::= CHOICE {
     imsi                               [0] IMSI,
     msisdn                             [1] ISDN-AddressString
     }

LCSClientExternalID ::= SEQUENCE {
     externalAddress                    [0] AddressString               OPTIONAL,
     extensionContainer                 [1] ExtensionContainer          OPTIONAL,
     ... }

LCSClientInternalID ::= ENUMERATED {
     broadcastService                   (0),
     o-andM-HPLMN                       (1),
     o-andM-VPLMN                       (2),
     anonymousLocation                  (3),
     targetMSsubscribedService          (4),
     ... }


-- data types for CAMEL

CellIdOrLAI ::= CHOICE {
     cellIdFixedLength                  [0] CellIdFixedLength,
     laiFixedLength                     [1] LAIFixedLength}
```

```
CellIdFixedLength ::= OCTET STRING (SIZE (7))
     -- Refers to Cell Global Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS GSM 04.08
     -- octets 6 and 7                   Cell Identity (CI) according to TS GSM 04.08

LAIFixedLength ::= OCTET STRING (SIZE (5))
     -- Refers to Location Area Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS GSM 04.08


-- data types for subscriber management

BasicServiceCode ::= CHOICE {
     bearerService                      [2] BearerServiceCode,
     teleservice                        [3] TeleserviceCode}

Ext-BasicServiceCode ::= CHOICE {
     ext-BearerService                  [2] Ext-BearerServiceCode,
     ext-Teleservice                    [3] Ext-TeleserviceCode}

EMLPP-Info ::= SEQUENCE {
     maximumentitledPriority            EMLPP-Priority,
     defaultPriority                    EMLPP-Priority,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}

EMLPP-Priority ::= INTEGER (0..15)
     -- The mapping from the values A,B,0,1,2,3,4 to the integer-value is
     -- specified as follows where A is the highest and 4 is the lowest
     -- priority level
     -- the integer values 7-15 are spare and shall be mapped to value 4

priorityLevelA                          EMLPP-Priority ::= 6
priorityLevelB                          EMLPP-Priority ::= 5
priorityLevel0                          EMLPP-Priority ::= 0
priorityLevel1                          EMLPP-Priority ::= 1
priorityLevel2                          EMLPP-Priority ::= 2
priorityLevel3                          EMLPP-Priority ::= 3
priorityLevel4                          EMLPP-Priority ::= 4


   -- data types for geographic location

AgeOfLocationInformation ::= INTEGER (0..32767)
-- the value represents the elapsed time in minutes since the last
-- network contact of the mobile station (i.e. the actuality of the
-- location information).
-- value “0” indicates that the MS is currently in contact with the
--           network
-- value “32767” indicates that the location information is at least
--               32767 minutes old

END
```

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

17.7.13 Location service data types

```
MAP-LCS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LCS-DataTypes (25) version5 (5)}

DEFINITIONS
IMPLICIT TAGS
::=
BEGIN

EXPORTS
   RoutingInfoForLCS-Arg,
   RoutingInfoForLCS-Res,
   ProvideSubscriberLocation-Arg,
   ProvideSubscriberLocation-Res,
   SubscriberLocationReport-Arg,
   SubscriberLocationReport-Res,
   LocationType,
   LCSClientName,
   LCS-QoS,
   Horizontal-Accuracy,
   ResponseTime,
   Ext-GeographicalInformation
   PerformLocation-Arg,
   PerformLocation-Res,
   LCSRegistration-Arg,
   LCSRegistration-Res,
   LCSInformationRequest-Arg,
   LCSInformationReport-Arg,
   LCSReset-Arg,
   LCSAssignTrafficChannel-Arg,
   LCSAssignTrafficChannel-Res
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   IMEI,
   IMSI,
   LMSI,
   Identity,
   SubscriberIdentity,
   GlobalCellId,
   Ext-ExternalSignalInfo,
   AgeOfLocationInformation,
   LCSClientExternalID,
   LCSClientInternalID
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version5 (5)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version5 (5)}

   USSD-DataCodingScheme,
   USSD-String
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
   map-SS-DataTypes (14) version5 (5)}
;
```

```
RoutingInfoForLCS-Arg ::= SEQUENCE {
     mlcNumber                          [0] ISDN-AddressString,
     targetMS                           [1] SubscriberIdentity,
     extensionContainer                 [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
RoutingInfoForLCS-Res ::= SEQUENCE {
     targetMS                           [0] SubscriberIdentity,
     lcsLocationInfo                    [1] LCSLocationInfo,
     extensionContainer                 [2] ExtensionContainer          OPTIONAL,
     ...}
```

```
LCSLocationInfo ::= SEQUENCE {
    msc-Number                          ISDN-AddressString,
    lmsi                                [0] LMSI                            OPTIONAL,
    extensionContainer                  [1] ExtensionContainer              OPTIONAL,
    ...}
```

```
ProvideSubscriberLocation-Arg ::= SEQUENCE {
    locationType                        LocationType,
    mlc-Number                          ISDN-AddressString,
    lcs-ClientID                        [0] LCS-ClientID                    OPTIONAL,
    privacyOverride                     [1] NULL                            OPTIONAL,
    imsi                                [2] IMSI                            OPTIONAL,
    msisdn                              [3] ISDN-AddressString              OPTIONAL,
    lmsi                                [4] LMSI                            OPTIONAL,
    imei                                [5] IMEI                            OPTIONAL,
    na-ESRK                             [6] ISDN-AddressString              OPTIONAL,
    lcs-Priority                        [67] LCS-Priority                   OPTIONAL,
    lcs-QoS                             [78] LCS-QoS                        OPTIONAL,
    extensionContainer                  [89] ExtensionContainer             OPTIONAL,
    ...}

-- one of imsi or, msisdn or na-ESRK is mandatory
-- na-ESRK is applicable only to North American PLMNs
```

EDITORIAL NOTE: the ASN.1 TAG for extensionContainer should be 8

```
LocationType ::= SEQUENCE {
    locationEstimateType                [0] LocationEstimateType,
    ... }
```

```
LocationEstimateType ::= ENUMERATED {
    currentLocation                     (0),
    currentOrLastKnownLocation          (1),
    initialLocation                     (2),
    ... }
--  exception handling:
--  a ProvideSubscriberLocation-Arg containing an unrecognized LocationEstimateType
--  shall be rejected by the receiver with a return error cause of unexpected data value
```

```
LCS-ClientID ::= SEQUENCE {
    lcsClientType                       [0] LCSClientType,
    lcsClientExternalID                 [1] LCSClientExternalID             OPTIONAL,
    lcsClientDialedByMS                 [2] AddressString                   OPTIONAL,
    lcsClientInternalID                 [3] LCSClientInternalID             OPTIONAL,
    lcsClientName                       [4] LCSClentName                    OPTIONAL,
    ... }
```

```
LCSClientType ::= ENUMERATED {
    emergencyServices                   (0),
    valueAddedServices                  (1),
    plmnOperatorServices                (2),
    lawfulInterceptServices             (3),
    ... }
--  exception handling:
--  unrecognized values may be ignored if the LCS client uses the privacy override
--  otherwise, an unrecognized value shall be treated as unexpected data by a receiver
--  a return error shall then be returned if received in a MAP invoke
```

```
LCSClientName ::= SEQUENCE {
    dataCodingScheme                    [0] USSD-DataCodingScheme,
    nameString                          [2] NameString,
    ...}

-- The USSD-DataCodingScheme shall indicate use of the default alphabet through the
-- following encoding
--  bit  7 6 5 4 3 2 1 0
--       0 0 0 0 1 1 1 1
```

```
NameString ::= USSD-String (SIZE (1..maxNameStringLength))

maxNameStringLength  INTEGER ::= 63
```

```
LCS-Priority ::= OCTET STRING (SIZE (1))
    -- 0 = highest priority
    -- 1 = normal priority
    -- all other values treated as 1
```

```
LCS-QoS ::= SEQUENCE {
    horizontal-accuracy                 [0] Horizontal-Accuracy          OPTIONAL,
    verticalCoordinateRequest           [1] NULL                         OPTIONAL,
    vertical-accuracy                   [2] Vertical-Accuracy            OPTIONAL,
    responseTime                        [31] ResponseTime                OPTIONAL,
    extensionContainer                  [42] ExtensionContainer          OPTIONAL,
    ...}
```

```
Horizontal-Accuracy ::= OCTET STRING (SIZE (1))
    -- bit 8 = 0
    -- bits 7-1 = 7 bit Uncertainty Code defined in GSM 03.32
```

```
Vertical-Accuracy ::= OCTET STRING (SIZE (1))
    -- bit 8 = 0
    -- bits 7-1 = 7 bit Vertical Uncertainty Code defined in GSM 03.32
```

```
ResponseTime ::= SEQUENCE {
    responseTimeCategory                ResponseTimeCategory,
    ...}
--  note: an expandable SEQUENCE simplifies later addition of a numeric response time.
```

```
ResponseTimeCategory ::= ENUMERATED {
    nodelay   (0),
    lowdelay  (01),
    delaytolerant  (12),
    ... }
--  exception handling:
--  an unrecognized value shall be treated the same as value 12 (delaytolerant)
```

```
ProvideSubscriberLocation-Res ::= SEQUENCE {
    locationEstimate                    Ext-GeographicalInformation,
    ageOfLocationEstimate               [0] AgeOfLocationInformation     OPTIONAL,
    extensionContainer                  [1] ExtensionContainer           OPTIONAL,
    ...}
```

```
Ext-GeographicalInformation ::= OCTET STRING (SIZE (1..maxExt-GeographicalInformation))
-- Refers to geographical Information defined in GSM 03.32.
-- This is composed of 1 or more octets with an internal structure according to GSM 03.32
-- Octet 1: Type of shape, only the following shapes in GSM 03.32 are allowed:
--       (a) Ellipsoid point with uncertainty circle
--       (b) Ellipsoid point with uncertainty ellipse
--       (c) Ellipsoid point with altitude and uncertainty ellipsoid
--       (d) Ellipsoid Arc
-- Any other value in octet 1 shall be treated as invalid
-- Octets 2 to 8 for case (a) – Ellipsoid point with uncertainty circle
--       Degrees of Latitude                                        3 octets
--       Degrees of Longitude                                       3 octets
--       Uncertainty code                                           1 octet
-- Octets 2 to 1110 for case (b) – Ellipsoid point with uncertainty ellipse:
--       Degrees of Latitude                                        3 octets
--       Degrees of Longitude                                       3 octets
--       Uncertainty semi-major axis                                1 octet
--       Uncertainty semi-minor axis                                1 octet
--       Angle of major axis                                        1 octet
--       Confidence                                                 1 octet
-- Octets 2 to 14 for case (c) – Ellipsoid point with altitude and uncertainty ellipsoid
--       Degrees of Latitude                                        3 octets
--       Degrees of Longitude                                       3 octets
--       Altitude                                                   2 octets
--       Uncertainty semi-major axis                                1 octet
--       Uncertainty semi-minor axis                                1 octet
--       Angle of major axis                                        1 octet
--       Uncertainty altitude                                       1 octet
--       Confidence                                                 1 octet
-- Octets 2 to 13 for case (d) – Ellipsoid Arc
--       Degrees of Latitude                                        3 octets
--       Degrees of Longitude                                       3 octets
--       Inner radius                                               2 octets
--       Uncertainty radius                                         1 octet
--       Offset angle                                               1 octet
--       Included angle                                             1 octet
--       Confidence                                                 1 octet
--
-- An Ext-GeogrpahicalInformation parameter containing any other shape or an incorrect number
-- of octets or coding according to GSM 03.32 shall be treated as invalid data by a receiver
```

```
maxExt-GeographicalInformation  INTEGER ::= 20
-- the maximum length allows for further shapes in GSM 03.32 to be included in later versions
-- of GSM 09.02
```

```
SubscriberLocationReport-Arg ::= SEQUENCE {
     lcs-Event                          LCS-Event,
     lcs-ClientID                       LCS-ClientID,
     lcsLocationInfo                    LCSLocationInfo,
     msisdn                             [0] ISDN-AddressString           OPTIONAL,
     imsi                               [1] IMSI                         OPTIONAL,
     imei                               [2] IMEI                         OPTIONAL,
     na-ESRD                            [3] ISDN-AddressString           OPTIONAL,
     na-ESRK                            [4] ISDN-AddressString           OPTIONAL,
     locationEstimate                   [5] Ext-GeographicalInformation  OPTIONAL,
     ageOfLocationEstimate              [6] AgeOfLocationInformation     OPTIONAL,
     extensionContainer                 [7] ExtensionContainer           OPTIONAL,
     ...}

-- one of msisdn or, imsi, or na-ESRK is mandatory
-- in North America, the na-ESRD is mandatory
```

```
LCS-Event ::= ENUMERATED {
     emergencyCallOrigination  (0),
     emergencyCallRelease  (1),
     mo-lr  (2),
     ... }
--   exception handling:
--   a SubscriberLocationReport-Arg containing an unrecognized LCS-Event
--   shall be rejected by a receiver with a return error cause of unexpected data value
```

```
SubscriberLocationReport-Res ::= SEQUENCE {
     extensionContainer                 ExtensionContainer               OPTIONAL,
     ...}
```

```
PerformLocation-Arg ::= SEQUENCE {
     globalCellId                       GlobalCellId,
     radioChannelType                   [0] RadioChannelType             OPTIONAL,
     lcs-Priority                       [1] LCS-Priority                 OPTIONAL,
     lcs-QoS                            [2] LCS-QoS                      OPTIONAL,
     lcs-APDU                           [3] Ext-ExternalSignalInfo       OPTIONAL,
     extensionContainer                 [4] ExtensionContainer           OPTIONAL,
     ...}
```

```
RadioChannelType ::= ENUMERATED {
     sdcch  (0),
     tch-fr (1),
     tch-hr (2),
     ... }
--   exception handling
--   an unrecognized value shall be treated as unexpected data
--   a return error shall be returned if received in a MAP invoke
```

```
PerformLocation-Res ::= SEQUENCE {
     locationEstimate                   Ext-GeographicalInformation,
     positioningData                    [0] PositioningDataList          OPTIONAL,
     extensionContainer                 [1] ExtensionContainer           OPTIONAL,
     ... }
```

```
PositioningDataList ::= SEQUENCE SIZE (1..maxNumOfPositionAttempts) OF
                                        PositioningData
     -- list of positioning data for each positioning attempt
     -- first in list = first attempt, last in list = last attempt
```

```
maxNumOfPositionAttempts  INTEGER ::= 5
```

```
PositioningData ::= SEQUENCE {
     positionMethod                     PositionMethod,
     positionResult                     PositionResult,
     duration                           [0] Duration                     OPTIONAL,
     toa-LMU-data                       [1] TOA-LMU-Data                 OPTIONAL,
     extensionContainer                 [2] ExtensionContainer           OPTIONAL,
     ...}

-- Positioning data need not be provided to an LCS client but may be useful to the PLMN
-- for billing, accounting and statistical purposes
```

```
PositionMethod ::= ENUMERATED {
    timingAdvance  (0),
    toa (1),
    ... }
--  exception handling:
--  an unrecognized value may be stored in billing or accounting records
--  an unrecognized value shall not cause rejection of any associated location estimate
```

```
PositionResult ::= ENUMERATED {
    failure (0),
    success-NoDeliveryToClient (1),
    success-DeliveryToClient  (2) }
```

```
Duration  ::= INTEGER (0..250)
    -- duration of location attempt in units of 100ms
    -- 250 : duration >= 25 seconds
```

```
TOA-LMU-Data ::= SEQUENCE {
    numberOfAssignedLMUs                INTEGER (0..12),
    numberOfLMUsWithValidMeasurements   INTEGER (0..12),
    extensionContainer                  [0] ExtensionContainer          OPTIONAL,
    ... }
```

```
LCSRegistration-Arg ::= SEQUENCE {
    lmuIdentity                         Identity,
    registrationType                    RegistrationType,
    mscNumber                           [0] ISDN-AddressString          OPTIONAL,
    extensionContainer                  [1] ExtensionContainer          OPTIONAL,
    ...}
```

```
RegistrationType ::= ENUMERATED {
    registration                            (0),
    deRegistration                          (1)}
```

```
LCSRegistration-Res ::= SEQUENCE {
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ...}
```

```
LCSInformationRequest-Arg ::= SEQUENCE {
    lcs-Entity                          LCS-Entity,
    mlcNumber                           [0] ISDN-AddressString          OPTIONAL,
    release-forbidden                   [1] NULL                        OPTIONAL,
    reportError-request                 [2] NULL                        OPTIONAL,
    lcs-apdu                            [3] Ext-ExternalSignalInfo      OPTIONAL,
    -- lcs-apdu carries either the Facility Information Element defined in GSM 04.71
    -- or the Location Information parameter defined in GSM 08.71
    extensionContainer                  [4] ExtensionContainer          OPTIONAL,
    ...}
```

```
LCS-Entity ::= SEQUENCE {
    entityType                          EntityType,
    entityIdentity                      [0] EntityIdentity              OPTIONAL,
    ...}
```

```
EntityType ::= ENUMERATED {
    lmu (0),
    serving-BSC (1),
    ... }
--  Exception handling:
--  an unrecognized value for the Entity Type shall cause any associated LCS APDU to be
--  discarded; the Report Error procedure in GSM 03.71 may also be invoked if requested in
--  an LCSInformationRequest-Arg.
```

```
EntityIdentity ::= SEQUENCE {
    lmuIdentity                         Identity                        OPTIONAL,
    ...}
```

```
LCSInformationReport-Arg ::= SEQUENCE {
    lcs-Entity                      LCS-Entity,
    lcsCause                        [0] LCSCause                    OPTIONAL,
    -- lcsCause is included if and only if the MSC is returning an lcs-apdu to the SMLC
    -- that could not be successfully transferred to its destination LCS entity.
    lcs-apdu                        [1] Ext-ExternalSignalInfo      OPTIONAL,
    -- lcs-apdu carries either the Facility Information Element defined in GSM 04.71
    -- or the Location Information parameter defined in GSM 08.71
    extensionContainer              [2] ExtensionContainer          OPTIONAL,
    ...}
```

```
LCSCause ::= ENUMERATED {
    undefined                       (0),
    unknownLCSEntity                (1),
    noPagingResponse                (2),
    errorInAuthentication           (3),
    errorInServingMSC               (4),
    ... }
--  exception handling:
--  an unrecognized value shall be treated the same as value 0 (undefined)
```

```
LCSReset-Arg ::= SEQUENCE {
    mlcNumber                       ISDN-AddressString,
    lmu-List                        [0] LMU-List                    OPTIONAL,
    extensionContainer              [1] ExtensionContainer          OPTIONAL,
    ...}
```

```
LMU-Id ::= IMSI
    -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
    -- MSIN) defining a set of LMUs sharing the same SMLC
```

```
LMU-List ::= SEQUENCE SIZE (1..maxNumOfLMU-Id) OF
                                    LMU-Id
```

```
maxNumOfLMU-Id  INTEGER ::= 10
```

```
LCSAssignTrafficChannel-Arg ::= SEQUENCE {
    radioChannelType                RadioChannelType,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
LCSAssignTrafficChannel-Res ::= SEQUENCE {
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
END
```

3GPP TSG CN WG2
Phoenix AZ, 15-19 Nov 1999

Document N2-99H65
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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

23.003	**CR**	**011**	Current Version:	3.2.0

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

For submission to:	TSG CN#06	for approval	X	strategic	X	*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

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

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

Source:	TSG N2	**Date:** 15 Nov 1999
Subject:	Mirror CR to that for GSM 03.03 v.7.1.1 - support of VLR and HLR Data Restoration procedures with LCS	
Work item:	Location Services (LCS)	

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

Correction	
Corresponds to a correction in an earlier release	
Addition of feature	
Functional modification of feature	X
Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Add new SCCP SSNs for LCS

Clauses affected: 8

Other specs affected:

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

Other comments:

8 SCCP subsystem numbers

Subsystem numbers are used to identify applications within network entities which use SCCP signalling. In GSM, subsystem numbers may be used between PLMNs, in which case they are taken from the globally standardised range (1 - 31) or the part of the national network range (129 – 150) reserved for GSM use between PLMNs, or within a PLMN, in which case they are taken from the part of the national network range (32 – 128 & 151 - 254) not reserved for GSM use between PLMNs.

8.1 Globally standardised subsystem numbers used for GSM

The following globally standardised subsystem numbers have been allocated for use by GSM:

0000 0110 HLR (MAP);

0000 0111 VLR (MAP);

0000 1000 MSC (MAP);

0000 1001 EIR (MAP);

0000 1010 is allocated for evolution (possible Authentication centre).

8.2 National network subsystem numbers used for GSM

The following national network subsystem numbers have been allocated for use within GSM networks:

1111 1010 BSC (BSSAP-LE)

1111 1011 MSC (BSSAP-LE)

1111 1100 SMLC (BSSAP-LE)

1111 1101 BSS O&M (A interface);

1111 1110 BSSAP (A interface).

The following national network subsystem numbers have been allocated for use within and between GSM networks:

1000 1110 RANAP;

1000 1111 RNSAP;

1001 0001 GMLC(MAP);

1001 0010 CAP;

1001 0011 gsmSCF(MAP);

1001 0100 SIWF(MAP);

1001 0101 SGSN(MAP);

1001 0110 GGSN(MAP);

3GPP TSG-CN WG2 meeting #12 ***Document*** ***N2-99H89***

Phoenix, AZ, USA 15-19 Nov 1999

3G CHANGE REQUEST

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23.007 **CR** **003** Current Version: 3.1.0

3G specification number ↑ *↑ CR number as allocated by 3G support team*

For submision to TSG CN#06 *list TSG meeting no. here ↑*

for approval [X]
for information [ ]

(only one box should be marked with an X)

Form: 3G CR cover sheet, version 1.0 *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/3GCRF-xx.rtf*

Proposed change affects: *(at least one should be marked with an X)* USIM [ ] ME [ ] UTRAN [ ] Core Network [X]

Source: TSG N2 **Date:** 9/11/1999

Subject: Support of VLR and HLR Data Restoration procedures with LCS

3G Work item: LCS

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

F	Correction	[ ]
A	Corresponds to a correction in a 2G specification	[ ]
B	Addition of feature	[X]
C	Functional modification of feature	[ ]
D	Editorial modification	[ ]

Reason for change: Provide description of data restoration in LCS entities (LMU, SMLC) and the interaction of data restoration in the VLR with LCS.

Clauses affected: 1, 3, 4, 12, 13

Other specs affected:

Other 3G core specifications	[ ]	→ List of CRs:
Other 2G core specifications	[ ]	→ List of CRs:
MS test specifications	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

1 Scope

The data stored in location registers are automatically updated in normal operation; the main information stored in a location register defines the location of each mobile station and the subscriber data required to handle traffic for each mobile subscriber. The loss or corruption of these data will seriously degrade the service offered to mobile subscribers; it is therefore necessary to define procedures to limit the effects of failure of a location register, and to restore the location register data automatically. This TS defines the necessary procedures.

The basic principle is that restoration should be based on radio contact to avoid faulty data being spread in the system.

Subscriber data for supplementary services must also be correctly restored, although the impact on service of corruption of supplementary service data is less severe.

Procedures for supporting these functions are defined in GSM 09.02 and 09.60.

The MAP operation "IMSI Attach" is used only in MAP version 1; in MAP version 2 the same function is performed by the MAP operation "Update Location Area". References in this specification to IMSI attach apply only to MAP version 1 network entities.

If the restoration of subscriber data in the VLR is triggered by Location Updating or IMSI Attach, the VLR retrieves subscriber data from the HLR by sending an "Update Location" request, which triggers one or more "Insert Subscriber Data" operations from the HLR. The "Update Location" request may also be used to send the LMSI to the HLR.

If the restoration of subscriber data in the VLR is triggered by a "Provide Roaming Number" request, the behaviour of the VLR depends on whether it is implemented according to MAP version 1 or MAP version 2. For MAP version 2, the VLR retrieves subscriber data from the HLR by sending a "Restore Data" request, which triggers one or more "Insert Subscriber Data" operations from the HLR. The "Restore Data" request is also used to send the LMSI to the HLR. For MAP version 1, the VLR retrieves subscriber data from the HLR by sending a "Send Parameters" request with parameter type "Subscriber Data", which cannot be used to send the LMSI to the HLR.

The VLR number and MSC number in the subscriber data in the HLR are updated by the "Update Location" procedure.

The GGSN (Gateway GPRS Support Node) is the point of PDN interconnection with the GSM PLMN supporting GPRS. The GGSN contains routing information for GPRS users with a PDP context active. The necessary procedures needed to restore GGSN data information after a restart are described in this document.

The SGSN (Serving GPRS Support Node) is the node that is serving the MS. The SGSN stores information regarding e.g. mobility management, routing and security. The necessary procedures needed to restore this SGSN information after a restart are described in this document.

The LMU (Location Measurement Unit) is a network node, accessed over the GSM air interface, that is functionally similar to an MS. All requirements associated with a non-GPRS MS in this specification apply also to an LMU except where specified otherwise.

1.1 Normative references

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] GSM 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] GSM 03.05: "Digital cellular telecommunication system (Phase 2+): Technical performance objectives".

[3] GSM 03.18: "Digital cellular telecommunications system (Phase 2+); Basic call handling; Technical realization".

[4] GSM 03.22: "Digital cellular telecommunications system (Phase 2+); Functions related to Mobile Station (MS) in idle mode and group receive mode".

[5] GSM 03.40: "Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS) Point-to-Point (PP)".

[6] GSM 03.60: "Digital cellular telecommunication system (Phase 2+); Stage 2 Service Description of the General Packet Radio Service (GPRS)".

[6a] GSM 03.71: “Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Functional Description; Stage 2”.

[7] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[8] GSM 09.18:"Digital cellular telecommunications system (Phase 2+); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR); Gs interface layer 3 specification”.

[9] GSM 09.60: "Digital cellular telecommunication system (Phase 2+); General Packet radio Service (GPRS); GPRS Tunneling Protocol (GTP) across the Gn and Gp Interface”.

[10] GSM 12.07: "Digital cellular telecommunications system (Phase 2); Operations and performance management".

1.2 Abbreviations

Abbreviations used in this TS are listed in GSM 01.04.

2 Design objectives

To avoid loss of all the data stored in a location register when part of the equipment of the location register fails, a regime must be implemented to secure the data. This regime can include replication of volatile storage units and periodic back-up of data to non-volatile storage. If the data security regime ensures the integrity of the data in spite of failure of part of the location register equipment then there will be no impact on service. This Technical Specification describes the procedures to be used when the integrity of data in the location register cannot be ensured; that situation is referred to below as "failure".

The VLR and SGSN shall erase all IMSI records affected by the failure when it restarts after a failure. The GGSN shall erase all non-static PDP records affected by the failure and restore static PDP records when it restarts after a failure.

For the HLR, periodic back-up of data to non-volatile storage is mandatory.

The reliability objectives of location registration are listed in GSM 03.05 and GSM 12.07.

3 Restoration indicators in location registers and in GPRS support nodes

3.1 Restoration Indicators in the VLR

Three restoration indicators are provided in the VLR for each IMSI record: "Confirmed by Radio Contact", "Subscriber Data Confirmed by HLR" and "Location Information Confirmed in HLR". A further restoration indicator is provided in the VLR for each IMSI record belonging to an LMU: “Location Information Confirmed in SMLC”.

The indicator "Confirmed by Radio Contact" indicates whether the VLR"s record of location area identity and MSC number for the mobile station is confirmed by radio contact.

The indicator "Confirmed by Radio Contact" in an IMSI record is set to the initial value "Not Confirmed" when the VLR receives a "Provide Roaming Number" request, an "Update Location Area" request or an "IMSI Attach" request for an MS for which the VLR does not have an IMSI record. The indicator "Confirmed by Radio Contact" in an IMSI record is also set to the initial value "Not Confirmed" when the VLR receives a Reset indication message from the SGSN serving the MS if the MS is attached to both GPRS and non-GPRS services.

The indicator "Confirmed by Radio Contact" is set to "Confirmed" when the radio contact that has been established with the MS is authenticated.

The indicator "Subscriber Data Confirmed by HLR" indicates whether the subscriber data set for the mobile station held by the VLR is consistent with that held by the HLR.

The indicator "Subscriber Data Confirmed by HLR" is set to the initial value "Not Confirmed" when the VLR receives a "Provide Roaming Number" request, an "Update Location Area" request or an "IMSI Attach" request for an MS for which the VLR does not have an IMSI record.

The indicator "Subscriber Data Confirmed by HLR" is set to "Confirmed" at either of the following events:

- The VLR successfully performs an "Update Location" to the HLR;
- The VLR successfully performs a "Restore Data" operation to the HLR.

The indicator "Location Information Confirmed in HLR" indicates whether the HLR"s record of VLR number and MSC number for the mobile station is confirmed by radio contact.

The indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" at any of the following events:

- The VLR receives an "Update Location Area" request or an IMSI Attach" request for an MS for which the VLR has no IMSI record;
- A VLR which serves two or more MSCs receives a "Provide Roaming Number" request for an MS for which the VLR has no IMSI record;
- The VLR receives a "Reset" message from the HLR with which the MS is registered.

The indicator "Location Information Confirmed in HLR" is set to "Confirmed" at either of the following events:

- A VLR which serves only one MSC receives a "Provide Roaming Number" request for an MS for which the VLR has no IMSI record;
- Successful completion of the "Update Location" procedure triggered by authenticated radio contact.

The indicator “Location Information Confirmed in SMLC” indicates whether an SMLC’s record of MSC number for a particular LMU is confirmed by radio contact.

The indicator “Location Information Confirmed in SMLC” is set to “Not Confirmed” at any of the following events:

- The VLR receives an “Update Location Area” request or an “IMSI Attach” request for an MS for which the VLR has no IMSI record. The indicator, in this case, becomes valid only if HLR subscriber data later indicates an LMU.

- The VLR receives an “LCS Reset” message from an SMLC where the message is targetted to either a specific LMU or all LMUs registered with the SMLC.

- The VLR receives an “IMSI Detach” from an LMU that is registered with an SMLC

The indicator “Location Information Confirmed in SMLC” is set to “Confirmed” at the following event:

- Successful completion of the “LCS Registration” procedure triggered by a successful location update

- Successful transfer of an LCS Information message from an SMLC to the LMU

3.2 Restoration Indicators in the HLR

As an implementation option, one restoration indicator may be provided in the HLR for each IMSI record: "Check SS".

The "Check SS" indicator is set to "Check Required" when the HLR restarts after a failure.

The "Check SS" indicator is checked whenever the HLR receives an "Update Location" request from a VLR. If it is set to "Check Required", after successful completion of subscriber data retrieval that ran embedded in the "Update Location" procedure the HLR sends a "Forward Check SS Indication" request message to the VLR and sets the "Check SS" indicator to "Check Not Required".

3.3 Restoration Indicators in the SGSN

Two restoration indicators are provided in the SGSN for reach IMSI record: “Subscriber Data Confirmed by HLR” and “Location Information Confirmed in HLR”.

The indicator "Subscriber Data Confirmed by HLR" indicates whether the subscriber data set for the mobile station held by the SGSN is consistent with that held by the HLR.

The indicator "Subscriber Data Confirmed by HLR" is set to the initial value "Not Confirmed" when the SGSN receives a Routing Area Update request or an IMSI- and/or GPRS Attach request for an MS for which the SGSN does not have an IMSI record.

The indicator "Subscriber Data Confirmed by HLR" is set to "Confirmed" at the following event:

- The SGSN successfully performs an Update GPRS Location to the HLR;

The indicator "Location Information Confirmed in HLR" indicates whether the HLRs record of the SGSN address for the mobile station is confirmed by radio contact.

The indicator "Location Information Confirmed in HLR" is set to "Not Confirmed" at any of the following events:

- The SGSN receives a Routing Area Update request or an IMSI- and/or GPRS Attach request for an MS for which the SGSN has no IMSI record;

- The SGSN receives a “Reset” message from the HLR with which the MS is registered.

The indicator "Location Information Confirmed in HLR" is set to "Confirmed" at the following event:

- Successful completion of the Update GPRS Location procedure to the HLR.

The indicator "VLR-Reliable" indicates whether the VLR serving the MS has performed a restart.

The indicator "VLR-Reliable" is set to the value "false" when the SGSN receives a Reset indication message from the VLR serving the MS if the MS is attached to both GPRS and non-GPRS services. The indicator "VLR-Reliable" is set

to the value "true" when the SGSN receives a confirmation from a VLR that a location update procedure to the affected VLR has been successfully performed.

The indicator “SGSN-Reset” indicates whether the SGSN has recently experienced a restart.

The indicator "SGSN-Reset" is set to the value "true" when the SGSN suffers a restart. This indicator is unique per SGSN. The indicator "SGSN-Reset" is set to the value "false" after a certain time specified by the operator. The value of the timer controlling the reset of the “SGSN-Reset” indicator shall be longer than the periodic routeing area update timer value used by the MSs.

4 Restoration of data in the VLR

The effect on service of failure of a VLR is different from the effect of failure of an HLR. The procedures for restoration of a VLR and an HLR are therefore different.

4.1 Restart of the VLR

When a VLR restarts after a failure, all IMSI records affected by the failure are erased.

There will be no subscriber data or location information stored for an affected mobile station until after the VLR has received either a "Provide Roaming Number" request or an "Update location Area" request for that mobile station.

The VLR causes all affected TMSIs and all affected LMSIs to become invalid. "Invalid" in this context means that the TMSI and LMSI can no longer be regarded as accurate. The term is used to avoid unnecessary constraints on the implementation.

On receipt of either a "Provide Roaming Number" request or an "Update Location Area" request, restoration of subscriber data in the VLR is triggered individually for each IMSI record as described below.

4.2 Restoration Procedures

The objective of the restoration procedure is to handle all traffic for each mobile subscriber correctly. In order to meet this objective, the procedure must make the subscriber data in the VLR consistent with that in the HLR, and make the location information in the HLR and VLR reflect accurately the current location of the MS. For an LMU, the procedure must also make the location information in the SMLC reflect accurately the current serving location of the LMU.

4.2.1 Incoming Call

a) Send Routing Information (GMSC->HLR)

The HLR sends "Provide Roaming Number" to the VLR as for normal operation. The LMSI is updated by the VLR when the VLR requests the transfer of subscriber data from the HLR using the "Restore Data" operation.

b) Provide Roaming Number (HLR->VLR)

- Regardless of whether the VLR has an IMSI record corresponding to the IMSI in the "Provide Roaming Number", it returns an MSRN. If no IMSI record exists, the VLR creates a skeleton IMSI record, sets the indicators "Subscriber Data Confirmed by Radio Contact" and "Confirmed by HLR" to "Not Confirmed" and (if IMSI Attach is used) marks the IMSI as attached. If the VLR serves two or more MSCs, the VLR sets the indicator "Location Information Confirmed in HLR" to "Not Confirmed". Otherwise, if the VLR serves only one MSC, the indicator "Location Information Confirmed in HLR" is set to the initial value "Confirmed".

- If the indicator "Subscriber Data Confirmed by HLR" is "Not Confirmed" the VLR requests authentication data, if required and still not available and subscriber data from the HLR. When the dialogue that covers the subscriber data retrieval procedure is completed successfully, the VLR sets the indicator "Subscriber Data Confirmed by HLR" to "Confirmed". The indicators "Confirmed by Radio Contact" and "Location Information Confirmed in HLR" remain unchanged.

- If the IMSI record for the MS is marked "Subscriber Data Confirmed by HLR" but "Not Confirmed by Radio Contact" the operator may choose an appropriate method to limit the number of "Search for MS" procedures for that MS.

- If subscriber data from the HLR indicates an LMU, the indicator “Location Information Confirmed in SMLC” becomes applicable and is set to “not confirmed”. The means by which this indicator is set to “confirmed” are described under “Incoming LCS Information Request” and “Outgoing LMU Request”.

c) Send Information for I/C Call Setup (MSC->VLR)

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" the VLR returns a "System Failure" error.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact", the VLR handles the request in the normal way; for this MS, VLR restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the "Send Information for I/C Call Setup" procedure.

d) Process Access Request in Response to Search (MSC->VLR)

- If the MS responds to paging, the MSC sends a positive response to the search request and a "Process Access Request" to the VLR. After successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed", sets the location area information for the MS, and handles the request in the normal way.

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this MS, VLR restoration is complete.

4.2.2 Mobile Terminated Short Message

a) Send Routing Information for MT SMS (SMS-GMSC->HLR)

The HLR returns the MSC number as for normal operation.

b) Send Information for MT SMS (MSC->VLR) - MAP version 2

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" the VLR returns an "Unidentified Subscriber" error. This causes the MSC to report a short message delivery failure, with cause "Unidentified Subscriber", to the SMS gateway MSC. The Gateway MSC sends a "Report SM Delivery Status" request, with a cause of "Absent Subscriber", to the HLR. This causes the HLR to set the "Mobile Station Not Reachable Flag" for the MS, as described in Technical Specifications GSM 03.40 and GSM 09.02.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact", the VLR handles the request in the normal way; for this MS, VLR restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the "Send Information for MT SMS" procedure.

c) Send Information for I/C Call Setup (MSC->VLR) - MAP version 1

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" the VLR returns a "System Failure" error. This causes the MSC to report a short message delivery failure, with cause "System Failure", to the SMS gateway MSC.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact", the VLR handles the request in the normal way; for this MS, VLR restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the "Send Information for MT SMS" procedure.

d) Process Access Request in Response to Search (MSC->VLR)

- If the MS responds to paging, the MSC sends a positive response to the search request and a "Process Access Request" to the VLR. After successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed", sets the location area information for the MS, and handles the request in the normal way.

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed, the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this MS, VLR restoration is complete.

4.2.A Mobile Terminating Location Request (MT-LR)

Receipt of an MT-LR for a target MS identified by its IMSI in a serving MSC during VLR restoration is supported by the procedures below.

a) Provide Subscriber Location (GMLC->MSC/VLR)

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" the VLR returns an "Unidentified Subscriber" error. This causes the MSC to report a location failure, with cause "Unidentified Subscriber", to the GMLC.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure when paging for the MS.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact", the VLR handles the request in the normal way; for this MS, VLR restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the "Provide Subscriber Location" procedure.

b) Process Access Request in Response to Search (MSC->VLR)

- If the MS responds to paging, the MSC sends a positive response to the search request and a "Process Access Request" to the VLR. After successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed", sets the location area information for the MS, and handles the request in the normal way.

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed, the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this MS, VLR restoration is complete.

4.2.B Incoming LCS Information Request

Receipt of an incoming LCS Information Request from an SMLC directed to a specific LMU is supported by the procedures below.

a) Request associated with an LMU (SMLC->MSC/VLR)

- If the VLR has no IMSI record, or if the record is marked "Subscriber Data Not Confirmed by HLR" or if both the record is marked “Location Information not Confirmed in SMLC” and any LMSI supplied by the SMLC is incorrect, the VLR returns an "Unidentified Subscriber" error.

- If the VLR has an IMSI record for an LMU marked "Subscriber Data Confirmed by HLR" and "Not Confirmed by Radio Contact", the VLR handles the request in the normal way, except that the "Search for MS" procedure is used instead of the "Page MS" procedure when paging for the LMU.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact" and “Location Information not Confirmed in SMLC”, then if the VLR serves more than one MSC, the VLR verifies if the Location Area for the LMU belongs to the MSC to which the SMLC sent the LCS Information. Request. If this is not verified, the VLR returns an “Unidentified subscriber” error. Otherwise, the VLR handles the request in the normal way and sets the “Location Information Confirmed in SMLC” indicator to “Confirmed”. For this LMU, data restoration is complete.

- If the VLR has an IMSI record marked "Subscriber Data Confirmed by HLR" and "Confirmed by Radio Contact" and “Location Information Confirmed in SMLC”, the VLR handles the request in the normal way. For this LMU, data restoration is complete.

- The state of the indicator "Location Information Confirmed in HLR" does not affect the incoming LCS Information Request.

b) Process Access Request in Response to Search (MSC->VLR)

- If the LMU responds to paging, the MSC sends a positive response to the search request and a "Process Access Request" to the VLR. After successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed", sets the indicator “Location Information Confirmed in SMLC” to “Confirmed” (if not already “Confirmed”), sets the location area information for the LMU, and handles the request in the normal way.

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed, the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this LMU, VLR restoration is complete.

4.2.3 Outgoing MS request

An outgoing request (MS originated call, mobile originated Short Message or call-independent supplementary service activity) from the MS causes the VLR to check its IMSI record for that MS.

- If the MS is unknown in this VLR (i.e. the VLR has no IMSI record for the MS) or there is an IMSI record marked "Subscriber Data Not Confirmed by HLR" the outgoing request is rejected with error cause "Unidentified Subscriber". This causes the MS to initiate the location registration procedure described below.

- If the VLR has an IMSI record for the MS marked "Subscriber Data Confirmed by HLR" the request is handled in the normal way, and after any necessary authentication and/or IMEI checking the record is marked "Confirmed by Radio Contact".

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this MS, VLR restoration is complete.

4.2.C Outgoing LMU Request

An outgoing request (CM ServiceRequest) for LCS from an LMU causes the VLR to check its IMSI record for that LMU.

- If the LMU is unknown in this VLR (i.e. the VLR has no IMSI record for the LMU) or there is an IMSI record marked "Subscriber Data Not Confirmed by HLR" the outgoing request is rejected with error cause "Unidentified Subscriber". This causes the LMU to initiate the location registration procedure described below.

- If the VLR has an IMSI record for the MS marked "Subscriber Data Confirmed by HLR" and “Location Information not Confirmed in SMLC”, the outgoing request is rejected with the error cause “Not registered in SMLC”. This causes the LMU to initiate the location registration procedure described below.

- If the VLR has an IMSI record for the MS marked "Subscriber Data Confirmed by HLR" and “Location Information Confirmed in SMLC”, the request is handled in the normal way, and after any necessary authentication and/or IMEI checking the record is marked "Confirmed by Radio Contact".

- The VLR checks the indicator "Location Information Confirmed in HLR". If it indicates "Not Confirmed" the VLR starts an "Update Location" procedure to the HLR. When this procedure is successfully completed the VLR sets the indicator "Location Information Confirmed in HLR" to "Confirmed".

For this LMU, VLR restoration is complete.

4.2.4 Location Updating or IMSI Attach

A location registration request (location updating or IMSI attach) from an MS causes the VLR to check its IMSI record for that MS.

- If the MS is unknown in this VLR (i.e. the VLR has no IMSI record for the MS) the VLR creates a skeleton IMSI record for the MS and sets the indicators "Confirmed by Radio Contact", "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Not Confirmed". If authentication is required, the VLR retrieves authentication data. When the radio contact with the Mobile Station is authenticated, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed. The VLR then performs an "Update Location" to the HLR. If this is successful, the VLR sets the indicators "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Confirmed". For this MS, VLR restoration is complete.

- If the VLR has an IMSI record for the MS, after successful authentication, if required, the VLR sets the indicator "Confirmed by Radio Contact" to "Confirmed". If the record is marked "Location Information Not Confirmed in HLR" or "Subscriber Data Not Confirmed by HLR" the VLR performs an "Update Location" to the HLR. If this is successful, the VLR sets the indicators "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Confirmed". For this MS, VLR restoration is complete.

- If the VLR performs a successful “Update Location” and the IMSI record indicates an LMU with the indicator “Location Information Confirmed in SMLC” set to “Not Confirmed”, the VLR performs an “LCS Registration” to the SMLC associated with either the IMSI or serving cell of the LMU. If this is sucessful, the VLR sets the indicator “Location Information Confirmed in SMLC” to “Confirmed”. For this LMU, VLR restoration is complete.

4.2.5 Use of TMSI

After the VLR has restarted but before the next authenticated radio contact the TMSI known by the MS is invalid, as it was allocated before the VLR restarted. The VLR therefore uses the IMSI to identify the MS on the first radio contact during restoration.

- A VLR which initiates a "Search for Subscriber" procedure uses the IMSI to identify the MS.

- If an MS identifies itself by a TMSI in a "Location Registration" request, the VLR proceeds as follows:

a) The VLR checks the location area identity (LAI) of the previous location area sent by the MS. If this LAI is in a VLR different from the current one, the request is handled in the normal way.

b) If the LAI is in the current VLR, the status of the TMSI is checked.

- If the TMSI was allocated after the VLR restarted, and corresponds to a valid IMSI record, the request is handled as described in subclause 4.2.4.

- If the TMSI was allocated before the VLR restarted, or does not correspond to a valid IMSI record, the VLR requests the IMSI from the MS. If the MS returns an IMSI the VLR proceeds as described in subclause 4.2.4. If the MS does not return an IMSI the network aborts the location registration procedure.

- If an MS identifies itself by a TMSI in an outgoing MS request, the VLR proceeds as follows:

- If the TMSI was allocated after the VLR restarted, and corresponds to a valid IMSI record, the request is handled as described in subclause 4.2.3.

- If the TMSI was allocated before the VLR restarted, or does not correspond to a valid IMSI record, the VLR requests the IMSI from the MS. If the MS returns an IMSI the VLR proceeds as described in subclause 4.2.3. If the MS does not return an IMSI the network aborts the outgoing request.

4.2.6 SGSN associations

Based on configuration data, “Reset” messages are sent on the Gs-interface to the SGSNs in the Location Areas served by the VLR. The SGSNs mark all associations with the VLR as unreliable by setting the restoration indicator "VLR-Reliable" to "alse" for the MSs served by that VLR. The associations will be re-initiated one by one by the SGSN at the next Routing Area update or combined RA/LA update from each MS.

5 Restoration of data in the HLR

The loss or corruption of subscriber data in the HLR has an impact not only in the HLR"s own PLMN but also on the service for its mobiles in other PLMNs. Restoration of the data in the HLR requires co-operation from all the VLRs to which its mobiles have roamed.

5.1 Restart of the HLR

When an HLR restarts after failure it performs the following actions for the subscriber data records that have been affected by the HLR fault:

- Reload all data from the non-volatile back-up;

- Reset all "MS Purged" flags;

- Mark each subscriber record "SS Check Required" by setting the "Check SS" indicator if the "Forward Check SS Indication" service is implemented;

- Send a "Reset" message to each VLR where one or more of its MSs are registered. This causes each VLR concerned to mark each relevant subscriber record "Location Information Not Confirmed in HLR";

  Send to each SGSN where one or more of its MSs are registred a “Reset” message. This causes the SGSN to mark the relevant MM contexts record "Location Information Not Confirmed in HLR".

5.2 Procedures During Restoration

5.2.1 Mobile terminated call

If the VLR receives a "Process Access Request" request in response to a "Page" or "Search for MS" operation, after successful authentication, if required, it checks the indicator "Location Information Confirmed in HLR". If this indicates "Not Confirmed" the VLR triggers an "Update Location" to the HLR as described in subclause 4.2.1.d).

When the HLR receives the "Update Location" request it stores the VLR number, MSC number and LMSI in the subscriber record as for normal operation.

If the "Forward Check SS Indication" service is implemented, the HLR checks the indicator "Check SS". If this indicates "Check Required", after successful completion of the subscriber data retrieval procedure that ran embedded in the "Update Location" procedure the HLR sends a "Forward Check SS Indication" to the VLR and marks the subscriber record "Check Not Required. When the VLR receives the "Forward Check SS Indication" request it forwards an indication to the MS to alert the user that supplementary service parameters should be checked.

5.2.2 Mobile Originated Activity

When the VLR receives a request from an MS (MS originated call, mobile originated Short Message, call-independent supplementary service activity or location registration request) whose IMSI record is marked "Location Information Not Confirmed in HLR", it will perform an "Update Location" to the HLR as described in subclauses 4.2.3 and 4.2.4 above.

When the HLR receives an "Update Location" request from the VLR, it proceeds as described in subclause 5.2.1.

6 Periodic location updating

The time taken to confirm the location of an MS after location register failure is governed by the frequency with which the MS establishes radio contact with the network. The location information for an MS which remains silent for a long time will remain doubtful for a long time.

A method of reducing this time is to require the MS to establish radio contact with the network at intervals, purely to confirm its location, if the MS does not move to a new location area (which would lead to a normal location registration) or respond to paging for a mobile terminated call or request a mobile originated call or call-independent supplementary service activity.

The interval between successive periodic location updatings is controlled by a timer in the MS; this timer is reset to its initial value at the end of each successfully established radio contact between the MS and the network.

The use of the periodic location update timer is described in GSM 03.22.

7 Periodic routeing area updating

All GPRS-attached MSs, except MSs in class-B mode of operation engaged in CS communication, shall perform periodic RA updates. For MSs that are both IMSI-attached and GPRS-attached, the periodic updates depend on whether the Gs interface is installed or not:

- If the Gs interface is installed, periodic RA updates shall be performed, and periodic LA updates shall not be performed. If the SGSN has the indicator “VLR-reliable” set to ´false´ the SGSN shall perform a location area update procedure towards the VLR
- If the Gs interface is not installed, both periodic RA updates and periodic LA updates shall be performed independently. RA updates are performed via the Gb interface, and LA updates are performed via the A interface.

The periodic routeing area updating method can be used for re-establishment of SGSN and GGSN PDP contexts.

The periodic routeing area update is described in detail in GSM 03.60.

8 Stand-alone operation of the VLR

If no unused authentication triplets are available in the VLR for an IMSI record when authentication is required, the VLR may reuse already used authentication triplets. It is an operator option to define how many times an authentication triplets may be reused in the VLR.

If the Update Location response contains an error different from "Unknown Subscriber" or "Roaming Not Allowed" or if there is a parameter problem (e.g. no HLR number included), no error shall be indicated to the MSC and the IMSI record in the VLR shall not be affected, provided that the associated "Subscriber Data Confirmed by HLR" indicator is in the "Confirmed" status.

9 Stand-alone operation of the SGSN

If no unused authentication triplets are available in the SGSN for an IMSI record when authentication is required, the SGSN may reuse already used authentication triplets. It is an operator option to define how many times an authentication triplets may be reused in the SGSN.

10 Restoration of data in the GGSN

10.1 Restart of the GGSN

After a GGSN restart, all the PDP contexts stored in the GGSN and affected by the restart become invalid and may be deleted. GGSN storage of data is volatile except as specified in this subclause. The GGSN maintains in volatile memory an SGSN Restart counter for each SGSN with which the GGSN is in contact, and in non-volatile memory a GGSN Restart counter. The GGSN Restart counter shall be incremented and all the SGSN Restart counters cleared immediately after the GGSN has restarted.The SGSN performs a polling function (echo request and echo response) towards the GGSN’s with which the SGSN is in contact. The GGSN Restart counter shall be included in the echo response. If the value received in the SGSN differs from the one stored for that GGSN, the SGSN will consider that the GGSN has restarted (see GSM 09.60). The SGSN Restart counters shall be updated in the GGSN to the value received in the first echo message coming from each SGSN after the GGSN has restarted.

When the SGSN detects a restart in a GGSN with which it has any PDP context activated, it shall deactivate all these PDP contexts and request the MS to reactivate them. Also, the new value of the GGSN Restart counter received in the echo response from the GGSN restarted shall be updated in the SGSN.

10.2 Restoration Procedures

10.2.1 Mobile terminated transmission

When the GGSN receives a terminated PDU for which no valid PDP context exists the GGSN discards the received PDU and may also return an appropriate Error message depending on the protocol used. No further actions are performed by the GGSN. Alternatively, if the GGSN has static PDP information about the PDP address, the GGSN may try to deliver the PDP PDU by initiating the Network Requested PDP Context Activation procedure (see GSM 03.60).

10.2.2 Mobile originated transmission

When the GGSN receives a tunnel PDU for which no PDP context exists it discards the tunnel PDU and sends an Error indication message to the originating SGSN. The SGSN deactivates the PDP context and sends an Error indication to the MS. The MS may then re-activate the PDP context.

11 Restoration of data in the SGSN

11.1 Restart of the SGSN

After an SGSN restart, the SGSN deletes all MM and PDP contexts affected by the restart. SGSN storage of data is volatile except as specified in this subclause. The SGSN maintains in volatile memory a GGSN Restart counter for each GGSN with which the SGSN is in contact, and in non-volatile memory an SGSN Restart counter. The SGSN Restart counter shall be incremented and all the GGSN Restart counters cleared immediately after the SGSN has restarted. Optionally, the SGSN may broadcast a Reset message within the SGSN area. This causes the MS to reinitiate Attach and Activate PDP context procedures. The re-attach shall be performed after a random calculated time in each MS to avoid network congestion. At the next RA Update from the marked MS the SGSN performs an Update Location to the HLR as in the Attach or Inter-SGSN RA Update procedures.

The GGSN performs a polling function (echo request and echo response) towards the SGSNs with which the GGSN is in contact. The SGSN Restart counter shall be included in the echo response. If the value received in the GGSN differs from the one stored for that SGSN, the GGSN will consider that the SGSN has restarted (see GSM 09.60). The GGSN Restart counters shall be updated in the SGSN to the value received in the first echo message coming from each GGSN after the SGSN has restarted.

When the GGSN detects a restart in an SGSN with which it has any PDP context activated, it shall delete all these PDP contexts. Also, the new value of the SGSN Restart counter received in the echo response from the SGSN restarted shall be updated in the GGSN.

11.2 Restoration Procedures

11.2.1 Mobile terminated transmission

When the SGSN receives a tunnel PDU for which no PDP context exists it discards the tunnel PDU and sends an Error indication message to the originating GGSN. The SGSN may search for the MS by paging with the IMSI in the SGSN area if there is no MM context for the MS. When the MS contacts the SGSN, the SGSN shall command the MS to perform a GPRS attach procedure.

11.2.2 Mobile terminated services requested by the MSC/VLR

When the SGSN receives a request for CS paging from an MSC/VLR for an IMSI unknown by the SGSN, if the “SGSN-Reset” indicator is set to “true”, the SGSN sends the paging request with the location information provided by the VLR. If no such location information is provided, the SGSN shall page for the MS in all the routeing areas corresponding to that SGSN. If the “SGSN-Reset” indicator is set to “false” and the IMSI is unknown or the MS is marked as GPRS or non-GPRS detached by the SGSN, the paging request is rejected. If the “SGSN-Reset” indicator is set to “false” and the IMSI is known and the MS is marked as GPRS and non-GPRS attached by the SGSN, the paging request shall be sent to the MS. The association will be re-initiated by the SGSN, at the next Routing Area update or combined RA/LA update.

11.2.3 Mobile terminated SMS over GPRS

a) Send Routing Information for MT SMS (SMS-GMSC -> HLR)

   The HLR returns the SGSN number as for normal operation.

b) Send Information for MT SMS

   When the SGSN receives a mobile terminated SMS for an unknown MM context for the MS, or if the SGSN indicator "Subscriber Data Confirmed by HLR" is marked “Not Confirmed” it rejects the SMS request and returns a failure report with cause value “Unidentified Subscriber” to the SMS gateway MSC indicating unsuccessful delivery of the SMS. The Gateway MSC sends a "Report SM Delivery Status" request, with a cause of "Absent Subscriber", to the HLR. This causes the HLR to set the "Mobile Station Not Reachable for GPRS Flag" for the MS, as described in the Technical Specifications GSM 03.40 and GSM 09.02.

If the SGSN has the indicator "Subscriber Data Confirmed by HLR" set to “Confirmed”, the SGSN handles the SMS request in the normal way.

The state of the indicator "Location Information Confirmed in HLR" does not affect the Mobile Terminated SMS procedure.

11.2.4 Mobile originated transmission

A mobile originated transmission causes the SGSN to check its MM context for the MS.

11.2.4.1 Mobile originated Location Updating or Attach

If the MS is unknown in the SGSN (i.e. the SGSN has no MM context for the MS) the SGSN creates a MM context for the MS and sets the indicators "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Not Confirmed". If authentication is required, the SGSN retrieves authentication data. The SGSN then performs an "Update GPRS Location" to the HLR. If this is successful, the SGSN sets the indicators "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Confirmed".

If the SGSN has an MM context for the MS, and the indicators "Location Information Confirmed in HLR" or "Subscriber Data Confirmed by HLR" is set to “Not Confirmed” the SGSN performs an "Update GPRS Location" to the HLR. If this is successful, the SGSN sets the indicators "Location Information Confirmed in HLR" and "Subscriber Data Confirmed by HLR" to "Confirmed".

If the SGSN has an MM context for the MS with the indicator "Subscriber Data Confirmed by HLR" marked “Confirmed” the originated transmission is handled in the normal way.

The SGSN retrieves subscriber data from the HLR by sending an “Update GPRS Location” request, which triggers one or more "Insert Subscriber Data" operations from the HLR.

11.2.4.2 Mobile originated LLC PDU frame

At a mobile originated transmission the SGSN rejects a MS which has no MM context by sending a MM Disconnect message to the MS. The SGSN will use the incoming address field of the rejected frame to address the MS. This causes the MS to initiate Attach and Activate PDP context procedures which re-activate the PDP contexts at the SGSN and GGSN.

11.3 Use of TLLI

After the SGSN has restarted but before the next authenticated radio contact the TLLI known by the MS is invalid, as it was allocated before the SGSN restarted. The SGSN may request the MS to identify itself with the IMSI in order to make a relationship between the IMSI and the received old TLLI. The SGSN shall allocate a new TLLI for that MS.

If an MS identifies itself by a TLLI in an MS originating transmission or a "Location Registration" request, the SGSN proceeds as follows:

a) The SGSN checks the routing area identity (RAI) of the previous routing area sent by the MS. If this previous sent RAI belongs to a SGSN different from the current one, the request is MS´s that identifies themselves with an old TLLI from before the restart.

handled in the normal way.

b) If the previous sent RAI belongs to the current SGSN, the status of the TLLI is checked.

- If the TLLI was allocated after the SGSN restarted, and corresponds to a valid IMSI record, the request is handled in the normal way.

- If the TLLI was allocated before the SGSN restarted, or does not correspond to a valid IMSI record, the SGSN requests the IMSI from the MS. If the MS returns an IMSI the SGSN proceeds in the normal way. If the MS does not return an IMSI the network aborts the originating transmission request or location registration procedure.

11.4 VLR associations

All associations with VLRs affected by the restart of an SGSN are marked as unreliable and may be deleted. Based on configuration data, "Reset" messages are sent on the Gs-interface to the VLRs in the Location Areas served by the SGSN. The VLRs mark all associations with the SGSN as unreliable by setting the restoration indicator "Confirmed by radio contact" to "Not Confirmed" for the MSs served by that SGSN. The associations will be re-initiated one by one by the SGSN at the next Routing Area update, or combined RA/LA update from each MS.

12 Restoration of Data in an SMLC

12.1 Restart of an SMLC

When an SMLC restarts after a failure, it performs the following actions for those of its associated LMUs whose records have been affected by the fault:

- Reload all administered LMU data from non-volatile back-up
- Mark each LMU as "not registered"
- Reinitialize other temporary data for each LMU to indicate no ongoing measurement or diagnostic activities
- Send an "LCS Reset" message containing no LMU identifier to each VLR where an LMU may be currently served

Any VLR receiving an "LCS Reset" containing no LMU identifier shall reset the indicator "Location Information Confirmed in SMLC" to "Not Confirmed" for each LMU registered with this SMLC. The VLR shall also request the serving MSC for each affected LMU to release any LCS signaling connection to this LMU with the cause "Not registered in SMLC".

While the "Location Information Confirmed in SMLC" indicator remains "not Confirmed" for any LMU, the VLR shall react to any outgoing request from the LMU as follows

- For an outgoing request for LCS service, the VLR shall return an error response with cause "not registered in SMLC". This shall cause the LMU to request a location update.
- For a location update request, the VLR shall behave as for a normal MS. Once any location update to the HLR is completed successfully, or if no location update to the HLR is needed, the VLR shall perform an "LCS Registration" to the SMLC. If this is successful, the indicator "Location Information Confirmed in SMLC" shall be set to "Confirmed".

After an "LCS Registration" has been successfully completed, the SMLC may send an LCS Information Request to the LMU containing an LCS O&M Reset command. On receipt of this, the LMU shall cancel all active LCS measurement and O&M tasks previously ordered by the SMLC.

For this LMU, data restoration in the SMLC is complete.

12.2 Data Restoration for a Specific LMU

An SMLC may restore data for a specific LMU when the data in the SMLC or LMU is considered unreliable (e.g. if there is no communication between the SMLC and LMU for a long time or if messages received by the SMLC are inconsistent with the LMU state kept by the SMLC). To restore data for a specific LMU, the SMLC shall send an "LCS Reset" containing the identity of the LMU to the current serving VLR or to every VLR that may serve the LMU.

Any VLR receiving an "LCS Reset" containing a specific LMU identifier shall reset the indicator "Location Information Confirmed in SMLC" to "Not Confirmed" for this LMU and shall request the serving MSC to release any LCS signaling

connection to this LMU with the cause “Not registered in SMLC”. Further actions by the MSC, LMU and SMLC are as described in section 12.1

13 Restoration of Data in an LMU

When an LMU restarts following a failure, it shall reinitialize all data concerning LCS measurement and O&M tasks to indicate that no tasks ordered by an SMLC are active. The LMU shall then perform an “IMSI Attach”. Other actions are for further study.

Annex A (informative): Change history

SPEC	SMG#	TDoc	CR	PHASE	REV	VERS	NEW_VERS	SUBJECT
03.07	s23	97-691	A001	R97		5.0.0	5.1.0	Restauration procedures GPRS
03.07	s25	98-0092	A002	R97		5.1.0	6.0.0	Modification of Restoration Procedures for GPRS
03.07	s26	98-0412	A003	R97	2	6.0.0	6.1.0	Alignment with the latest revisions of GSM 03.60 and GSM 09.60
03.07	s26	98-0412	A004	R97	1	6.0.0	6.1.0	Alignment of restoration procedures for GPRS to GSM 09.18

History

Document history		
V6.1.0	July 1998	Publication

TSG CN2 B
Phoenix, AZ, 15-19 November, 1999

Document* *N2-99K56
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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

23.008	CR	011	Current Version:	3.1.0

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

For submission to:	TSG CN#6	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic	X	

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

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

Source: TSG N2 **Date:** 8 Dec 1999

Subject: Organization of Subscriber Data for LCS

Work item: Location Services (LCS)

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

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

Reason for change: Mirror CR to Release 98 – to change subscriber data for LCS

Clauses affected: 0, 1, 2, 4

Other specs affected:

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

Other comments: This is a mirror CR for Release 99 combining the LCS changes against GSM 03.08 v.7.0.0 approved at SMG#29 and against GSM 03.08 v.7.1.0 (CR A029) approved by CN WG2 in Phoenix, November 18, 1999.

0 Scope

The scope of this specification is to provide details concerning information to be stored in home location registers, visitor location registers and GPRS Support Nodes concerning mobile subscriber.

Clause 2 contains all details concerning the definition of the parameters, often given by reference to other specifications, and where the parameter is to be stored.

Table 1 in clause 3 gives a summary overview and clause 4 identifies the reference information required for accessing the information.

0.1 Normative references

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.02: "Digital cellular telecommunications system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 02.03: "Digital cellular telecommunications system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[4] GSM 02.04: "Digital cellular telecommunications system (Phase 2+); General on supplementary services".

[5] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".

[6] GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration procedures".

[7] GSM 03.09: "Digital cellular telecommunications system (Phase 2+); Handover procedures".

[8] GSM 03.12: "Digital cellular telecommunications system (Phase 2+); Location registration procedures".

[9] GSM 03.15: "Digital cellular telecommunications system (Phase 2+); Technical realization of operator determined barring".

[10] GSM 03.20: "Digital cellular telecommunications system (Phase 2+); Security related network functions".

[11] GSM 03.40: "Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS) Point-to-Point (PP)".

[12] GSM 03.67: "Digital cellular telecommunications system (Phase 2+); enhanced Multi-Level Precedence and Pre-emption service (eMLPP) - Stage 2".

[13] GSM 03.68: "Digital cellular telecommunications system (Phase 2+); Voice Group Call Service (VGCS) - Stage 2".

[14] GSM 03.69: "Digital cellular telecommunications system (Phase 2+); Voice Broadcast Service (VBS) - Stage 2".

[14a] GSM 03.71: “Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Functional Description; Stage 2”.

[15] GSM 03.78: " Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL) - Stage 2".

[16] GSM 03.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 2".

[17] GSM 03.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 2".

[18] GSM 03.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".

[19] GSM 03.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 2".

[20] GSM 03.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 2".

[21] GSM 03.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 2".

[22] GSM 03.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 2".

[23] GSM 03.90: "Digital cellular telecommunications system (Phase 2+); Unstructured Supplementary Service Data (USSD) - Stage 2".

[24] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[25] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[26] GSM 09.07: "Digital cellular telecommunications system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[27] GSM 12.03: "Digital cellular telecommunications system (Phase 2); Security management".

[28] GSM 12.08: "Digital cellular telecommunications system (Phase 2); Subscriber and Equipment Trace".

[29] CCITT Recommendation Q.763: "Specifications of Signalling System No.7; Formats and codes".

[30] ANSI T1.113 "Signalling System No7 (SS7) Integrated Services Digital Network (ISDN) User Part"

[31] GSM 02.60: "Digital cellular telecommunications system (Phase 2+); "General Packet Radio Service (GPRS) Stage 1".

[32] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); "General Packet Radio Service (GPRS) Stage 2".

[33] GSM 02.32: "Digital cellular telecommunications system (Phase 2+); Immediate Service Termination (IST) Service Description - Stage 1".

[34] GSM 03.35: "Digital cellular telecommunications system (Phase 2+); Immediate Service Termination (IST) Stage 2".

0.2 Abbreviations

Abbreviations used in this specification are listed in GSM 01.04.

1 Introduction

1.1 Definition

The term subscriber data is used to designate all information associated with a subscription which is required for service provisions, identification, authentication, routing, call handling, GPRS mode transmission, charging, subscriber tracing, operation and maintenance purposes. Some subscriber data are referred to as permanent subscriber data, i.e. they can only be changed by administration means. Other data are temporary subscriber data which may change as a result of normal operation of the system.

Unless shown to be conditional, all data items are considered to be mandatory.

1.2 Storage facilities

This specification considers subscriber data stored in the following~~two~~ types of functional unit:

- Home location register (HLR) which contains all permanent subscriber data and all relevant temporary subscriber data for all mobile subscribers permanently registered in the HLR.
- Visitor location register (VLR) which contains all subscriber data required for call handling and other purposes for mobile subscribers currently located in the area controlled by the VLR.
- Serving GPRS Support Node (SGSN) which contains all subscriber data required for GPRS mode transmission and other purposes for mobile subscribers currently located in the area controlled by the SGSN.
- Gateway GPRS Support Node (GGSN) which contains all subscriber data required for GPRS mode transmission for mobile subscribers using any service provided by the GGSN.
- Gateway Mobile Location Center (GMLC) which contains all subscriber data required for external clients of the location services (LCS).
- Serving Mobile Location Center (SMLC) which contains all LMU data required to manage location measurements in LMUs. (Note: a Type A LMU is a network entity that shares many of the attributes of an MS including subscription data in the HLR and identification using an IMSI).

In addition, subscriber data may also be stored in the following functional unit:

- Group Call Register (GCR) which contains all data required for configuration, set-up and handling of voice group and voice broadcast calls. This encompasses subscribers identities (mobile as well as fixed network) who are nominated as dispatchers for one or several groups within the area controlled by the GCR.

NOTE: The data stored in the GCR is not strictly "subscriber data". Description of GCR data is therefore out of scope of this specification and is covered in the corresponding specifications for enhanced Multi Level Precedence and Pre-emption Service (eMLPP), Voice Group Call Service (VGCS) and Voice Broadcast Service (VBS) instead (GSM 03.67, GSM 03.68 and GSM 03.69).

1.3 Subscriber data in functional units other than the HLR, the VLR, the SGSN, ~~and~~ the GGSN, the GMLC, the SMLC and the LMU

The individual Subscriber Authentication Key Ki defined in GSM 03.20 is stored in the Authentication Centre AuC; it is also stored in the SIM and therefore available in the MS. Version numbers of algorithms A3 and A8 may also be stored in the AuC.

NOTE: It is for further study whether or not other types of functional units containing mobile subscriber parameters are to be included in this specification. Such units could include encryption key distribution centres, maintenance centres, etc.

2 Definition of subscriber data

2.1 Data related to subscription, identification and numbering

2.1.1 Data defining the subscription profile

2.1.1.1 International Mobile Subscriber Identity (IMSI)

International Mobile Subscriber Identity (IMSI) is defined in GSM 03.03.

IMSI is permanent subscriber data. IMSI is stored in HLR, VLR, SGSN, ~~and~~ GGSN and SMLC. For Anonymous Access, IMSI is not used in SGSN nor in GGSN. The IMSI serves as the root of the subscriber data pseudo-tree.

2.1.1.2 Network Access Mode (NAM)

The Network Access Mode defines if the subscriber is registered to get access to the non-GPRS network, to the GPRS network or to both networks. NAM describes the first level of the subscriber data pseudo-tree below the IMSI root. It is permanent subscriber data stored in the HLR and the SGSN with the Gs interface option..

2.1.2 Mobile Station International ISDN Number (MSISDN)

Mobile Station ISDN Number (MSISDN) is defined in GSM 03.03.

The MSISDN is permanent subscriber data and is stored in HLR, VLR and SGSN.

If the multinumbering option applies, the MSISDN stored in the VLR and in the SGSN is the Basic MSISDN, see subclause 2.1.3.1.

2.1.3 MSISDNs for multinumbering option

If the HPLMN allocates different MSISDNs for different Basic Services (see GSM 09.07), these numbers are conditionally stored as permanent data in the HLR.

2.1.3.1 The Basic MSISDN indicator

The Basic MSISDN is defined in GSM 03.12. The Basic MSISDN indicator marks the MSISDN to be used as Basic MSISDN.

It is permanent subscriber data stored conditionally in the HLR.

2.1.3.2 The MSISDN-Alert indicator

The MSISDN-Alert is defined in GSM 03.40. The MSISDN-Alert indicator marks the MSISDN to be used as MSISDN-Alert.

It is permanent subscriber data stored conditionally in the HLR.

2.1.4 Temporary mobile subscriber identity (TMSI)

Temporary mobile subscriber identity (TMSI) is defined in GSM 03.03.

The TMSI is temporary subscriber data and is conditionally stored in the VLR.

2.1.5 Packet-Temporary Mobile Subscriber Identity (P-TMSI)

Packet-Temporary Mobile Subscriber Identity (P-TMSI) is defined in GSM 03.03. Its usage is described in GSM 03.60. P-TMSI is accompanied by the P-TMSI Signature, see subclause 2.3.5.

The P-TMSI is temporary subscriber data and is conditionally stored in the SGSN.

2.1.6 Temporary Link Layer Identifier (TLLI)

Temporary Link Layer Identifier (TLLI) is defined in GSM 03.03. It is derived from the P-TMSI by the MS and occurs in the variants Local TLLI and Foreign TLLI. The TLLI is temporary subscriber data and is conditionally stored in the SGSN. For use of TLLI see GSM 03.60.

2.1.7 Random TLLI

Random TLLI is chosen randomly by the MS. It is defined in GSM 03.03. Random TLLI is short living temporary subscriber data and is conditionally stored in the SGSN. For use of Random TLLI see GSM 03.60.

A Random TLLI may be used if no valid P-TMSI is available.

2.1.8 Local Mobile Station Identity (LMSI)

Local Mobile Station Identity (LMSI) is defined in GSM 03.03. The LMSI is temporary subscriber data. The LMSI may be stored in the VLR; if it is received in the HLR it must be stored there.

2.1.9 International Mobile Equipment Identity (IMEI)

International Mobile Equipment Identity (IMEI) is defined in GSM 03.03. The IMEI is temporary subscriber data and is conditionally stored in the SGSN.

2.2 Data related to Mobile Station types

2.2.1 Mobile Station Category

Mobile Station Category has a structure identical to that of "Calling Party's Category" defined in ISUP (CCITT Recommendation Q.763).

The following values of category shall be supported:

- ordinary subscriber.

The category is assigned per IMSI.

Mobile Station Category is permanent subscriber data and is stored in HLR and VLR.

2.2.A LMU Identifier

The LMU identifier is part of the subscriber data for a Type A LMU, when associated with an NSS based SMLC, and serves to distinguish a Type A LMU from a normal MS.

2.3 Data related to authentication and ciphering

2.3.1 Random Number (RAND), Signed Response (SRES) and Ciphering Key (Kc)

Random Number (RAND), Signed Response (SRES) and Ciphering Key (Kc) form a triplet of vectors used for authentication and encryption as defined in GSM 03.20.

A set of up to 5 triplet values is calculated in the AuC (see GSM 12.03), provided to and stored in the HLR and then sent to the VLR and to the SGSN on request. These data are temporary subscriber data stored in the HLR, the VLR and the SGSN.

2.3.2 The Ciphering Key Sequence Number (CKSN)

The Ciphering Key Sequence Number (CKSN) is used to ensure authentication information (Kc) consistency between the MS and the VLR and between the MS and the SGSN.

CKSN and its handling are defined in GSM 04.08 and GSM 03.20. It is a temporary subscriber data and is stored in the VLR and in the SGSN.

2.3.3 Selected Ciphering Algorithm

Selected Ciphering Algorithm is defined in GSM 03.60.

Selected Ciphering Algorithm is temporary subscriber data stored in the SGSN.

2.3.4 Current Kc

Current Kc is defined in GSM 03.20.

Current Kc is temporary subscriber data stored in the SGSN.

2.3.5 P-TMSI Signature

P-TMSI Signature is defined in TSs GSM 03.03 and GSM 03.60. It is used for identification checking purposes.

P-TMSI Signature is temporary subscriber data and is conditionally stored in the SGSN.

2.4 Data related to roaming

2.4.1 Mobile Station Roaming Number (MSRN)

Mobile Station Roaming Number (MSRN) is defined in GSM 03.03.

NOTE: There may be more than one MSRN simultaneously per IMSI.

The MSRN is short-lived temporary subscriber data stored in the VLR.

2.4.2 Location Area Identification (LAI)

Location Area Identification (LAI) is defined in GSM 03.03.

The LAI is temporary subscriber data and is stored in the VLR.

2.4.3 Routing Area Identification (RAI)

Routing Area Identification (RAI) is defined in GSM 03.03.

The RAI is temporary subscriber data and is stored in the SGSN.

2.4.4 Cell Global Identification

Cell Identity (CI) is defined in GSM 03.03.

CI is temporary subscriber data and is conditionally stored in the SGSN.

2.4.5 VLR number

VLR number is defined in GSM 03.03.

The VLR number is temporary subscriber data and is stored in the HLR. Absence of the VLR number in HLR indicates that the mobile station is deregistered for non-GPRS or the subscriber has not a non-GPRS subscription in the HLR. The VLR number is stored in the SGSN with the Gs interface option. For usage of the VLR number in SGSN, please refer to GSM 03.60.

2.4.6 MSC number

MSC number is defined in GSM 03.03.

The MSC number is temporary subscriber data and is stored in the HLR and conditionally in the VLR. For absence of the MSC number in the HLR, the remarks on VLR number apply accordingly, cf. subclause 2.4.5.

2.4.7 HLR number

HLR number is defined in GSM 03.03.

The HLR number may be stored in the VLR and SGSN. It is received as a mandatory parameter in the updating location accepted message. This data may be needed to retrieve subscribers to be restored after HLR reset.

The HLR number is temporary subscriber data and may optionally be stored in the VLR and SGSN.

2.4.8 GSN number

GSN number occurs as SGSN number and as GGSN number.

2.4.8.1 SGSN number

SGSN number is the SS7 address of the SGSN . It is defined in GSM 03.03.

The SGSN number is temporary subscriber data and is stored in the HLR for a GPRS subscription. It is conditionally stored in the VLR if the Gs interface is installed. Absence of the SGSN number in the HLR indicates that the mobile station is deregistered for GPRS or the subscriber has no GPRS subscription in the HLR. Absence of the SGSN number in the VLR indicates that there is no association between the VLR and the SGSN for this MS. The SGSN number is to be distinguished from the SGSN address described in subclause 2.13.10.

2.4.8.2 GGSN number

GGSN number is the SS7 address of the GGSN .It is defined in GSM 03.03. Its usage is described in GSM 03.60. It is contained in the GGSN-list stored in the HLR and does not appear as separate subscriber data. Cf. subclause 2.13.11.

2.4.A MLC number

The MLC number occurs as an SMLC number and as a GMLC number.

2.4.A.1 SMLC number

The SMLC number is the E.164 address of an NSS based SMLC.

The SMLC number is permanent data that may be stored in an MSC in association with either a set of IMSIs belonging to LMUs controlled by the SMLC or a set of cell identifiers belonging to the geographic area served by the SMLC.

2.4.A.2 GMLC number

The GMLC number is the E.164 address of the GMLC. One or more GMLC numbers may be stored in the MS subscriber data in the HLR and downloaded to the VLR. These GMLC numbers identify the GMLCs for the particular MS from which a location request for this MS may be confined for particular LCS clients.

2.4.9 Subscription restriction

Subscription restriction is a parameter indicating whether or not certain restrictions apply to the subscription. The parameter takes either of the following values (see also GSM 02.13):

- accessible area for service:
- all GSM PLMNs,
- one national and all foreign GSM PLMNs,
- regionally restricted (part of a GSM PLMN in one country),
- regionally restricted plus all other GSM PLMNs.

The HLR associates location updating information with subscription restriction. It deregisters the MS if the PLMN is not allowed and sets

- the MSC area restricted flag if the MSC area is not allowed, see subclause 2.4.11.
- SGSN area restricted flag if the SGSN area is not allowed, see subclause 2.4.13

Handling of Regionally Restricted Subscription is defined in subclause 2.4.10. By operator agreement, regional restriction in parts of different GSM PLMNs is also possible.

The subscription restriction is permanent subscriber data and is stored in the HLR.

2.4.10 Regional Subscription Information

If a mobile subscriber has a regional subscription, the HLR shall store a list of up to ten Regional Subscription Zone Identities (RSZIs) per Network Destination Code (NDC) of the PLMN involved. The structure of RSZI is defined in GSM 03.03; since it is composed of the PLMN identification (CC NDC) and the Zone Code it is sufficient to store the Zone Code List per CC NDC.

On updating the VLR or the SGSN, the HLR identifies the VPLMN and NDC given by the VLR or SGSN number and transfers the pertaining Zone Code List to the VLR or SGSN. The VLR or SGSN derives from the Zone Code List the allowed and not allowed MSC or SGSN areas and location areas; it sets the "LA not allowed flag" should the target LAI of the mobile station be excluded, and it informs the HLR should the MSC or SGSN area be excluded. Signalling of cause value "location area not allowed" towards the mobile station is defined in TSs GSM 09.02 and GSM 04.08.

2.4.10.1 RSZI lists

The RSZI lists are permanent subscriber data stored conditionally in the HLR.

2.4.10.2 Zone Code List

The VLR and the SGSN shall store as permanent and conditional subscriber data at least those Zone Codes by which they are affected.

2.4.11 MSC area restricted flag

MSC area restricted flag is a parameter which can take either of the following values:

- MSC area restricted;
- MSC area not restricted.

The parameter is set in the HLR during updating of the VLR. Handling of unsupported services and information received from the VLR based on national roaming or regionally restricted subscription (subclause 2.4.10) determine its value. The parameter contributes to the "MS Not Reachable" state for handling of terminating traffic in the HLR. The default value is "MSC area not restricted".

The MSC area restricted flag is temporary subscriber data and is contained in the HLR.

2.4.12 LA not allowed flag

The LA not allowed flag is set in the VLR and the SGSN depending on National Roaming, Regionally Restricted Subscription and Roaming Restriction Due To UnSupported Feature, see GSM 09.02. It is applied to restrict service on a location area basis.

The LA not allowed flag is temporary subscriber data stored in the VLR and the SGSN.

2.4.13 SGSN area restricted flag

SGSN area restricted flag is a parameter which can take either of the following values:

- SGSN area restricted;
- SGSN area not restricted.

The parameter is set in the HLR during updating of the SGSN. Handling of unsupported services and information received from the SGSN based on national roaming or regionally restricted subscription (subclause 2.4.7) determine its value. The parameter contributes to the "MS Not Reachable" state for handling of terminating traffic in the HLR. The default value is "SGSN area not restricted".

The SGSN area restricted flag is temporary subscriber data and is contained in the HLR.

2.4.15 Service restriction data induced by roaming

If in the course of roaming or at updating of the VLR or SGSN the HLR is informed that the VLR or SGSN does not support certain sensitive services or features, or, the HLR is informed in data request that the VLR or the SGSN supports only specific services, features or phases which do not correspond to subscribed services, features or phases, the HLR takes appropriate measures to restrict service for the mobile station in that VLR or SGSN by setting and sending network induced replacing services such as available services, features or phases, barring programs or the roaming restriction for the MSC or SGSN area.

These network-induced data have to be kept separate in the HLR, and where possible as discussed below in the VLR, from the permanent subscriber data of the call barring supplementary services, from the barring related data that can be modified by the subscriber or from the permanent regional subscription data.

These network-induced data have to be kept separate in the HLR, and where possible as discussed below in the SGSN, from the permanent regional subscription data.

The network induced data take precedence over the subscriber data of the user where they are in conflict. If, in the course of roaming, restrictions caused by a service are lifted, the original subscriber data have to be re-installed both in HLR, in SGSN and in VLR when applicable, regarding any remaining restrictions due to other service replacements.

All network-induced restriction data are temporary subscriber data.

For ODB, GSM 03.15 recommends mainly barring programs to replace this feature. The replacing barring data are conditionally stored in the HLR and VLR. In the VLR they cannot be distinguished from the permanent supplementary services data with the available signalling means, and no additional storage is needed. Interrogation shall reflect in both HLR and VLR the valid setting of the replacing temporary data; to prevent interference with Subscriber Controlled Input and to inform the customer on the restriction, the "control of barring services" subscription option is also temporarily set to the value "by the service provider".

CUG is also replaced by Outgoing Call Barring as described in GSM 03.85.

Roaming restriction in the MSC area due to unsupported features is used to replace AoCC, see GSM 03.86, and Zone Codes for regional subscription, see subclause 2.4.10 and GSM 09.02. A flag in HLR and VLR, see subclause 2.4.15.2, collects the sources of network-induced roaming restriction which are also kept separate by the HLR.

Roaming restriction in the SGSN area due to unsupported features is used to replace Zone Codes for regional subscription, see subclause 2.4.10 and GSM 09.02. A flag in HLR and SGSN, see subclause 2.4.15.2, collects the sources of network-induced roaming restriction which are also kept separate by the HLR.

2.4.15.1 ODB-induced barring data

ODB-induced barring data are temporary data stored conditionally in the HLR; they include the necessary replacing barring programs for outgoing and incoming calls depending on the ODB profile. The subscription option "control of barring services" is set to "by the service provider". The corresponding barring supplementary services for outgoing calls are set by the HLR and sent to the VLR.

2.4.15.2 Roaming restriction due to unsupported feature

Roaming restriction due to unsupported feature is a parameter which indicates that one or several services or features are not supported by the MSC or the SGSN, resulting in roaming restriction in the MSC area or SGSN area. It can take either of the following values:

- roaming restricted;
- roaming not restricted.

The parameter governs the "LA not allowed flag" in the VLR (see subclause 2.4.12) and the "MSC area restricted flag" in the HLR (see subclause 2.4.11), or the "LA not allowed flag" in the SGSN (see subclause 2.4.12) and the "SGSN area restricted flag" in the HLR (see subclause 2.4.13), see GSM 09.02.

The flag "roaming restriction due to unsupported feature" is temporary subscriber data stored in the VLR, SGSN and in the HLR.

2.4.16 Cell ID

The cell ID indicates the global cell identity of the cell in which the MS is currently in radio contact or in which the MS was last in radio contact. The VLR shall update the stored cell ID at establishment of every radio connection.

The cell ID is temporary subscriber data stored in the VLR. It is conditional data, the VLR shall store it whenever the subscriber data is marked as confirmed by radio contact.

2.4.17 Localised Service Area Information

If a mobile subscriber has a localised service area subscription, the HLR shall store a list of up to 20 Localised Service Area Identities (LSA IDs) per PLMN. The structure of LSA ID is defined in GSM 03.03.

On updating the VLR or the SGSN, the HLR identifies the VPLMN given by the VLR or SGSN number and transfers the applicable LSA ID List to the VLR or SGSN. The VLR or SGSN derives from the LSA ID List the allowed LSA(s), priority of each LSA and the "LSA only access" indicator.

2.4.17.1 LSA Identity

LSA Identity (LSA ID) is defined in GSM 03.03. The element uniquely identifies a LSA.

2.4.17.2 LSA Priority

Localised Service Area Priority (LSA Priority) is defined in GSM 08.08. The LSA Priority is permanent subscriber data stored conditionally in the HLR.

2.4.17.3 LSA Only Access Indicator

The LSA Only Access Indicator defines if the subscriber is only allowed within its subscribed LSAs. The LSA Only Access Indicator is permanent subscriber data stored conditionally in the HLR.

2.4.17.4 LSA Active Mode Indicator

The Localised Service Area Active Mode Indicator defines if the LSA Identity of the cell in which the MS is currently in radio contact with shall be indicated to the subscriber in active mode. The LSA Active Mode Indicator is permanent subscriber data stored conditionally in the HLR.

2.4.17.5 VPLMN Identifier

The VPLMN Identifier identifies the VPLMN in which an LSA Identity is applicable. This identifier is not applicable to Universal LSA IDs as defined in GSM 03.03. The VPLMN identifier is permanent subscriber data stored conditionally in the HLR.

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

2.15 Data related to IST

2.15.1 IST Alert Timer

The IST Alert Timer indicates the timer value that the VMSC and the GMSC shall use to inform the HLR about each of the call activities that an IST non-CAMEL subscriber performs.

This parameter is only sent to the VLRs which support the non-CAMEL IST functionality.

2.A Data related to Location Services

2.A.1 Subscriber Data stored in HLR

2.A.1.1 Privacy Exception List

This data contains the privacy classes for any target MS which identify the LCS clients permitted to locate the MS. For a detailed definition of this data, refer to GSM 03.71.

2.A.1.2 GMLC Numbers

This data contains the GMLC addresses for an MS subscriber. These addresses may be used to verify that a location request from specific LCS clients is authorized for the target MS.

2.A.1.3 MO-LR List

This data contains the classes of MO-LR that are permitted for the MS subscriber. For a detailed definition of this data, refer to GSM 03.71.

2.A.2 Data stored in GMLC

The GMLC stores data related to LCS clients. Refer to GSM 03.71 for a detailed description.

2.A.3 Data stored in SMLC

The SMLC stores data related to associated Type A and Type B LMUs from which location measurements may be received. Refer to GSM 03.71 for a detailed description.

2.A.4 Data stored in LMU

The LMU stores data related to its LCS measurement and O&M capabilities and may store data related to LCS measurements and O&M reports that it is required to provide to its controlling SMLC. The nature and content of this data is not defined in GSM.

2.A.5 Data stored in the MSC

In order to support routing of connectionless LCS messages to an SMLC or a Type B LMU, the MSC may store permanent routing data for an SMLC or a Type B LMU in association with a specific location area identifier or location area identifier plus cell identifier.

2.A.6 Data stored in the BSC

In order to support routing of connectionless LCS messages to an SMLC or a Type B LMU, the BSC may store permanent routing data for an SMLC or a Type B LMU in association with a specific location area identifier or location area identifier plus cell identifier.

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

4 Accessing subscriber data

It shall be possible to retrieve or store subscriber data concerning a specific MS from the HLR by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);
- Mobile Station ISDN Number (MSISDN)

It shall be possible to retrieve or store subscriber data concerning a specific MS from the VLR by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);
- Temporary Mobile Subscriber Identity (TMSI).

It shall be possible to retrieve or store subscriber data concerning a specific MS from the SGSN by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);

  Packet Temporary Mobile Subscriber identity (P-TMSI).

It shall be possible to retrieve or store subscriber data concerning a specific MS from the GGSN by use of each of the following references:

- International Mobile Subscriber Identity (IMSI);

See clause 3 for explanation of M, C, T and P in table 1 and table 2.

Table 1: Overview of data stored for non-GPRS Network Access Mode

PARAMETER	SUBCLAUSE	HLR	VLR	TYPE	
IMSI	2.1.1.1	M	M	P	Note
Network Access Mode	2.1.1.2	M	-	P	Note
International MS ISDN number	2.1.2	M	M	P	
multinumbering MSISDNs	2.1.3	C	-	P	Note
Basic MSISDN indicator	2.1.3.1	C	-	P	
MSISDN-Alert indicator	2.1.3.2	C	-	P	
TMSI	2.1.4	-	C	T	
LMSI	2.1.8	C	C	T	Note
Mobile Station Category	2.2.1	M	M	P	
LMU Identifier	2.2.A	C	C	P	
RAND, SRES and Kc	2.3.1	M	M	T	
Ciphering Key Sequence Number	2.3.2	-	M	T	
MSRN	2.4.1	-	C	T	Note
Location Area Identity	2.4.2	-	M	T	
VLR number	2.4.5	M	-	T	Note
MSC number	2.4.6	M	C	T	
HLR number	2.4.7	-	C	T	
Subscription restriction	2.4.9	C	-	P	
RSZI lists	2.4.10.1	C	-	P	
Zone Code List	2.4.10.2	-	C	P	
MSC area restricted flag	2.4.11	M	-	T	
LA not allowed flag	2.4.12	-	M	T	
ODB-induced barring data	2.4.15.1	C	-	T	
Roaming restriction due to unsupported feature	2.4.15.2	M	M	T	
Cell ID	2.4.16	-	C	T	
LSA Identity	2.4.X.1	C	C	P	
LSA Priority	2.4.X.2	C	C	P	
LSA Only Access Indicator	2.4.X.3	C	C	P	
LSA Active Mode Indicator	2.4.X.4	C	C	P	
VPLMN Identifier	2.4.X.5	C	-	P	
Provision of bearer service	2.5.1	M	M	P	
Provision of teleservice	2.5.2	M	M	P	
BC allocation	2.5.3	C	C	P	
IMSI detached flag	2.7.1	-	C	T	
Confirmed by Radio Contact indicator	2.7.4.1	-	M	T	
Subscriber Data Confirmed by HLR indicator	2.7.4.2	-	M	T	
Location Information Confirmed in HLR indicator	2.7.4.3	-	M	T	
Check SS indicator	2.7.4.4	M	-	T	
MS purged for non-GPRS flag	2.7.5	M	-	T	
MNRR	2.7.7	C	-	T	
Subscriber status	2.8.1	C	C	P	
Barring of outgoing calls	2.8.2.1	C	C	P	
Barring of incoming calls	2.8.2.2	C	-	P	
Barring of roaming	2.8.2.3	C	-	P	
Barring of premium rate calls	2.8.2.4	C	C	P	
Barring of supplementary service management	2.8.2.5	C	C	P	
Barring of registration of call forwarding	2.8.2.6	C	-	P	
Barring of invocation of call transfer	2.8.2.7	C	C	P	
Operator determined barring PLMN-specific data	2.8.3	C	C	P	
Handover Number	2.9.1	-	C	T	
Messages Waiting Data	2.10.1	C	-	T	
Mobile Station Not Reachable Flag	2.10.2	C	M	T	
Memory Capacity Exceeded Flag	2.10.3	C	-	T	

(continued)

Table 1 (concluded): Overview of data stored for non-GPRS Network Access Mode

PARAMETER	SUBCLAUSE	HLR	VLR	TYPE	
Trace Reference	2.11.1	C	C	P	
Trace Type	2.11.2	C	C	P	
Operations Systems Identity	2.11.3	C	C	P	
HLR Trace Type	2.11.4	C	-	P	
MAP Error On Trace	2.11.5	C	-	T	
Trace Activated in VLR	2.11.6	C	C	T	
Foreign Subscriber Registered in VLR	2.11.7	-	C	P	Note
VGCS Group Membership List	2.12.1	C	C	P	
VBS Group Membership List	2.12.2	C	C	P	
Broadcast Call Initiation Allowed List	2.12.2.1	C	C	P	
Originating CAMEL Subscription Information	2.14.1.1	C	C	P	
Terminating CAMEL Subscription Information	2.14.1.2	C	-	P	
Location Information/Subscriber state Information	2.14.1.3	C	-	P	
USSD CAMEL subscription information(U-CSI)	2.14.1.4	C	-	P	
SS invocation notification (SS-CSI)	2.14.1.5/3.2	C	C	P	
FTN translation information flag(TIF-CSI)	2.14.1.6	C	-	P	
USSD General CAMEL service information (UG-CSI)	2.14.2	C	-	P	
Negotiated CAMEL Capability Handling	2.14.2	C	-	T	
IST Alert Timer	2.16.1	C	C	P	
Privacy Exception List	2.A.1.1	C	C	P	
GMLC Numbers	2.A.1.2	C	C	P	
MO-LR List	2.A.1.3	C	C	P	

3GPP TSG CN WG2
Phoenix AZ, 15-19 Nov 1999

Document N2-99H66
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

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23.016	CR	006	Current Version:	3.2.0

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

For submission to:	TSG CN#06	for approval	X	strategic	X	(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

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

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

Source: TSG N2 **Date:** 15 Nov 1999

Subject: Support of Subscriber Data Management in the HLR and VLR for LCS

Work item: Location Services (LCS)

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

Correction	
Corresponds to a correction in an earlier release	
Addition of feature	
Functional modification of feature	X
Editorial modification	

Release:

Phase 2	
Release 96	
Release 97	
Release 98	
Release 99	X
Release 00	

Reason for change: Modify Subscriber Data Management for LCS

Clauses affected: 3, 4

Other specs affected:

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

Other comments:

3 Definitions and abbreviations

3.1 Abbreviations

Abbreviations used in this specification are listed in GSM 01.04.

3.2 Definitions

Subscriber data to be stored in the HLR, VLR and SGSN are defined in GSM 03.08, GSM 03.71 and in GSM 03.6x, GSM 03.8x and GSM 03.9x-series of technical specifications.

Voice Broadcast Service (VBS), Voice Group Call Service (VGCS) and enhanced Multi Level Precedence and Pre-emption Service (eMLPP) Data related to group call area, cell or dispatcher attributes is only stored in the Group Call Register (GCR) which is linked to each MSC/VLR.

The GCR and it's stored data is out of scope of this specification.

Subscriber related VBS, VGCS and eMLPP Data only concerns entitlement data for these-services and is seen as shared non-GPRS subscriber data.

GPRS and non-GPRS subscriber data:

The HLR has to download data to the VLR and to the SGSN. In this specification those data sent to the VLR are called non-GPRS subscriber data and those data sent to the SGSN are called GPRS subscriber data.

Whenever the refining identifier non-GPRS or GPRS is missing a common rule is addressed which hold for both kinds of subscriber data.

Subscriber data specific to non-GPRS shall only be sent from the HLR to the VLR. Subscriber data specific to GPRS shall only be sent from the HLR to the SGSN.

Subscriber data common to both non-GPRS and GPRS (regional subscription information) are downloaded from the HLR to both entities.

Shared non-GPRS subscriber data:

Common subset of subscriber data defined to be stored in both the HLR and VLR. Subscriber data only stored in the HLR is not part of shared subscriber data. Shared subscriber data includes:

BS: Bearer Service (see GSM 02.02);

TS: Teleservice (see GSM 02.03);

BSG: Basic Service Group (see GSM 02.01, GSM 02.04 and GSM 03.11);

EBSG: Elementary Basic Service Group (see GSM 03.11);

CBSG: Collective Basic Service Group (see GSM 03.11).

LSA Information: Localised Service Area Information (see GSM 03.73).

IST Information: Immediate Service Termination Information (see GSM 03.35).

Shared GPRS subscriber data:

Common subset of subscriber data defined to be stored in both the HLR and SGSN. Subscriber data only stored in the HLR is not part of shared subscriber data. Shared GPRS subscriber data includes:

TS: Teleservice (see GSM 02.03);

PDP Context (see GSM 03.60).

LSA Information: Localised Service Area Information (see GSM 03.73).

Mandatory data:

Data required to form a self-consistent set of subscriber data. The context governs whether a specific parameter is mandatory, e.g. the data set for a specific service may be optional, however if data for this service is present, then parameters within this data set may be mandatory.

Mandatory data is defined by the service description (see e.g. GSM 03.6x, GSM 03.8x and GSM 03.9x-series of technical specifications and GSM 03.15, GSM 03.71) and by PLMN defined requirements.

NOTE: The above definition is seen from a semantic point of view. Semantically, mandatory parameters may be defined as syntactically optional or mandatory by the protocol.

Optional data:

Data which is defined as subscriber data, but which is not required to form a self-consistent set of subscriber data; the context governs whether a specific parameter is optional.

Optional data is data which is defined by the service description (see e.g. GSM 03.6x, GSM 03.8x and GSM 03.9x-series of technical specifications and GSM 03.15, GSM 03.71) or by PLMN defined requirements but is not defined as mandatory data.

NOTE: The above definition is seen from a semantic point of view. Semantically optional parameters are always defined as syntactically optional by the protocol.

Missing data:

Data which is mandatory in a given context but is not received nor is valid data available locally.

Unexpected data:

Data which is received and cannot be further processed. This may be either:

- optional data not required in a given context; or
- optional or mandatory data, required in this context but received with an unexpected value.

Overlapping data:

Two different cases of overlapping within subscriber data are possible:

- two or more parameters are to be stored at the same address in the data structure (see subclause 4.4);
- two or more BSGs within a BSG list include or are identical with one and the same EBSG.

The following **groups of non-GPRS subscriber information** are defined:

- Subscriber information (Group A):
  - International Mobile Subscriber Identity (IMSI);
  - basic Mobile Station International ISDN Number (MSISDN);
  - category;
  - subscriber status,
  - LMU identifier
- Basic service information (Group B):
  - Bearer Service list;
  - Teleservice list.

NOTE: VBS and VGCS entitlement data are subsumed under Teleservices

- Supplementary Service (SS) information (Group C):
  - forwarding information;
  - call barring information;
  - Closed User Group (CUG) information;
  - eMLPP data;
  - SS Data;
- Operator Determined Barring (ODB) information (Group D):
  - ODB Data for non-GPRS services;
- Roaming restriction information (Group E):
  - roaming restriction due to unsupported feature;
- Regional subscription information (Group F):
  - regional subscription data.
- VBS/VGCS subscription information (Group G):
  - VBS subscription data;
  - VGCS subscription data.
- CAMEL subscription information (Group H):
  - Originating CAMEL Subscription Information.
- LSA Information (Group I):
  - LSA data.
- Location Services (LCS) information (Group X)
  - ~~HPLMN~~ GMLC List
  - LCS Privacy Exception List~~.~~
  - MO-LR List.
- IST Information (Group J):
  - IST data.

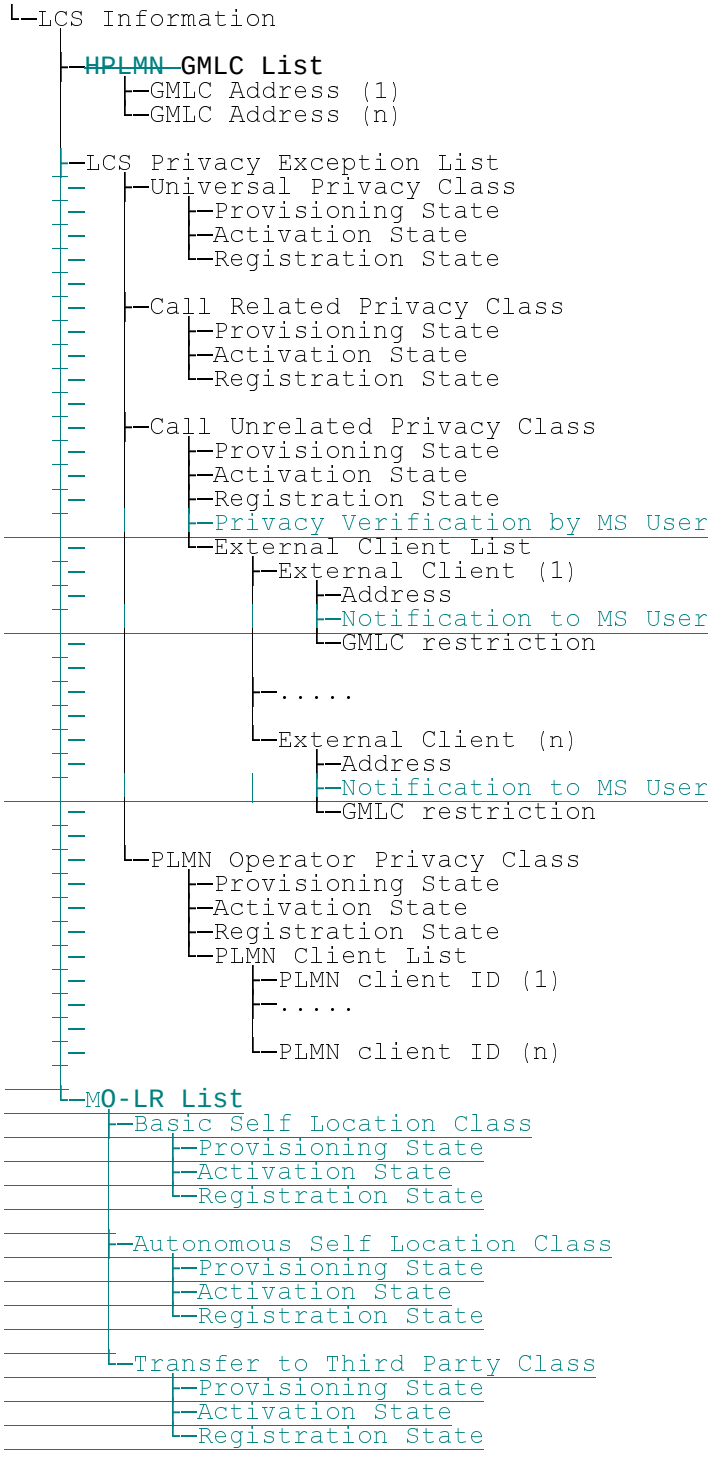
The following **groups of GPRS subscriber information** are defined:

- Subscriber information (Group P1):
  - International Mobile Subscriber Identity (IMSI);
  - basic Mobile Station International ISDN Number (MSISDN);
  - subscriber status;
- Basic service information (Group P2):
  - Teleservice list.
- Operator Determined Barring (ODB) information (Group P3):
  - ODB Data for GPRS services;

- Roaming restriction information (Group P4):
  - roaming restriction in SGSN due to unsupported feature;
- Regional subscription information (Group P5):
  - regional subscription data.
- GPRS subscription information (Group P6):
  - GPRS subscription data.
- LSA Information (Group P7):
  - LSA data.

4 General on handling of subscriber information

4.5.4 Consistency of supplementary service data



NOTE: For detailed information see GSM 03.71 and 3GPP 29.002~~GSM 09.02~~.

Figure 16: LCS Information

3GPP TSG CN WG2
Phoenix AZ, 15-19 Nov 1999

Document N2-99H52
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

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29.002	CR	060r1	Current Version:	3.2.0

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

For submission to:	TSG CN#06	for approval	X	strategic	X	*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

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

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

(U)SIM		ME		UTRAN / Radio		Core Network	X

Source: TSG N2 **Date:** 15 Nov 1999

Subject: MAP Impacts for Location Services (LCS)

Work item: Location Services (LCS)

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

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

Reason for change: Mirror CR to CR A273r1 for GSM 09.02 approved for Release 98. Provides modification of MAP messages and parameters to support enhancements to the Location Services (LCS)

Clauses affected: 2, 4, 5, 6, 7, 8, 13A, 16, 17

Other specs affected:

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

Other comments:

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.01: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 02.02: "Digital cellular telecommunications system (Phase 2+); Bearer Services (BS) Supported by a GSM Public Land Mobile Network (PLMN)".

[4] GSM 02.03: "Digital cellular telecommunications system (Phase 2+); Teleservices Supported by a GSM Public Land Mobile Network (PLMN)".

[5] GSM 02.04: "Digital cellular telecommunications system (Phase 2+); General on supplementary services".

[6] GSM 02.09: "Digital cellular telecommunications system (Phase 2+); Security aspects".

[7] GSM 02.16: "Digital cellular telecommunications system (Phase 2+); International Mobile station Equipment Identities (IMEI)".

[8] GSM 02.41: "Digital cellular telecommunications system (Phase 2+); Operator determined barring".

[9] GSM 02.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 1".

[10] GSM 02.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 1".

[11] GSM 02.83 : "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".

[12] GSM 02.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 1".

[13] GSM 02.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 1".

[14] GSM 02.86: "Digital cellular telecommunications system (Phase 2+); Advice of charge (AoC) supplementary services - Stage 1".

[15] GSM 02.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 1".

[16] GSM 02.90: "Digital cellular telecommunication system (Phase 2+); Unstructured supplementary services operation - Stage 1".

[17] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".

[18] GSM 03.04: "Digital cellular telecommunications system (Phase 2+); Signalling requirements relating to routeing of calls to mobile subscribers".

[19] GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration procedures".

[20] GSM 03.08: "Digital cellular telecommunications system (Phase 2+); Organisation of subscriber data".

[21] GSM 03.09: "Digital cellular telecommunications system (Phase 2+; Handover procedures".

[22] GSM 03.11: "Digital cellular telecommunications system (Phase 2+); Technical realization of supplementary services".

[23] GSM 03.12: "Digital cellular telecommunications system (Phase 2+); Location registration procedures".

[24] GSM 03.20: "Digital cellular telecommunications system (Phase 2+); Security related network functions".

[25] GSM 03.38: "Digital cellular telecommunications system (Phase 2+); Alphabets and language specific information for GSM".

[26] GSM 03.40: "Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS) Point to Point (PP)".

[26a] GSM 03.71: “Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Functional Description; Stage 2”.

[27] GSM 03.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 2".

[28] GSM 03.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 2".

[29] GSM 03.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".

[30] GSM 03.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 2".

[31] GSM 03.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 2".

[32] GSM 03.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 2".

[33] GSM 03.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 2".

[34] GSM 03.90: "Digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 2".

[35] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[36] GSM 04.10: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 Supplementary services specification General aspects".

[37] GSM 04.11: "Digital cellular telecommunications system (Phase 2+); Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface".

[37a] GSM 04.71: “Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 location services specification.

[38] GSM 04.80: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 supplementary services specification Formats and coding".

[39] GSM 04.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 3".

[40] GSM 04.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 3".

[41] GSM 04.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 3".

[42] GSM 04.84: "Digital cellular telecommunications system (Phase 2+); Multi Party (MPTY) supplementary services - Stage 3".

[43] GSM 04.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 3".

[44] GSM 04.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 3".

[45] GSM 04.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 3".

[46] GSM 04.90: "Digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 3".

[47] GSM 08.02: "Digital cellular telecommunications system (Phase 2+); Base Station System - Mobile-services Switching Centre (BSS - MSC) interface Interface principles".

[48] GSM 08.06: "Digital cellular telecommunications system (Phase 2+); Signalling transport mechanism specification for the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".

[49] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".

[49a] GSM 08.08: "Digital cellular telecommunications system (Phase 2+); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".

[49a1] GSM 08.31: “Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Center (SMLC) – Serving Mobile Location Center (SMLC); SMLC Peer Protocol (SMLCPP).”

[49b] GSM 08.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Centre - Base Station System (SMLC - BSS) interface Layer 3 specification".

[50] GSM 09.01: "Digital cellular telecommunications system (Phase 2+); General network interworking scenarios".

[51] GSM 09.02: "Digital cellular telecommunications system (Phase 1); Mobile Application Part (MAP) specification".

[52] GSM 09.03: "Digital cellular telecommunications system (Phase 2+); Signalling requirements on interworking between the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) and the Public Land Mobile Network (PLMN)".

[53] GSM 09.04: "Digital cellular telecommunications system (Phase 2+); Interworking between the Public Land Mobile Network (PLMN) and the Circuit Switched Public Data Network (CSPDN)".

[54] GSM 09.05: "Digital cellular telecommunications system (Phase 2+); Interworking between the Public Land Mobile Network (PLMN) and the Packet Switched Public Data Network (PSPDN) for Packet Assembly/Disassembly facility (PAD) access".

[55] GSM 09.06: "Digital cellular telecommunications system (Phase 2+); Interworking between a Public Land Mobile Network (PLMN) and a Packet Switched Public Data Network/Integrated Services Digital Network (PSPDN/ISDN) for the support of packet switched data transmission services".

[56] GSM 09.07: "Digital cellular telecommunications system (Phase 2+); General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[57] GSM 09.08: "Digital cellular telecommunications system (Phase 2+); Application of the Base Station System Application Part (BSSAP) on the E-interface".

[58] GSM 09.10: "Digital cellular telecommunications system (Phase 2+); Information element mapping between Mobile Station - Base Station System and BSS - Mobile-services Switching Centre (MS - BSS - MSC) Signalling procedures and the Mobile Application Part (MAP)".

[59] GSM 09.11: "Digital cellular telecommunications system (Phase 2+); Signalling interworking for supplementary services".

[59a] GSM 09.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Base Station System Application Part LCS Extension (BSSAP-LE)”.

[60] GSM 09.90: "Digital cellular telecommunications system (Phase 2+); Interworking between Phase 1 infrastructure and Phase 2 Mobile Stations (MS)".

[61] GSM 12.08: "Digital cellular telecommunications system (Phase 2); Subscriber and Equipment Trace".

[62] ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3 specifications for basic call control".

[63] ETS 300 136 (1992): "Integrated Services Digital Network (ISDN); Closed User Group (CUG) supplementary service description".

[64] ETS 300 138 (1992): "Integrated Services Digital Network (ISDN); Closed User Group (CUG) supplementary service Digital Subscriber Signalling System No.one (DSS1) protocol".

[65] ETS 300 287: "Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2".

[66] ETR 060: "Signalling Protocols and Switching (SPS); Guide-lines for using Abstract Syntax Notation One (ASN.1) in telecommunication application protocols".

[67] CCITT Recommendation E.164: "Numbering plan for the ISDN era".

[68] CCITT Recommendation E.212: "Identification plan for land mobile stations".

[69] CCITT Recommendation E.213: "Telephone and ISDN numbering plan for land mobile stations".

[70] CCITT Recommendation E.214: "Structuring of the land mobile global title for the signalling connection control part".

[71] CCITT Recommendation Q.669: "Interworking between the Digital Subscriber Signalling System Layer 3 protocol and the Signalling System No.7 ISDN User part".

[72] CCITT Recommendation Q.711: "Specifications of Signalling System No.7; Functional description of the signalling connection control part".

[73] CCITT Recommendation Q.712: "Definition and function of SCCP messages".

[74] CCITT Recommendation Q.713: "Specifications of Signalling System No.7; SCCP formats and codes".

[75] CCITT Recommendation Q.714: "Specifications of Signalling System No.7; Signalling connection control part procedures".

[76] CCITT Recommendation Q.716: "Specifications of Signalling System No.7; Signalling connection control part (SCCP) performances".

[77] CCITT Recommendation Q.721 (1988): "Specifications of Signalling System No.7; Functional description of the Signalling System No.7 Telephone user part".

[78] CCITT Recommendation Q.722 (1988): "Specifications of Signalling System No.7; General function of Telephone messages and signals".

[79] CCITT Recommendation Q.723 (1988): "Specifications of Signalling System No.7; Formats and codes".

[80] CCITT Recommendation Q.724 (1988): "Specifications of Signalling System No.7; Signalling procedures".

[81] CCITT Recommendation Q.725 (1988): "Specifications of Signalling System No.7; Signalling performance in the telephone application".

[82] CCITT Recommendation Q.761 (1988): "Specifications of Signalling System No.7; Functional description of the ISDN user part of Signalling System No.7".

[83] CCITT Recommendation Q.762 (1988): "Specifications of Signalling System No.7; General function of messages and signals".

[84] CCITT Recommendation Q.763 (1988): "Specifications of Signalling System No.7; Formats and codes".

[85] CCITT Recommendation Q.764 (1988): "Specifications of Signalling System No.7; Signalling procedures".

[86] CCITT Recommendation Q.767: "Specifications of Signalling System No.7; Application of the ISDN user part of CCITT signalling System No.7 for international ISDN interconnections".

[87] CCITT Recommendation Q.771: "Specifications of Signalling System No.7; Functional description of transaction capabilities".

[88] CCITT Recommendation Q.772: "Specifications of Signalling System No.7; Transaction capabilities information element definitions".

[89] CCITT Recommendation Q.773: "Specifications of Signalling System No.7; Transaction capabilities formats and encoding".

[90] CCITT Recommendation Q.774: "Specifications of Signalling System No.7; Transaction capabilities procedures".

[91] CCITT Recommendation Q.775: "Specifications of Signalling System No.7; Guide-lines for using transaction capabilities".

[92] CCITT Recommendation X.200: "Reference Model of Open systems interconnection for CCITT Applications".

[93] CCITT Recommendation X.208 (1988): "Specification of Abstract Syntax Notation One (ASN.1)".

[94] CCITT Recommendation X.209 (1988): "Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1)".

[95] CCITT Recommendation X.210: "Open systems interconnection layer service definition conventions".

[96] GSM 09.02: "Digital cellular telecommunications system (Phase 2); Mobile Application Part (MAP) specification”.

[97] GSM 03.18: "Digital cellular telecommunications system (Phase 2+); Basic Call Handling".

[98] GSM 03.78: "Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL) - Stage 2”.

[99] GSM 03.79: "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routeing (SOR) - Stage 2”.

[100] GSM 03.68: "Digital cellular telecommunications system (Phase 2+); - Stage 2".

[101] GSM 03.69: "Digital cellular telecommunications system (Phase 2+); - Stage 2".

[102] ANSI T1.113: "Signaling System No. 7 (SS7) - ISDN User Part".

[103] GSM 03.54 "Digital cellular telecommunications system (Phase 2+); Stage 2 Description for the use of a Shared Inter Working Function (SIWF) in a GSM PLMN".

[104] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS) Description; Stage 2".

[105] GSM 09.60: "Digital cellular telecommunications system (Phase 2+), General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface".

[106] GSM 09.18: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Serving GPRS Support Node (SGSN) - Visitors Location Register (VLR); Gs interface layer 3 specification".

[107] GSM 03.93: "Digital cellular telecommunications system (Phase 2+); Technical Realization of Completion of Calls to Busy Subscriber (CCBS); Stage 2".

[108] GSM 03.66: "Digital cellular telecommunications system (Phase 2+); Support of Mobile Number Portability (MNP); Technical Realisation Stage 2".

[109] ANSI T1.112 (1996): "Telecommunication – Signaling No. 7 – Signaling Connection Control Part (SCCP)".

5 Overload and compatibility overview

5.1 Overload control

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

5.1.2 Overload control for MAP entities

Table 5.1/2: Priorities of Application Contexts for MSC/VLR as Responder

Responder = MSC/VLR	Initiating Entity
Priority high	
Handover	
handoverControl (prepareHandover/v2), (performHandover/v1)	MSC
Mobility and Location Register Management	
locationCancel (cancelLocation)	HLR
reset (reset)	HLR
immediateTermination (istCommand/v3)	HLR
interVlrInfoRetrieval (sendIdentification/v2), (sendParameters/v1)	VLR
subscriberDataMngt (insertSubscriberData), (deleteSubscriberData)	HLR
tracing (activateTraceMode), (deactivateTraceMode)	HLR
Short Message Service	
shortMsgMO-Relay (MO-ForwardSM v3) (forwardSM v1/v2)	MSC/SGSN
shortMsgMT-Relay (MT-ForwardSM v3) (forwardSM v1/v2)	MSC
shortMsgAlert (alertServiceCentre/v2), (alertServiceCentreWithoutResult/v1)	HLR
Mobile Terminating Traffic	
roamingNbEnquiry (provideRoamingNumber)	HLR
callControlTransfer (resumeCallHandling)	MSC
subscriberInfoEnquiry (provideSubscriberInformation)	HLR
reporting (remoteUserFree) (SetReportingState)	HLR
Location Services	
~~locationSvcLMUControl (lcsReset v3)~~	~~SMLC~~
~~locationSvcDataTransfer (lcsInformationRequest v3)~~	~~SMLC~~
locationSvcEnquiry (provideSubscriberLocation v3)	GMLC
Network-Initiated USSD	
networkUnstructuredSs (unstructuredSS-Request/v2), (unstructuredSS-Notify/v2)	HLR
Priority low	

NOTE: The application context name is the last component but one of the object identifier.
Operation names are given in brackets for information with "/vn" appended to vn only operations.

~~**Table 5.1/4: Priorities of Application Contexts for SMLC as Responder**~~

~~**Responder – SMLC**~~	~~**Initiating Entity**~~
~~***Priority high***~~	
~~*Location Services*~~	
~~locationSvcLMUControl (lcsRegistration v3)~~	~~VLR~~
~~locationSvcDataTransfer (lcsInformationReport v3)~~	~~MSC~~
~~locationSvcPositioning (performLocation v3)~~	~~MSC~~
~~***Priority low***~~	

~~NOTE: The application context name is the last component but one of the object identifier.~~
~~Operation names are given in brackets for information with "/vn" appended to vn.~~

6 Requirements concerning the use of SCCP and TC

6.1 Use of SCCP

6.1.3 SCCP addressing

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

6.1.3.1 Introduction

Within the GSM System there will be a need to communicate between entities within the same PLMN and in different PLMNs. Using the Mobile Application Part (MAP) for this function implies the use of Transaction Capabilities (TC) and the Signalling Connection Control Part (SCCP) of CCITT Signalling System No. 7.

Only the entities which should be addressed are described below. If the CCITT or ITU-T SCCP is used , the format and coding of address parameters carried by the SCCP for that purpose shall comply with CCITT Recommendation Q.713 with the following restrictions:

1) Intra-PLMN addressing

   For communication between entities within the same PLMN, a MAP SSN shall always be included in the called and calling party addresses. All other aspects of SCCP addressing are network specific.

2) Inter-PLMN addressing

   a) Called Party Address

   - SSN indicator = 1 (MAP SSN always included);
   - Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
   - the translation type field will be coded "00000000" (Not used). For call related messages for non-optimal routed calls (as described in GSM 03.66) directed to another PLMN the translation type field may be coded "10000000" (CRMNP);
   - Routing indicator = 0 (Routing on global title);

   b) Calling Party Address

   - SSN indicator = 1 (MAP SSNs always included);
   - Point code indicator = 0;
   - Global title indicator = 0100 (Global title includes translation type, numbering plan, encoding scheme and nature of address indicator);
   - Numbering Plan = 0001 (ISDN Numbering Plan, E.164; In Case of Inter-PLMN Signalling, the dialogue initiating entity and dialogue responding entity shall always include its own E.164 Global Title as Calling Party Address);
   - the translation type field will be coded "00000000" (Not used);
   - Routing indicator = 0 (Routing on Global Title).

If ANSI T1.112 SCCP is used, the format and coding of address parameters carried by the SCCP for that purpose shall comply with ANSI specification T1.112 with the following restrictions:

1) Intra-PLMN addressing

For communication between entities within the same PLMN, a MAP SSN shall always be included in the called and calling party addresses. All other aspects of SCCP addressing are network specific.

2) Inter-PLMN addressing

a) Called Party Address

- SSN indicator = 1 (MAP SSN always included);
- Global title indicator = 0010 (Global title includes translation type);
- the Translation Type (TT) field will be coded as follows:

  TT = 9, if IMSI is included,

  TT = 14, if MSISDN is included,

  Or TT = 10, if Network Element is included. (If TT=10, then Number Portability GTT is not invoked, if TT=14, then Number Portability GTT may be invoked.)

- Routing indicator = 0 (Routing on global title);

b) Calling Party Address

- SSN indicator = 1 (MAP SSNs always included);
- Point code indicator = 0;
- Global title indicator = 0010 (Global title includes translation type);

  TT = 9, if IMSI is included,

  TT = 14, if MSISDN is included,

  Or TT = 10, if Network Element is included. (If TT=10, then Number Portability GTT is not invoked, if TT=14, then Number Portability GTT may be invoked.)

Routing indicator = 0 (Routing on Global Title).

If a Global Title translation is required for obtaining routeing information, one of the numbering plans E.164, E.212 and E.214 is applicable.

- E.212 numbering plan

  When CCITT or ITU-T SCCP is used, an E.212 number must not be included as Global Title in an SCCP UNITDATA message. The translation of an E.212 number into a Mobile Global Title is applicable in a dialogue initiating VLR, SGSN or GGSN if the routeing information towards the HLR is derived from the subscriber's IMSI. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used as a Global Title to address the HLR. When an MS moves from one VLR service area to another, the new VLR may derive the address of the previous VLR from the Location Area Identification provided by the MS in the location registration request. The PLMN where the previous VLR is located is identified by the E.212 numbering plan elements of the Location Area Identification, ie the Mobile Country Code (MCC) and the Mobile Network Code (MNC).

- E.214 and E.164 numbering plans

  When CCITT or ITU-T SCCP is used, , only address information belonging to either E.214 or E.164 numbering plan is allowed to be included as Global Title in the Called and Calling Party Address. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used as a Global Title to address the HLR.

  If the Calling Party Address associated with the dialogue initiating message contains a Global Title, the sending network entity shall include its E.164 entity number.

  When receiving an SCCP UNITDATA message, SCCP shall accept either of the valid numbering plans in the Called Party Address and in the Calling Party Address.

When CCITT or ITU-T SCCP is used and an N-UNITDATA-REQUEST primitive from TC is received, SCCP shall accept an E.164 number or an E.214 number in the Called Address and in the Calling Address. In World Zone 1 when ANSI SCCP is used, the IMSI (E.212 number) is used instead of E.214 number.

The following subclauses describe the method of SCCP addressing appropriate for each entity both for the simple intra-PLMN case and where an inter-PLMN communication is required. The following entities are considered:

- the Mobile-services Switching Centre (MSC);
- the Home location Register (HLR);
- the Visitor Location Register (VLR);
- the Gateway Mobile-services Switching Centre (GMSC);
- the GSM Service Control Function (gsmSCF);
- the Interworking Mobile-services Switching Centre (IWMSC);
- the Shared Inter Working Function (SIWF);
- the Serving GPRS Support Node (SGSN);
- the Gateway GPRS Support Node (GGSN);
- ~~the Serving Mobile Location Center (SMLC);~~
- the Gateway Mobile Location Center (GMLC).

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

6.1.3.10 The Gateway MSC (GMSC) for Short Message Service

The GMSC provides interworking with the network to access the Short Message Service Centre, the mobile network and routing of Send Routing Info For SM. The GMSC has on E.164 address known in the HLR, SGSN or MSC

~~6.1.3.10A The Serving Mobile Location Center (SMLC)~~

~~There are several instances where an SMLC needs to be addressed.~~

~~6.1.3.10A.1 Registration (LMU)~~

~~When an LMU needs to register with a controlling SMLC, it may derive the identity of the SMLC from pre-administered data. The identity will be represented in this case by an international E.164 address.~~

~~6.1.3.10A.2 Instigation of Positioning (MSC)~~

~~When an MSC needs to instigate procedures to obtain location information for a target MS, it derives the identity of the SMLC for this MS from the MS's serving cell site. The identity of the SMLC shall be represented by either an SS7 signalling point code or an international E.164 address.~~

6.1.3.10B The Gateway Mobile Location Center (GMLC)

The GMLC initiates location requests on behalf of external clients. The E.164 address of the GMLC is provided to an HLR when the GMLC requests a serving MSC address from the HLR for a target MS. The E.164 address of the GMLC is also provided to a serving MSC when the GMLC requests the location of a target MS served by this MSC.

6.1.3.11 Summary table

The following tables summarize the SCCP address used for invoke operations. As a principle, within a PLMN either an SPC or a GT may be used (network operation option), whereas when addressing an entity outside the PLMN the GT must be used. The address type mentioned in the table (e.g. MSISDN) is used as GT or to derive the SPC.

For a response, the originating address passed in the invoke is used as SCCP Called Party Adress. For extra-PLMN addressing the own E.164 entity address is used as SCCP Calling Party Address; for intra-PLMN addressing an SPC derived from the entity number may be used instead. When using an SPC, the SPC may be taken directly from MTP.

Table 6.1/1

to from	fixed net work	HLR	VLR	MSC	EIR	gsmSCF	SIWF	SGSN	GGSN
fixed network	---	E:GT T:MSISDN	---	---	---	---	---	---	---
home location register	---	---	I:SPC/GT E:GT T:VLR NUMBER	---	---	I:SPC/GT E:GT T:gsmSCF NUMBER	---	I:SPC/GT E:GT T:SGSN NUMBER	I:SPC/GT E:GT T:GGSN NUMBER
visitor location register	---	I:SPC/GT E:GT T:MGT (outside World Zone 1)/MSISDN (World Zone 1/)HLR NUMBER (note)	I:SPC/GT E:GT T:VLR NUMBER	---	---	---	---	---	---
mobile-services switching centre	---	I:SPC/GT E:GT T:MSISDN	I:SPC/GT E:GT T:VLR NUMBER	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	I:SPC/GT E:GT T:gsmSCF NUMBER	I:SPC/GT E:GT T:SIWF NUMBER	I:SPC/GT E:GT T:SGSN NUMBER	---
gsm Service Control Function	---	I:SPC/GT E:GT T:MSISDN	---	---	---	---	---	---	---
Shared Inter Working Function	---	---	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---
Serving GPRS Support Node	---	I:SPC/GT E:GT T:MGT/ MSISDN/HLR NUMBER	---	I:SPC/GT E:GT T:MSC NUMBER	I:SPC/GT E:GT T:EIR NUMBER	---	---	---	---
Gateway GPRS Support Node	---	I:SPC/GT E:GT T:MGT	---	---	---	---	---	---	---
~~**Serving Mobile Location Centre**~~	~~---~~	~~---~~	~~I:SPC/GT (E:GT) T:VLR NUMBER~~	~~I:SPC/GT (E:GT) T:MSC NUMBER~~	~~---~~	~~---~~	~~---~~	~~---~~	~~---~~
Gateway Mobile Location Center	---	I:SPC/GT E:GT T:MSISDN, MGT (outside World Zone 1) or IMSI (World Zone 1) (note)	---	I:SPC/GT E:GT T:MSC NUMBER	---	---	---	---	---

I: Intra-PLMN E: Extra(Inter)-PLMN T: Address Type
GT: Global Title MGT: E.214 Mobile Global Title SPC: Signalling Point Code

NOTE: For initiating the location updating procedure and an authentication information retrieval from the HLR preceding it, the VLR has to derive the HLR address from the IMSI of the MS. The result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).. When continuing the established update location dialogue (as with any other dialogue) the VLR must derive the routeing information towards the HLR from the Calling Party Address received with the first responding CONTINUE message until the dialogue terminating message is received.
For transactions invoked by the VLR after update location completion, the VLR may derive the information for addressing the HLR from addresses received in the course of the update location procedure (MSISDN or HLR number) or from the IMSI.

When invoking the Restore Data procedure and an authentication information retrieval from the HLR preceding it, the VLR must derive the information for addressing the HLR from the address information received in association with the roaming number request. This may be either the IMSI received as a parameter of the MAP message requesting the Roaming Number or the Calling Party Address associated with the MAP message requesting the Roaming Number.
The gsmSCF shall be addressed using more than one Global Title number. The first Global Title number is used to address a gsmSCF for MAP. The second Global Title number is used to address a gsmSCF for CAP.
For querying the HLR to obtain the VMSC address to support location services, the GMLC has to derive the HLR address from either the MSISDN or IMSI of the target MS. When using the IMSI, the result can be an SPC or an E.214 Mobile Global Title if CCITT or ITU-T SCCP is used, or IMSI itself if ANSI SCCP is used (ANSI SCCP is used in World Zone 1).

~~Inter-PLMN signalling from an SMLC to MSC is not defined in GSM 03.71; hence, the type of addressing is not significant.~~

Table 6.1/2

to from	~~SMLC~~	GMLC
fixed network	---	---
home location register	---	---
visitor location register	~~I:SPC/GT (E:GT) T:MLC NUMBER~~	---
mobile-services switching centre	~~I:SPC/GT (E:GT) T:MLC NUMBER~~	---
gsm Service Control Function	---	---
Shared Inter Working Function	---	---
Serving GPRS Support Node	---	---
Gateway GPRS Support Node	---	---
~~**Serving Mobile Location Centre**~~	---	---
Gateway Mobile Location Center	---	

I: Intra-PLMN E: Extra(Inter)-PLMN T: Address Type
GT: Global Title MGT: E.214 Mobile Global Title SPC: Signalling Point Code

~~NOTE: Inter-PLMN signalling from an MSC to SMLC is not defined in GSM 03.71; hence, the type of addressing is not significant.~~

7 General on MAP services

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

7.6 Definition of parameters

Following is an alphabetic list of parameters used in the common MAP-services in subclause 7.3:

Application context name	7.3.1	Refuse reason	7.3.1
Destination address	7.3.1	Release method	7.3.2
Destination reference	7.3.1	Responding address	7.3.1
Diagnostic information	7.3.4	Result	7.3.1
Originating address	7.3.1	Source	7.3.5
Originating reference	7.3.1	Specific information	7.3.1/7.3.2/7.3.4
Problem diagnostic	7.3.6	User reason	7.3.4
Provider reason	7.3.5		

Following is an alphabetic list of parameters contained in this clause:

Extensible No reply condition timer	7.6.3.19
Extensible SS-Data	7.6.3.29
Extensible SS-Info	7.6.3.14
Extensible SS-Status	7.6.3.17
Extensible Teleservice	7.6.3.4
External Signal Information	7.6.9.4
Forwarded-to number	7.6.2.22
Forwarded-to subaddress	7.6.2.23
Forwarding feature	7.6.4.16
Forwarding information	7.6.4.15
Forwarding Options	7.6.4.6
GGSN address	7.6.2.40
GGSN number	7.6.2.41
GMSC CAMEL Subscription Info	7.6.3.34
GPRS Node Indicator	7.6.8.14
GPRS Subscription Data	7.6.3.46
GPRS Subscription Data Withdraw	7.6.3.45
GPRS Support Indicator	7.6.8.15
Group Id	7.6.2.33
GSM bearer capability	7.6.3.6
Guidance information	7.6.4.22
Handover number	7.6.2.21
High Layer Compatibility	7.6.3.43
HLR Id	7.6.2.15
HLR number	7.6.2.13
HO-Number Not Required	7.6.6.7
IMEI	7.6.2.3
IMSI	7.6.2.1
Inter CUG options	7.6.3.27
Intra CUG restrictions	7.6.3.28
SM-RP-SMEA	7.6.8.17
SM-RP-UI	7.6.8.4
Sres	7.6.7.3
SS-Code	7.6.4.1
SS-Data	7.6.4.3
SS-Event	7.6.4.42
SS-Event-Data	7.6.4.43
SS-Info	7.6.4.24
SS-Status	7.6.4.2
Stored location area Id	7.6.2.5
Subscriber State	7.6.3.30
Subscriber Status	7.6.3.7
Supported CAMEL Phases	7.6.3.36
Suppress T-CSI	7.6.3.33
Suppression of Announcement	7.6.3.32
Target cell Id	7.6.2.8
Target location area Id	7.6.2.7
Target MSC number	7.6.2.12
Teleservice	7.6.4.39
TMSI	7.6.2.2
Trace reference	7.6.10.2
Trace type	7.6.10.3
User error	7.6.1.4
USSD Data Coding Scheme	7.6.4.36
USSD String	7.6.4.37
UU Data	7.6.5.12
UUS CF Interaction	7.6.5.13
VBS Data	7.6.3.40
VGCS Data	7.6.3.39
VLR CAMEL Subscription Info	7.6.3.35
VLR number	7.6.2.14
VPLMN address allowed	7.6.3.48
Zone Code	7.6.2.28

7.6.1 Common parameters

The following set of parameters are used in several MAP service-primitives:

7.6.1.1 Invoke Id

This parameter identifies corresponding service primitives. The parameter is supplied by the MAP service-user and must be unique over each service-user/service-provider interface.

7.6.1.2 Linked Id

This parameter us used for linked services and it takes the value of the invoke Id of the service linked to.

7.6.1.3 Provider error

This parameter is used to indicate a protocol related type of error:

- duplicated invoke Id;
- not supported service;
- mistyped parameter;
- resource limitation;
- initiating release, i.e. the peer has already initiated release of the dialogue and the service has to be released;
- unexpected response from the peer;
- service completion failure;

- no response from the peer;
- invalid response received.

7.6.1.4 User error

This parameter can take values as follows:

NOTE: The values are grouped in order to improve readability; the grouping has no other significance.

a) Generic error:

- system failure, i.e. a task cannot be performed because of a problem in another entity. The type of entity or network resource may be indicated by use of the network resource parameter;
- data missing, i.e. an optional parameter required by the context is missing;
- unexpected data value, i.e. the data type is formally correct but its value or presence is unexpected in the current context;
- resource limitation;
- initiating release, i.e. the receiving entity has started the release procedure;
- facility not supported, i.e. the requested facility is not supported by the PLMN;
- incompatible terminal, i.e. the requested facility is not supported by the terminal.

b) Identification or numbering problem:

- unknown subscriber, i.e. no such subscription exists;
- number changed, i.e. the subscription does not exist for that number any more;
- unknown MSC;
- unidentified subscriber, i.e. if the subscriber is not contained in the database and it has not or cannot be established whether or not a subscription exists;
- unallocated roaming number;
- unknown equipment;
- unknown location area.

c) Subscription problem:

- roaming not allowed, i.e. a location updating attempt is made in an area not covered by the subscription;
- illegal subscriber, i.e. illegality of the access has been established by use of authentication procedure;
- bearer service not provisioned;
- teleservice not provisioned;
- illegal equipment, i.e. the IMEI check procedure has shown that the IMEI is blacklisted or not whitelisted.

d) Handover problem:

- no handover number available;
- subsequent handover failure, i.e. handover to a third MSC failed for some reason.

e) Operation and maintenance problem:

- tracing buffer full, i.e. tracing cannot be performed because the tracing capacity is exceeded.

f) Call set-up problem:

- no roaming number available, i.e. a roaming number cannot be allocated because all available numbers are in use;
- absent subscriber, i.e. the subscriber has activated the detach service or the system detects the absence condition. This error may be qualified to indicate whether the subscriber was IMSI detached, in a restricted area or did not respond to paging;
- busy subscriber. This error may be qualified to indicate that the subscriber was busy due to CCBS and that CCBS is possible;
- no subscriber reply;
- forwarding violation, i.e. the call has already been forwarded the maximum number of times that is allowed;
- CUG reject, i.e. the call does not pass a CUG check; additional information may also be given in order to indicate rejection due to e.g. incoming call barred or non-CUG membership.
- call barred. Optionally, additional information may be included for indicating either that the call meets a barring condition set by the subscriber or that the call is barred for operator reasons. In case of barring of Mobil Terminating Short Message, the additional information may indicate a barring condition due to « unauthorised Message Originator».
- optimal routeing not allowed, i.e. the entity which sends the error does not support optimal routeing, or the HLR will not accept an optimal routeing interrogation from the GMSC, or the call cannot be optimally routed because it would contravene optimal routeing constraints.
- forwarding failed, i.e. the GMSC interrogated the HLR for forwarding information but the HLR returned an error.

g) Supplementary services problem:

- call barred;
- illegal SS operation;
- SS error status;
- SS not available;
- SS subscription violation;
- SS incompatibility;
- negative password check;
- password registration failure;
- Number of Password Attempts;
- USSD Busy;
- Unknown Alphabet.
- short term denial;
- long term denial.

For definition of these errors see GSM 04.80.

h) Short message problem:

- SM delivery failure with detailed reason as follows:
  - memory capacity exceeded;
  - MS protocol error;
  - MS not equipped;
  - unknown service centre (SC);
  - SC congestion;
  - invalid SME address;
  - subscriber is not an SC subscriber;
  - and possibly detailed diagnostic information, coded as specified in TS GSM 03.40, under SMS-SUBMIT-REPORT and SMS-DELIVERY-REPORT. If the SM entity which returns the SM Delivery Failure error includes detailed diagnostic information, it shall be forwarded in the MAP_MO_FORWARD_SHORT_MESSAGE and in the MAP_MT_FORWARD_SHORT_MESSAGE response.
- message waiting list full, i.e. no further SC address can be added to the message waiting list;
- Subscriber busy for MT SMS, i.e. the mobile terminated short message transfer cannot be completed because:
  - another mobile terminated short message transfer is going on and the delivery node does not support message buffering; or
  - another mobile terminated short message transfer is going on and it is not possible to buffer the message for later delivery; or
  - the message was buffered but it is not possible to deliver the message before the expiry of the buffering time defined in GSM 03.40;
- Absent Subscriber SM, i.e. the mobile terminated short message transfer cannot be completed because the network cannot contact the subscriber. Diagnostic information regarding the reason for the subscriber's absence may be included with this error.

i) Location services problem:

- Unauthorized Requesting Network
- Unauthorized LCS Client with detailed reason as follows
- Unauthorzied Privacy Class
- Unauthoized Call Unrelated External Client
- Unauthorized Call Related External Client
- Privacy override not applicable
- Position method failure with detailed reason as follows:
    - Congestion
    - Insufficient resources
    - Insufficient Measurement Data
    - Inconsistent Measurement Data
    - Location procedure not completed
    - Location procedure not supported by target MS
    - QoS not attainable

- ~~Position method failure with restart allowed~~
- ~~LMU Unknown or Offline~~
- ~~Traffic channel establishment failure~~
- Unknown or unreachable LCS Client

7.6.1.5 All Information Sent

This parameter indicates to the receiving entity when the sending entity has sent all necessary information.

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

7.6.3 Subscriber management parameters

7.6.3.58 LSA Information Withdraw

This parameter indicates that LSA information shall be deleted from the VLR or the SGSN.

7.6.3.59 LMU Indicator

This parameter indicates the presence of an LMU.

7.6.3.60 LCS Information

This parameter defines the LCS related information for an MS subscriber and contains the following components:

- ~~HPLMN~~ GMLC List (see subclause 7.6.3.61)
- LCS Privacy Exception List (see subclause 7.6.3.62)

- MO-LR List (see subclause 7.6.3.65A)

7.6.3.61 ~~HPLMN~~ GMLC List

This parameter contains the addresses of all GMLCs in the MS subscriber's HPLMN that are permitted to issue a non-call related MT-LR location request for this MS. Usage of this parameter is defined in GSM 03.71.

7.6.3.62 LCS Privacy Exception List

This parameter defines the classes of LCS Client that are allowed to locate any target MS. For each class, the following information is provided:

- SS-Code (see subclause 7.6.4.1);
- a list of LCS privacy exception parameters (see subclause 7.6.3.63).

7.6.3.63 LCS Privacy Exception Parameters

This parameter gives the status of each LCS privacy exception class and any additional parameters relevant to this class. The parameter contains the following information:

- provisioned SS-Status (see subclause 7.6.3.17);
- privacy verification by MS user (see subclause 7.6.3.65B);
- external client List (see subclause 7.6.3.64);
- internal client List (see subclause 7.6.3.65)

7.6.3.64 External Client List

This parameter is only applicable to the non-call related privacy class and gives the identities of the external clients that are allowed to locate a target MS for a non-call related MT-LR. Each identity is an international (e.g.E.164) address. For each identified external client, GMLC restrictions may be defined. It may also be indicated if the MS shall be notified of a non-restricted MT-LR from each identified LCS client.and, if so, whether notification only or notification with privacy verification shall apply. Usage of this parameter is defined in GSM 03.71.

7.6.3.65 Internal Client List

This parameter is only applicable to the PLMN operator privacy class and gives the identities of the internal PLMN operator clients that are allowed to locate a target MS for an NI-LR or MT-LR. Usage of this parameter is defined in GSM 03.71.

7.6.3.65A MO-LR List

This parameter defines the classes of MO-LR for which a subscription exists for a particular MS. For each class, the following information is provided:

- SS-Code (see subclause 7.6.4.1);

7.6.3.65B Privacy Verification By MS User

This parameter is applicable to the non-call related privacy class and indicates whether the MS user shall be notified for a non-call related MT-LR from any value added LCS client when the MT-LR is restricted and be enabled to accept or override the restriction.

7.6.3.65C GMLC List Withdraw

This parameter indicates whether the subscriber's LCS GMLC list shall be deleted from the VLR. The parameter does not apply to, and shall be ignored if received by, an SGSN.

7.6.3.66 IST Alert Timer

This parameter indicates the IST Alert Timer value that must be used in the MSC to inform the HLR about the call activities that the subscriber performs. Units are minutes.

7.6.3.67 Call Termination Indicator

This parameter indicates whether the MSC shall terminate a specific ongoing call, or all the call activities related to a specified subscriber.

7.6.3.68 IST Information Withdraw

This parameter indicates that IST information shall be deleted from the VMSC.

7.6.3.69 IST Support Indicator

This parameter indicates the degree of IST functionality supported by the MSC (Visited MSC or Gateway MSC). It can take one of the following values:

- Basic IST functionality
- IST command service (in addition to the basic IST functionality and including the ability to terminate all calls being carried for the identified subscriber).

7.6.4 Supplementary services parameters

7.6.4.1 SS-Code

This parameter may refer to one supplementary service or a set of supplementary services as defined in TS GSM 02.04. For MAP Release ‘98~~'97~~ this includes:

- Calling Line Identification Presentation service (CLIP);
- Calling Line Identification Restriction service (CLIR);
- Connected Line Identification Presentation service (COLP);
- Connected Line Identification Restriction service (COLR);
- Calling Name Presentation (CNAP)
- All Call Forwarding services;
- Call Waiting (CW);
- Call Hold (HOLD);
- Multi-Party service (MPTY);
- Closed User Group (CUG);
- All Charging services;
- All Call Restriction services;
- Explicit Call Transfer service (ECT);
- enhanced Multi-Level Precedence and Pre-emption service (eMLPP);
- Completion of Calls to Busy Subscriber, originating side (CCBS-A);

- Completion of Calls to Busy Subscriber, destination side (CCBS-B);
- All LCS privacy exceptions (see subclause 7.6.4.44);
- Mobile Originating Location Request (MO-LR) (see subclause 7.6.4.44A).

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

7.6.4.42 SS-event

This parameter indicates the Supplementary Service for which an invocation notification is sent towards the gsmSCF. It can indicate one of the following services:

- Explicit Call Transfer (ECT)
- Call Deflection (CD)
- Multi-Party call (MPTY)

7.6.4.43 SS-event data

This parameter contains additional information related to Supplementary Service invocation. Depending on the service invoked it can contain the following information:

ECT A list with all Called Party Numbers involved.

CDThe called Party number involved.

7.6.4.44 LCS Privacy Exceptions

Distinct SS codes are assigned to the following classes of LCS client in a target MS subscriber's privacy exception list.

- Universal Class
- Call related value added class
- Non-Call related value added class
- PLMN operator class

7.6.4.44A Mobile Originating Location Request (MO-LR)

Distinct SS codes are assigned to the following classes of MO-LR:

- Basic Self Location
- Autonomous Self Location
- Transfer to Third Party

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

7.6.11 Location Service Parameters

7.6.11.1 Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

~~7.6.11.2 Report Error Indication~~

~~If present, this parameter requests an LCS Information Report error message from a serving MSC when an LCS Information message from an SMLC cannot be transferred to a target LMU.~~

~~7.6.11.3 LCS Cause~~

~~This parameter contains the reason why LCS data could not be transferred to an LMU.~~

7.6.11.4 LCS Client ID

This parameter provides information related to the identity of an LCS client.

7.6.11.5 LCS Event

This parameter identifies an event associated with the triggering of a location estimate.

7.6.11.6 LCS MLC Data

This parameter provides the identities of any authorized~~home~~ GMLCs for a target MS. Only these GMLCs are allowed to send a location request for an external client when location requests are restricted to these GMLCs~~home PLMN~~.

7.6.11.7 LCS Priority

This parameter gives the priority of the location request.

7.6.11.8 LCS QoS

This parameter defines the Quality of Service (QoS) for any location request. It is composed of the following elements.

1) Response Time

   Indicates the category of response time – ~~"no delay",~~ "low delay" or "delay tolerant"

2) Horizontal Accuracy

Indicates the required horizontal accuracy of the location estimate.

3) Vertical Coordinate

Indicates if a vertical coordinate is required (in addition to horizontal coordinates)

4) Vertical Accuracy

Indicates the required vertical accuracy of the location estimate (inclusion is optional).

~~7.6.11.9 LCS APDU~~

~~This parameter carries LCS related data between an SMLC and a BSC or LMU. For data transfer to or from an LMU, it is identical to the Facility Information Element defined in GSM 04.71. For data transfer to or from a BSC, it is identical to the LCS Information parameter defined in GSM 08.71.~~

~~7.6.11.10 LMU List~~

~~This parameter defines a list of LMUs sharing the same SMLC.~~

7.6.11.11 Location Estimate

This parameter gives an estimate of the location of an MS in universal coordinates and the accuracy of the estimate.

7.6.11.12 Location Type

This parameter indicates the type of location estimate required by the LCS client. Possible location estimate types include:

- current location
- current or last known location
- initial location for an emergency services call

7.6.11.13 NA-ESRD

This parameter only applies to location for an emergency services call in North America and gives the North American Emergency Services Routing Digits.

7.6.11.14 NA-ESRK

This parameter only applies to location for an emergency services call in North America and gives the North American Emergency Services Routing Key.

~~7.6.11.15 Positioning Data~~

~~This parameter provides data on the positioning process for possible use in billing in location method evaluation. The data includes the following for each position method attempt:~~

~~- positioning method~~

~~- positioning result (success, failure)~~

~~- positioning duration~~

~~- resources used~~

7.6.11.16 Privacy Override

This parameter indicates if MS privacy is overridden by the LCS client when the GMLC and VMSC for an MR-LR are in the same country.

~~7.6.11.17 Radio Channel Type~~

~~This parameter identifies the type of radio channel currently assigned to or to be assigned to the target MS.~~

~~7.6.11.18 Registration Type~~

~~This parameter distinguishes LMU registration in an SMLC from LMU deregistration.~~

~~7.6.11.19 Release Forbidden~~

~~This parameter indicates if an LMU is forbidden to release a signaling channel to the serving MSC.~~

8 Mobility services

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

8.8 Subscriber management services

8.8.1 MAP-INSERT-SUBSCRIBER-DATA service

8.8.1.2 Service primitives

Table 8.8/1: MAP-INSERT-SUBSCRIBER-DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	C	C(=)		
MSISDN	C	C(=)		
Category	C	C(=)		
Subscriber Status	C	C(=)		
Bearer service List	C	C(=)	C	C(=)
Teleservice List	C	C(=)	C	C(=)
Forwarding information List	C	C(=)		
Call barring information List	C	C(=)		
CUG information List	C	C(=)		
SS-Data List	C	C(=)		
eMLPP Subscription Data	C	C(=)		
Operator Determined Barring General data	C	C(=)	C	C(=)
Operator Determined Barring HPLMN data	C	C(=)		
Roaming Restriction Due To Unsupported Feature	C	C(=)		
Regional Subscription Data	C	C(=)		
VLR CAMEL Subscription Info	C	C(=)		
Voice Broadcast Data	C	C(=)		
Voice Group Call Data	C	C(=)		
Network access mode	C	C(=)		
GPRS Subscription Data	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
North American Equal Access preferred Carrier Id List	U	C(=)		
LSA Information	C	C(=)		
IST Alert Timer	C	C(=)		
SS-Code List			C	C(=)
LMU Identifier	C	C(=)		
LCS Information	C	C(=)		
Regional Subscription Response			C	C(=)
Supported CAMEL Phases			C	C (=)
User error			U	C(=)
Provider error				O

8.8.1.3 Parameter use

North American Equal Access preferred Carrier Id List

A list of the preferred carrier identity codes that are subscribed to.

When the VLR receives this parameter from the HLR, it shall replace the previously stored preferred carrier identity codes with the received ones. It is not possible to delete all the preferred carrier identity codes from the VLR using this service. To delete all the preferred carrier identity codes from the VLR, the HLR shall use the MAP_CANCEL_LOCATION service.

LSA Information

If included in the ISD request, this parameter contains a list of localised service area identities a user might have subscribed to together with the priority of each localised service area; see subclause 7.6. The access right outside these localised service areas is also indicated. In all cases mentioned below, the LSA information shall only include LSA Data applicable to the VPLMN where the Subscriber is located. The VLR number, received in the MAP-UPDATE_LOCATION primitive, or the SGSN number, received in the MAP_UPDATE_GPRS_LOCATION primitive, can be used, alongside data stored in the HLR, to determine the LSA Data applicable to the VPLMN.

At restoration, location updating or GPRS location updating the HLR shall include the complete set of applicable LSA Information.

When there is a change in LSA data the HLR shall include at least the new and/or modified LSA data.

When there is a change in the access right outside the localised service areas the HLR shall include the LSA only access indicator.

When the SGSN or the VLR receives LSA information within a dialogue it shall check if the received data has to be considered as the entire LSA information. If so, it shall replace the stored LSA information with the received data set, otherwise it shall replace the data only for the modified LSA data (if any) and/or access right, and add the new LSA data (if any) to the stored LSA Information.

If the entire LSA information is received, it shall always include the LSA only access indicator value together with the LSA data applicable for the PLMN (if any).

If LSA Information is omitted in the Insert Subscriber Data operation the SGSN or the VLR shall keep the previously stored LSA Information.

If the SGSN or the VLR detects that there is overlapping in the information received within a dialogue, it shall send the error Unexpected Data Value. This parameter is used by the VLR and the SGSN.

IST Alert Timer

This parameter contains the IST Alert timer value that must be used to inform the HLR about the call activities that the subscriber performs.

At Location Updating, restoration, or when there is a change in the IST data defined for the Subscriber, the HLR shall include the IST Alert timer.

LMU Identifier

This parameter indicates the presence of an LMU. This parameter is used only by the VLR and shall be ignored if received by an SGSN.

LCS Information

This parameter provides the following LCS related information for an MS subscriber:

- list of GMLCs in the HPLMN
- privacy exception list
- MO-LR list

At restoration and location updating, the HLR shall include the complete LCS data of the subscriber.

When there is a change in LCS subscriber data the HLR shall include at least the new and/or modified LCS data. LCS data that is not modified need not be included.

The VLR shall keep any previously stored LCS Information that is not included in an Insert Subscriber Data operation.

If the VLR detects that there is overlapping in the LCS information received within a dialogue, it shall send the error Unexpected Data Value.

This parameter is used only by the VLR and shall be ignored if received by an SGSN.

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

8.8.2 MAP-DELETE-SUBSCRIBER-DATA service

8.8.2.2 Service primitives

Table 8.8/2: MAP-DELETE-SUBSCRIBER-DATA

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
Basic service List	C	C(=)		
SS-Code List	C	C(=)		
Roaming Restriction Due To Unsupported Feature	C	C(=)		
Camel Subscription Info Withdraw	C	C(=)		
Regional Subscription Data	C	C(=)		
VBS Group Indication	C	C(=)		
VGCS Group Indication	C	C(=)		
GPRS Subscription Data Withdraw	C	C(=)		
Roaming Restricted In SGSN Due To Unsupported Feature	C	C(=)		
LSA Information Withdraw	C	C(=)		
IST Information Withdraw	C	C(=)		
Regional Subscription Response			C	C(=)
GMLC List Withdraw	C	C(=)		
User error			C	C(=)
Provider error				O

8.8.2.3 Parameter use

All parameters are described in subclause 7.6. The following clarifications are applicable:

Basic service List

A list of Extensible Basic service parameters (Extensible Basic service is defined in subclause 7.6). It is used when one, several or all basic services are to be withdrawn from the subscriber. If the VLR or the SGSN receives a value for an Extensible Basic Service which it does not support, it shall ignore that value. This parameter is used by the VLR and by the SGSN.

SS-Code List

A list of SS-Code parameters (SS-Code is defined in subclause 7.6). It is used when several or all supplementary services are to be withdrawn from the subscriber.

There are three possible options:

- deletion of basic service(s);

  The parameter Basic service List is only included.

- deletion of supplementary service(s);

  The parameter SS-Code List is only included.

- deletion of basic and supplementary services;

  Both Basic service List and SS-Code List are included.

This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Roaming Restriction Due To Unsupported Feature

This parameter is used if Roaming Restriction Due To Unsupported Feature is deleted from the subscriber data. This may occur if unsupported features or services are removed from the subscriber data in the HLR.

If this parameter is sent the VLR shall check if the current Location Area is possibly allowed now. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

CAMEL Subscription Info Withdraw

This parameter is used to indicate that CAMEL Subscription Info shall be deleted from the VLR. All CAMEL Subscription Info for the subscriber shall be deleted. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

Regional Subscription Identifier

Contains one single Zone Code (as defined subclause 7.6) and is used if all Zone Codes shall be deleted from the subscriber data. When all the Zone Codes are deleted, the VLR or the SGSN shall check for its location areas whether they are allowed or not. If the whole MSC area is restricted, VLR will report it to HLR by returning the Regional Subscription Response "MSC Area Restricted". If the whole SGSN area is restricted, SGSN will report it to HLR by returning the Regional Subscription Response "SGSN Area Restricted".

The binary coding of the Zone Code value received in a Delete Subscriber Data request shall not be checked by the VLR or by the SGSN.

Note that support of this parameter is a network operator option and it shall not be sent to networks which do not support Regional Subscription.

If Regional Subscription is not supported by the VLR or by the SGSN, the request for deletion of Zone Codes is refused by sending the Regional Subscription Response "Regional Subscription Not Supported" to the HLR.

If no Zone Codes are stored in the respective subscriber data record, the request for deleting all Zone Code information shall be ignored and no Regional Subscription Response shall be returned. This parameter is used by the VLR and by the SGSN.

VBS Group Indication

Contains an indication (flag) which is used if all Group Id's shall be deleted from the subscriber data for the Voice Broadcast teleservice.

If VBS is not supported in the VLR or no Group Ids are stored for VBS in the respective subscriber record, the request for deletion of all Group Ids shall be ignored. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

VGCS Group Indication

Contains an indication (flag) which is used if all Group Id's shall be deleted from the subscriber data for the Voice Group Call teleservice. This parameter is used only by the VLR and if the SGSN receives this parameter it shall ignore it.

If VGCS is not supported in the VLR or no Group Ids are stored for VGCS in the respective subscriber record, the request for deletion of all Group Ids shall be ignored.

GPRS Subscription Data Withdraw

This parameter is used to indicate whether all GPRS Subscription Data for the subscriber shall be deleted or if only a subset of the stored GPRS Subscription Data for the subscriber shall be deleted. In the latter case only those PDP context whose identifiers are included in the subsequent identifier list will be deleted. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

Roaming Restricted In SGSN Due To Unsupported Feature

This parameter is used if Roaming Restricted In SGSN Due To Unsupported Feature is deleted from the GPRS subscriber data. This may occur if unsupported features or services are removed from the GPRS subscriber data in the HLR.

If this parameter is sent the SGSN shall check if the current Location Area is possibly allowed now. This parameter is used only by the SGSN and if the VLR receives this parameter it shall ignore it.

LSA Information Withdraw

This parameter is used to indicate whether all LSA Information for the subscriber shall be deleted or if only a subset of the stored LSA Information for the subscriber shall be deleted. In the latter case only the LSA data whose LSA identities are included in the subsequent LSA data list will be deleted. This parameter is used by the VLR and the SGSN.

IST Information Withdraw

This parameter is used to indicate that the IST condition has been removed for the subscriber. See GSM 03.35 for the use of this parameter.

Regional Subscription Response

If included in the Delete Subscriber Data response this parameter indicates one of:

- MSC Area Restricted
- SGSN Area Restricted;
- Regional Subscription Not Supported.

This parameter is used by the VLR and by the SGSN.

GMLC List Withdraw

This parameter indicates that the subscriber's LCS GMLC List shall be deleted from the VLR.

This parameter is used only by the VLR and shall be ignored if received by an SGSN.

User error

Only one of the following values is applicable:

- Unidentified subscriber;
- Data missing;
- Unexpected data value.

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

13A Location Service Management Services

13A.1 MAP-SEND-ROUTING-INFO-FOR-LCS Service

13A.1.1 Definition

This service is used between the GMLC and the HLR to retrieve the routing information needed for routing a location service request to the servicing VMSC. The MAP-SEND-ROUTING-INFO-FOR-LCS is a confirmed service using the primitives from table A.1/1.

13A.1.2 Service Primitives

The service primitives are shown in table 13A.1/1.

Table 13A.1/1: MAP-SEND-ROUTING-INFO-FOR-LCS

Parameter name	Request	Indication	Response	Confirm
Invoke Id	M	M(=)	M(=)	M(=)
MLC Number	M	M(=)		
MSISDN	C	C(=)	C	C(=)
IMSI	C	C(=)	C	C(=)
LMSI			C	C(=)
MSC Number			C	C(=)
User error			C	C(=)
Provider error				O

13A.1.3 Parameter Use

Invoke id:

See definition in subclause 7.6.1.

MLC Number:

See definition in subclause 7.6.2.

MSISDN:

See definition in subclause 7.6.2. The request shall carry either the IMSI or MSISDN. The response shall carry whichever of these was not included in the request (see GSM 03.71 for details).

IMSI:

See definition in subclause 7.6.2.

LMSI:

See definition in subclause 7.6.2. It is an operator option to provide this parameter from the VLR; it is mandatory for the HLR to include the LMSI in a successful response, if the VLR has used the LMSI.

MSC Number:

See definition in subclause 7.6.2. This parameter is provided in a successful response.

User error:

The following errors defined in subclause 7.6.1 may be used, depending on the nature of the fault:

- Unknown subscriber;
- Absent Subscriber;
- Facility Not Supported;
- System failure;
- Unexpected Data Value;
- Data missing;
- Unauthorized requesting network

Provider error:

For definition of provider errors see subclause 7.6.1.

13A.2 MAP-PROVIDE-SUBSCRIBER-LOCATION Service

13A.2.1 Definition

This service is used by a GMLC to request the location of a target MS from the visited MSC at any time. This is a confirmed service using the primitives from table 13A.2/1.

13A.2.2 Service Primitives

Table 13A.2/1: Provide_Subscriber_Location

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Location Type	M	M(=)		
MLC Number	M	M(=)		
LCS Client ID	M	M(=)		
Privacy Override	U	C(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
LMSI	C	C(=)		
LCS Priority	C	C(=)		
LCS QoS	C	C(=)		
~~NA-ESRK~~	~~C~~	~~C(=)~~		
IMEI	U~~C~~	C(=)		
Location Estimate			M	M(=)

Age of Location Estimate			C	C(=)
User error			C	C(=)
Provider error				O

13A.2.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Location Type

This parameter identifies the type of location information requested

MLC Number

This is the E.164 number of the requesting GMLC.

LCS Client ID

This parameter provides information related to the identity of an LCS client.

Privacy Override

This parameter indicates if MS privacy is overridden by the LCS client when the GMLC and VMSC for an MR-LR are in the same country.

IMSI

The IMSI is provided to identify the target MS. At least one of the IMSI~~,~~ or MSISDN ~~or NA-ESRK~~ is mandatory.

MSISDN

The MSISDN is provided to identify the target MS. At least one of the IMSI~~,~~ or MSISDN ~~or NA-ESRK~~ is mandatory.

LMSI

The LMSI shall be provided if previously supplied by the HLR

LCS Priority

This parameter indicates the priority of the location request.

LCS QoS

This parameter indicates the required quality of service in terms of response time and accuracy.

~~NA-ESRK~~

~~This parameter only applies to North America and provides a North American Emergency Service Routing Key.~~

IMEI

Inclusion of the IMEI is optional~~The IMEI shall be provided if available when the target MS is identified by an NA-ESRK~~.

Location Estimate

This parameter provides the location estimate.

Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

User error

This parameter is sent by the responder when the location request has failed or cannot proceed and if present, takes one of the following values defined in section 7.6.1.

- System Failure;
- Data Missing;
- Unexpected Data Value;
- ~~Unknown Subscriber~~
- Facility Not Supported;
- Unidentified Subscriber;
- Illegal Subscriber;
- Illegal Equipment;
- Absent Subscriber (diagnostic information may also be provided);
- Unauthorized requesting network;
- Unauthorized LCS Client with detailed reason;
- Position method failure with detailed reason.

Provider error

These are defined in subclause 7.6.1.

13A.3 MAP-SUBSCRIBER-LOCATION-REPORT Service

13A.3.1 Definition

This service is used by a VMSC to provide the location of a target MS to a GMLC when a request for location is either implicitly administered or made at some earlier time. This is a confirmed service using the primitives from table 13A.3/1.

13A.3.2 Service Primitives

Table 13A.3/1: Subscriber_Location_Report

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
LCS Event	M	M(=)		
LCS Client ID	M	M(=)		
MSC Number	M	M(=)		
IMSI	C	C(=)		
MSISDN	C	C(=)		
NA-ESRD	C	C(=)		

NA-ESRK	C	C(=)		
IMEI	U~~C~~	C(=)		
Location Estimate	C	C(=)		
Age of Location Estimate	C	C(=)		
LMSI	U	C(=)		
User error			C	C(=)
Provider error				O

13A.3.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

LCS Event

This parameter indicates the event that triggered the Subscriber Location Report.

LCS Client ID

This parameter provides information related to the identity of the recipient LCS client.

MSC Number:

See definition in subclause 7.6.2. This parameter provides the address of the visited MSC for target MS.

IMSI

The IMSI shall be provided if available to the VMSC

MSISDN

The MSISDN shall be provided if available to the VMSC

NA-ESRD

If the target MS has originated an emergency service call in North America, the NA-ESRD shall be provided by the VMSC if available.

NA-ESRK

If the target MS has originated an emergency service call in North America, the NA-ESRK shall~~may~~ be provided by the VMSC if assigned~~available~~.

IMEI

Inclusion of the IMEI is optional~~If the target MS has originated an emergency service call in North America, the IMEI may be provided by the VMSCV~~.

Location Estimate

This parameter provides the location estimate. The absence of this parameter implies that a location estimate was not available or could not be successfully obtained.

Age of Location Estimate

This parameter indicates how long ago the location estimate was obtained.

LMSI

The LMSI may be provided if assigned by the VLR.

User error

This parameter is sent by the responder when the received message contains an error, cannot be forwarded or stored for an LCS client or cannot be accepted for some other reason and if present, takes one of the following values defined in section 7.6.1.

- System Failure;
- Data Missing;
- Unexpected Data Value;
- Resource Limitation;
- Unknown Subscriber;
- Unauthorized requesting network;
- Unknown or unreachable LCS Client.

Provider error

These are defined in subclause 7.6.1.

~~13A.4 MAP-PERFORM -LOCATION Service~~

~~13A.4.1 Definition~~

~~This service is used by a serving MSC to request location information from an SMLC for a target MS. This is a confirmed service using the primitives from table 13A.4/1.~~

~~13A.4.2 Service Primitives~~

~~Table 13A.4/1: Perform_Location~~

~~Parameter name~~	**~~Request~~**	**~~Indication~~**	**~~Response~~**	**~~Confirm~~**
~~Invoke id~~	~~M~~	~~M(=)~~	~~M(=)~~	~~M(=)~~
~~Global cell Id~~	~~M~~	~~M(=)~~		
~~Radio Channel Type~~	~~C~~	~~C(=)~~		
~~LCS Priority~~	~~C~~	~~C(=)~~		
~~LCS QoS~~	~~C~~	~~C(=)~~		
~~LCS-APDU~~	~~C~~	~~C(=)~~		
~~Location Estimate~~			~~C~~	~~C(=)~~
~~Positioning Data~~			~~C~~	~~C(=)~~
~~User error~~			~~C~~	~~C(=)~~
~~Provider error~~				~~O~~

13A.4.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Global cell Id

This is the current cell location of the MS being located.

Radio Channel Type

This parameter gives the type of radio channel currently assigned to the MS.

LCS Priority

This parameter indicates the priority of the location request.

LCS QoS

This is the Quality of Service required for the location request in terms of response time and accuracy.

LCS APDU

This parameter contains LCS related information (e.g. Timing Advance) received from the BSC.

Location Estimate

This parameter gives an estimate of the MS location and the accuracy of the estimate.

Positioning Data

This parameter provides data on the positioning process including the result and resources used.

User error

This parameter is sent by the SMLC when the location request has failed or cannot proceed and if present, takes one of the following values defined in section 7.6.1.

- System Failure
- Data Missing;
- Unexpected Data Value
- Position method failure with detailed reason (restart not allowed)
- Position method failure with restart allowed

Provider error

These are defined in subclause 7.6.1.

13A.5 MAP-LCS-Registration Service

13A.5.1 Definition

This service is used by a VLR to register or deregister an LMU in an SMLC. This is a confirmed service using the primitives from table 13A.5/1.

13A.5.2 Service Primitives

Table 13A.5/1: LCS Registration

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
IMSI	M	M(=)		
LMSI	U	C(=)		
Registration Type	M	M(=)		
MSC Number	C	C(=)		
User error			C	C(=)
Provider error				O

13A.5.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of the LMU.

LMSI

The LMSI of the LMU shall be provided by the MSC if assigned in the VLR and if the registration type indicates registration.

Registration Type

The registration type distinguishes registration and deregistration.

MSC Number

This is the E.164 number of the MSC serving the LMU. Inclusion of the MSC number is mandatory if the registration type indicates registration.

User error

This parameter is sent by the SMLC when the registration procedure has failed and, if present, takes one of the following values defined in section 7.6.1.

- LMU unknown or offline;
- system failure;
- unexpected Data Value;
- Data Missing

Provider error

These are defined in subclause 7.6.1.

13A.6 MAP-LCS-INFORMATION-REQUEST Service

13A.6.1 Definition

This service is used by an SMLC to transfer LCS related data to an MSC for onward transfer to an LMU or serving BSC. This is an unconfirmed service using the primitives from table 13A.6/1.

13A.6.2 Service Primitives

Table 13A.6/1: LCS Information Request

Parameter name	Request	Indication
Invoke id	M	M(=)
IMSI	C	C(=)
LMSI	C	C(=)
MLC Number	U	C(=)
Release Forbidden	U	C(=)
Report Error Indication	U	C(=)
LCS-APDU	C	C(=)

13A.6.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of an LMU. Inclusion of the IMSI is mandatory when the destination for the LCS data is an LMU, For other destinations, an IMSI shall not be included.

LMSI

When the destination is an LMU, the LMSI of the LMU shall be provided by the SMLC if previously supplied by the MSC.

MLC Number

This parameter contains the E.164 address for the SMLC. The inclusion of this parameter is optional.

Release Forbidden

This parameter is applicable only when the destination is an LMU. It indicates if an LMU is forbidden to release a signaling channel to the MSC.

Report Error Indication

If present, this parameter requests an LCS Information Report error message from the serving MSC if the LCS Information Request message cannot be transferred to the required destination.

LCS-APDU

This parameter contains the LCS data to be sent on by the MSC to the required destination. For transfer to an LMU, the content of the data is defined in GSM 04.71 For transfer to a BSC, it is defined in GSM 08.71.

13A.7 MAP-LCS-INFORMATION-REPORT Service

13A.7.1 Definition

This service is used by an MSC to transfer LCS related data to an SMLC that was received from or intended for an LMU or BSC. This is an unconfirmed service using the primitives from table 13A.7/1. The message shall be transferred

to the SMLC using SCCP class 1.

13A.7.2 Service Primitives

Table 13A.7/1: LCS Information Report

Parameter name	Request	Indication
Invoke id	M	M(=)
IMSI	C	C(=)
LMSI	U	C(=)
LCS Cause	C	C(=)
LCS-APDU	C	C(=)

13A.7.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

IMSI

This is the E.212 IMSI identity of the LMU. Inclusion of the IMSI is mandatory for data transfer related to an LMU. An IMSI shall not be included for other types of data transfer.

LMSI

For data transfer related to an LMU, the MSC may include the LMSI if available in the VLR.

LCS Cause

This parameter contains the reason why LCS data received by the MSC in an LCS Information Request could not be transferred to its intended destination. This parameter shall be included if and only if the MSC is returning LCS data to the SMLC that could not be transferred to the intended destination.

LCS-APDU

This parameter contains the LCS data received from or intended for an LMU or BSC. The content of this parameter is defined in GSM 04.71 for an LMU and in GSM 08.71 for a BSC.

13A.8 MAP-LCS-RESET Service

13A.8.1 Definition

This service is used by an SMLC after either a restart or discovery of inconsistent data to request that a VLR instigate a reset for either all LMUs that are served by the VLR or just certain specific LMUs. This is an unconfirmed service using the primitives from table 13A.8/1.

13A.8.2 Service Primitives

Table 13A.8/1: LCS Reset

Parameter name	Request	Indication
Invoke id	M	M(=)

MLC number	M	M(=)
LMU List	U	C(=)

13A.8.3 Parameter Definition and Use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

MLC

This is the E.164 address for the SMLC.

LMU List

This is a list of LMUs sharing the same SMLC.

13A.9 MAP-LCS-ASSIGN-TRAFFIC-CHANNEL Service

13A.9.1 Definition

This service is used by an SMLC to request assignment of a traffic channel to the target MS by the visited MSC. This is a confirmed service using the primitives from table 13A.9/1.

13A.9.2 Service primitives

Table 13A.9/1: LCS Assign Traffic Channel

Parameter name	**Request**	**Indication**	**Response**	**Confirm**
Invoke id	M	M(=)	M(=)	M(=)
Radio Channel Type	M	M(=)		
User error			C	C(=)
Provider error				O

13A.9.3 Parameter definition and use

All parameters are defined in section 7.6. The use of these parameters and the requirements for their presence are specified in GSM 03.71.

Radio Channel Type

This parameter defines the type of traffic channel to be assigned.

User error

This parameter is sent by the MSC when the required type of traffic channel cannot be assigned and, if present, takes one of the following values defined in section 7.6.1.

- Traffic channel establishment failure;
- system failure;
- unexpected Data Value;

~~— data missing;~~

~~Provider error~~

~~These are defined in subclause 7.6.1.~~

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

16 Mapping on to TC services

16.2 Service specific procedures

Specific services are mapped to TC component handling services.

16.2.1 Directly mapped parameters

The Invoke Id parameter of the MAP request and indication primitive is directly mapped on to the Invoke Id parameter of the component handling primitives.

16.2.2 Use of other parameters of component handling primitives

16.2.2.4 Operation

When mapping a request primitive on to a Remote Operations PDU (invoke), the MAP PM shall set the operation code according to the mapping described in table 16.2/1.

When mapping a response primitive on to a Remote Operations service, the MAP PM shall set the operation code of the TC-RESULT-L/NL primitive (if required) to the same value as the one received at invocation time.

Table 16.2/1: Mapping of MAP specific services on to MAP operations

MAP-SERVICE	operation
MAP-ACTIVATE-SS	activateSS
MAP-ACTIVATE-TRACE-MODE	activateTraceMode
MAP-ALERT-SERVICE-CENTRE	alertServiceCentre
MAP-ANY-TIME-INTERROGATION	anyTimeInterrogaton
MAP-CANCEL-LOCATION	cancelLocation
MAP-CHECK-IMEI	checkIMEI
MAP-DEACTIVATE-SS	deactivateSS
MAP-DEACTIVATE-TRACE-MODE	deactivateTraceMode
MAP-DELETE-SUBSCRIBER-DATA	deleteSubscriberData
MAP-ERASE-CC-ENTRY	eraseCC-Entry
MAP-ERASE-SS	eraseSS
MAP-FAILURE-REPORT	failureReport
MAP-FORWARD-ACCESS-SIGNALLING	forwardAccessSignalling
MAP-FORWARD-CHECK-SS-INDICATION	forwardCheckSsIndication
MAP-FORWARD-GROUP-CALL-SIGNALLING	forwardGroupCallSignalling
MAP-MT-FORWARD-SHORT-MESSAGE	mt-forwardSM
MAP-MO-FORWARD-SHORT-MESSAGE	mo-forwardSM
MAP-GET-PASSWORD	getPassword
MAP-INFORM-SERVICE-CENTRE	informServiceCentre
MAP-INSERT-SUBSCRIBER-DATA	insertSubscriberData
MAP-INTERROGATE-SS	interrogateSs
MAP-IST-ALERT	istAlert
MAP-IST-COMMAND	istCommand
~~MAP-LCS-ASSIGN-TRAFFIC-CHANNEL~~	~~lcsAssignTrafficChannel~~
~~MAP_LCS_INFORMATION_REPORT~~	~~lcsInformationReport~~
~~MAP_LCS_INFORMATION_REQUEST~~	~~lcsInformationRequest~~
~~MAP_LCS_REGISTRATION~~	~~lcsRegistration~~
~~MAP_LCS_RESET~~	~~lcsReset~~
MAP-NOTE-MS-PRESENT-FOR-GPRS	noteMsPresentForGprs
~~MAP-PERFORM-LOCATION~~	~~performLocation~~
MAP-PREPARE-GROUP-CALL	prepareGroupCall
MAP-PREPARE-HANDOVER	prepareHandover
MAP-PREPARE-SUBSEQUENT-HANDOVER	prepareSubsequentHandover
MAP-PROCESS-ACCESS-SIGNALLING	processAccessSignalling
MAP-PROCESS-GROUP-CALL-SIGNALLING	processGroupCallSignalling
MAP-PROCESS-UNSTRUCTURED-SS-REQUEST	processUnstructuredSS-Request
MAP-PROVIDE-ROAMING-NUMBER	provideRoamingNumber
MAP-PROVIDE-SIWFS-NUMBER	provideSIWFSNumber
MAP-PROVIDE-SUBSCRIBER-LOCATION	provideSubscriberLocation
MAP-PROVIDE-SUBSCRIBER-INFO	provideSubscriberInfo
MAP-PURGE-MS	purgeMS
MAP-READY-FOR-SM	readyForSM
MAP-REGISTER-CC-ENTRY	registerCC-Entry
MAP-REGISTER-PASSWORD	registerPassword
MAP-REGISTER-SS	registerSS
MAP-REMOTE-USER-FREE	remoteUserFree
MAP-REPORT-SM-DELIVERY-STATUS	reportSmDeliveryStatus
MAP-RESET	reset
MAP-RESTORE-DATA	restoreData
MAP-SEND_GROUP-CALL_END_SIGNAL	sendGroupCallEndSignal
MAP-SEND-END-SIGNAL	sendEndSignal
MAP-SEND-AUTHENTICATION-INFO	sendAuthenticationInfo
MAP-SEND-IMSI	sendIMSI
MAP-SEND-IDENTIFICATION	sendIdentification
MAP-SEND-ROUTING-INFO-FOR-SM	sendRoutingInfoForSM
MAP-SEND-ROUTING-INFO-FOR-GPRS	sendRoutingInfoForGprs
MAP-SEND-ROUTING-INFO-FOR-LCS	sendRoutingInfoForLCS
MAP-SEND-ROUTING-INFORMATION	sendRoutingInfo
MAP-SET-REPORTING-STATE	setReportingState
MAP-SIWFS-SIGNALLING-MODIFY	SIWFSSignallingModify
MAP-STATUS-REPORT	statusReport
MAP-SUBSCRIBER-LOCATION-REPORT	subscriberLocationReport

MAP-SUPPLEMENTARY-SERVICE-INVOCATION-NOTIFICATION	ss-Invocation-Notification
MAP-UNSTRUCTURED-SS-NOTIFY	unstructuredSS-Notify
MAP-UNSTRUCTURED-SS-REQUEST	unstructuredSS-Request
MAP-UPDATE-GPRS-LOCATION	updateGprsLocation
MAP-UPDATE-LOCATION	updateLocation

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

17 Abstract syntax of the MAP protocol

17.1 General

17.1.6 Application Contexts

The following informative table lists the latest versions of the Application Contexts used in this specification, with the operations used by them and, where applicable, whether or not the operation description is exactly the same as for previous versions. Information in sections 17.6 & 17.7 relates only to the ACs in this table.

AC Name	AC Version	Operations Used	Comments *
locationCancellationContext	v3	cancelLocation	
equipmentMngtContext	v2	checkIMEI	
imsiRetrievalContext	v2	sendIMSI	
infoRetrievalContext	v2	sendAuthenticationInfo	
interVlrInfoRetrievalContext	v2	sendIdentification	
handoverControlContext	v2	prepareHandover forwardAccessSignalling sendEndSignal processAccessSignalling prepareSubsequentHandover	
mwdMngtContext	v3	readyForSM	
msPurgingContext	v3	purgeMS	
shortMsgAlertContext	v2	alertServiceCentre	
resetContext	v2	reset	
networkUnstructuredSsContext	v2	processUnstructuredSS-Request unstructuredSS-Request unstructuredSS-Notify	
tracingContext	v3	activateTraceMode deactivateTraceMode	
networkFunctionalSsContext	v2	registerSS eraseSS activateSS deactivateSS registerPassword interrogateSS getPassword	
shortMsgMO-RelayContext	v3	mo-forwardSM	
shortMsgMT-RelayContext	v3	mt-forwardSM	
shortMsgGatewayContext	v3	sendRoutingInfoForSM reportSM-DeliveryStatus InformServiceCentre	the syntax of this operation has been extended in comparison with release 96 version
networkLocUpContext	v3	updateLocation forwardCheckSs-Indication restoreData insertSubscriberData activateTraceMode	the syntax is the same in v1 & v2
gprsLocationUpdateContext	v3	updateGprsLocation insertSubscriberData activateTraceMode	
subscriberDataMngtContext	v3	insertSubscriberData deleteSubscriberData	
roamingNumberEnquiryContext	v3	provideRoamingNumber	

locationInfoRetrievalContext	v3	sendRoutingInfo	
gprsNotifyContext	v3	noteMsPresentForGprs	
gprsLocationInfoRetrievalContext	v3	sendRoutingInfoForGprs	
failureReportContext	v3	failureReport	
callControlTransferContext	v4	resumeCallHandling	
subscriberInfoEnquiryContext	v3	provideSubscriberInfo	
anyTimeEnquiryContext	v3	anyTimeInterrogation	
ss-InvocationNotificationContext	v3	ss-InvocationNotification	
sIWFSAllocationContext	v3	provideSIWFSNumber sIWFSSignallingModify	
groupCallControlContext	v3	prepareGroupCall processGroupCallSignalling forwardGroupCallSignalling sendGroupCallEndSignal	
reportingContext	v3	setReportingState statusReport remoteUserFree	
callCompletionContext	v3	registerCC-Entry eraseCC-Entry	
istAlertingContext	v3	istAlert	
ImmediateTerminationContest	v3	istCommand	
~~locationSvcLMUControlContext~~	~~v3~~	~~lcsRegistrationlcsReset~~	
~~locationSvcDataTransferContext~~	~~v3~~	~~lcsInformationRequest~~ ~~lcsInformationReport~~	
locationSvcEnquiryContext	v3	provideSubscriberLocation subscriberLocationReport	
locationSvcGatewayContext	v3	sendRoutingInfoForLCS	
~~locationSvcPositioningContext~~	~~v3~~	~~lcsAssignTrafficChannel~~ ~~lcsInformationRequest~~ ~~lcsInformationReport~~ ~~performLocation~~	

NOTE (*): The syntax of the operations is not the same as in previous versions unless explicitly stated

17.2 Operation packages

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

17.2.2 Packages specifications

17.2.2.43 Call Completion

This operation package includes the operations required for procedures between VLR and HLR for subscriber control of call completion services.

```
CallCompletionPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is HLR if Consumer is VLR
    CONSUMER INVOKES {
        registerCC-Entry,
        eraseCC-Entry}
```

This package is v3 only.

17.2.2.44 Location service gateway services

This operation package includes the operations required for location service gateway procedures between GMLC and HLR.

```
LocationSvcGatewayPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is HLR if Consumer is GMLC
    CONSUMER INVOKES {
         sendRoutingInfoForLCS}
```

This package is v3 only.

17.2.2.45 Location service enquiry

This operation package includes the operations required for the location service enquiry procedures between GMLC and MSC.

```
LocationSvcEnquiryPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is MSC if Consumer is GMLC
    CONSUMER INVOKES {
         provideSubscriberLocation}
    SUPPLIER INVOKES {
         subscriberLocationReport}
```

This package is v3 only.

~~17.2.2.46 Location service Positioning~~

~~This operation package includes the operations required for the location service positioning procedures between MSC and SMLC.~~

```
LocationSvcPositioningPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is SMLC if Consumer is MSC
    CONSUMER INVOKES {
         performLocation,
         lcsInformationReport}
    SUPPLIER INVOKES {
         lcsAssignTrafficChannel,              lcsInformationRequest}
```

~~This package is v3 only.~~

~~17.2.2.47 Location service LMU Control~~

~~This operation package includes the operations required for the location service LMU control procedures between MSC and SMLC.~~

```
LocationSvcLMUControlPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is SMLC if Consumer is VLR
    CONSUMER INVOKES {
         lcsRegistration }
    SUPPLIER INVOKES {
         LcsReset}
```

~~This package is v3 only.~~

~~17.2.2.48 Location service Data Transfer~~

~~This operation package includes the operations required for the location service data transfer procedures between MSC and SMLC when performed in stand alone mode.~~

```
LocationSvcDataTransferPackage-v3 ::= OPERATION-PACKAGE
    -- Supplier is MSC if Consumer is SMLC
    CONSUMER INVOKES {
         lcsInformationRequest}
    SUPPLIER INVOKES {
         lcsInformationReport}
```

~~This package is v3 only.~~

17.2.2.49 IST Alerting

This operation package includes the operation required for alerting procedures between the MSC (Visited MSC or Gateway MSC) and HLR.

```
IST-AlertingPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is HLR if Consumer is VMSC
     -- Supplier is HLR if Consumer is GMSC
     CONSUMER INVOKES {
          istAlert}
```

This package is v3 only.

17.2.2.50 Service Termination

This operation package includes the operation required for immediate service termination procedures between the HLR and the Visited MSC or between the HLR and the Gateway MSC.

```
ServiceTerminationPackage-v3 ::= OPERATION-PACKAGE
     -- Supplier is VMSC or GMSC if Consumer is HLR
     CONSUMER INVOKES {
          istCommand}
```

This package is v3 only.

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

17.3 Application contexts

17.3.2 Application context definitions

17.3.2.38 Call Completion

This application context is used between VLR and the HLR for subscriber control of call completion services.

```
callCompletionContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VLR
     INITIATOR CONSUMER OF {
          CallCompletionPackage-v3}
::= {map-ac callCompletion(8) version3(3)}
```

This application-context is v3 only.

17.3.2.39 Location Service Gateway

This application context is used for location service gateway procedures.

```
locationSvcGatewayContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is GMLC
     INITIATOR CONSUMER OF {
          locationSvcGatewayPackage-v3}
::= {map-ac locationSvcGateway(37) version3(3)}
```

17.3.2.40 Location Service Enquiry

This application context is used for location service enquiry procedures.

```
locationSvcEnquiryContext-v3 APPLICATION-CONTEXT
     -- Responder is MSC if Initiator is GMLC
     INITIATOR CONSUMER OF {
          locationSvcEnquiryPackage-v3}
::= {map-ac locationScvEnquiry(38) version3 (3)}
```

~~17.3.2.41 Location Service Positioning~~

~~This application context is used for location service positioning procedures.~~

```
locationSvcPositioningContext-v3 APPLICATION-CONTEXT
     -- Responder is SMLC if Initiator is MSC
     INITIATOR CONSUMER OF {
          locationSvcPositioningPackage-v3}
::= {map-ac locationSvcPositioning(39) version3(3)}
```

~~17.3.2.42 Location Service LMU Control~~

~~This application context is used for location service LMU control procedures.~~

```
locationSvcLMUControlContext-v3 APPLICATION-CONTEXT
     -- Responder is SMLC if Initiator is VLR
     INITIATOR CONSUMER OF {
          locationSvcLMUControlPackage-v3}
::= {map-ac locationSvcLMUControl(40) version3(3)}
```

~~17.3.2.43 Location Service Data Transfer~~

~~This application context is used for location service data transfer procedures.~~

```
locationSvcDataTransferContext-v3 APPLICATION-CONTEXT
     -- Responder is MSC if Initiator is SMLC
     INITIATOR CONSUMER OF {
          locationSvcDataTransferPackage-v3}
::= {map-ac locationSvcDataTransfer(41) version3(3)}
```

17.3.2.44 IST Alerting

This application context is used between MSC (Visited MSC or Gateway MSC) and HLR for for alerting services within IST procedures.

```
istAlertingContext-v3 APPLICATION-CONTEXT
     -- Responder is HLR if Initiator is VMSC
     -- Responder is HLR if Initiator is GMSC
     INITIATOR CONSUMER OF {
          IST-AlertingPackage-v3}
::= {map-ac alerting (4) version3(3)}
```

This application-context is v3 only.

17.3.2.45 Service Termination

This application context is used between HLR and MSC (Visited MSC or Gateway MSC) for service termination services within IST procedures.

```
serviceTerminationContext-v3 APPLICATION-CONTEXT
     -- Responder is VMSC or GMSC if Initiator is HLR
     INITIATOR CONSUMER OF {
          ServiceTerminationPackage-v3}
::= {map-ac serviceTermination (9) version3(3)}
```

This application-context is v3 only.

17.3.3 ASN.1 Module for application-context-names

The following ASN.1 module summarizes the application-context-name assigned to MAP application-contexts.

```
MAP-ApplicationContexts {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ApplicationContexts (2) version6 (6)}

DEFINITIONS

::=

BEGIN


-- EXPORTS everything


IMPORTS
   gsm-NetworkId,
   ac-Id
FROM MobileDomainDefinitions {
   ccitt (0) identified-organization (4) etsi (0) mobileDomain (0)
   mobileDomainDefinitions (0) version1 (1)}
;

-- application-context-names

map-ac  OBJECT IDENTIFIER ::= {gsm-NetworkId ac-Id}

networkLocUpContext-v3  OBJECT IDENTIFIER ::=
     {map-ac networkLocUp(1) version3(3)}

locationCancellationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locationCancel(2) version3(3)}

roamingNumberEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac roamingNbEnquiry(3) version3(3)}

locationInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac locInfoRetrieval(5) version3(3)}

resetContext-v2  OBJECT IDENTIFIER ::=
     {map-ac reset(10) version2(2)}

handoverControlContext-v2  OBJECT IDENTIFIER ::=
     {map-ac handoverControl(11) version2(2)}

equipmentMngtContext-v2  OBJECT IDENTIFIER ::=
     {map-ac equipmentMngt(13) version2(2)}

infoRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac infoRetrieval(14) version2(2)}

interVlrInfoRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac interVlrInfoRetrieval(15) version2(2)}

subscriberDataMngtContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberDataMngt(16) version3(3)}
```

```
tracingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac tracing(17) version3(3)}

networkFunctionalSsContext-v2  OBJECT IDENTIFIER ::=
     {map-ac networkFunctionalSs(18) version2(2)}

networkUnstructuredSsContext-v2  OBJECT IDENTIFIER ::=
     {map-ac networkUnstructuredSs(19) version2(2)}

shortMsgGatewayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgGateway(20) version3(3)}

shortMsgMO-RelayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgMO-Relay(21) version3(3)}

shortMsgAlertContext-v2  OBJECT IDENTIFIER ::=
     {map-ac shortMsgAlert(23) version2(2)}

mwdMngtContext-v3  OBJECT IDENTIFIER ::=
     {map-ac mwdMngt(24) version3(3)}

shortMsgMT-RelayContext-v3  OBJECT IDENTIFIER ::=
     {map-ac shortMsgMT-Relay(25) version3(3)}

imsiRetrievalContext-v2  OBJECT IDENTIFIER ::=
     {map-ac imsiRetrieval(26) version2(2)}

msPurgingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac msPurging(27) version3(3)}

subscriberInfoEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac subscriberInfoEnquiry(28) version3(3)}

anyTimeInfoEnquiryContext-v3  OBJECT IDENTIFIER ::=
     {map-ac anyTimeInfoEnquiry(29) version3(3)}

callControlTransferContext-v4  OBJECT IDENTIFIER ::=
     {map-ac callControlTransfer(6) version4(4)}

ss-InvocationNotificationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac ss-InvocationNotification(36) version3(3)}

sIWFSAllocationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac sIWFSAllocation(12) version3(3)}

groupCallControlContext-v3  OBJECT IDENTIFIER ::=
     {map-ac groupCallControl(31) version3(3)}

gprsLocationUpdateContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsLocationUpdate(32) version3(3)}

gprsLocationInfoRetrievalContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsLocationInfoRetrieval(33) version3(3)}

failureReportContext-v3  OBJECT IDENTIFIER ::=
     {map-ac failureReport(34) version3(3)}

gprsNotifyContext-v3  OBJECT IDENTIFIER ::=
     {map-ac gprsNotify(35) version3(3)}

reportingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac reporting(7) version3(3)}

callCompletionContext-v3  OBJECT IDENTIFIER ::=
     {map-ac callCompletion(8) version3(3)}

istAlertingContext-v3  OBJECT IDENTIFIER ::=
     {map-ac istAlerting(4) version3(3)}

serviceTerminationContext-v3  OBJECT IDENTIFIER ::=
     {map-ac immediateTermination(9) version3(3)}
```

```
locationSvcGatewayContext-v3  OBJECT IDENTIFIER ::=
    {map-ac locationSvcGateway(37) version3(3)}

locationSvcEnquiryContext-v3  OBJECT IDENTIFIER ::=
    {map-ac locationSvcEnquiry(38) version3(3)}

locationSvcPositioningContext-v3  OBJECT IDENTIFIER ::=
    {map-ac locationSvcPositioning(39) version3(3)}

locationSvcLMUControlContext-v3  OBJECT IDENTIFIER ::=
    {map-ac locationSvcLMUControl(40) version3(3)}

locationSvcDataTransferContext-v3  OBJECT IDENTIFIER ::=
    {map-ac locationSvcDataTransfer(41) version3(3)}


-- The following Object Identifiers are reserved for application-
-- contexts existing in previous versions of the protocol

-- AC Name & Version                    Object Identifier
--
-- networkLocUpContext-v1               map-ac networkLocUp (1)              version1 (1)
-- networkLocUpContext-v2               map-ac networkLocUp (1)              version2 (2)
-- locationCancellationContext-v1       map-ac locationCancellation (2)      version1 (1)
-- locationCancellationContext-v2       map-ac locationCancellation (2)      version2 (2)
-- roamingNumberEnquiryContext-v1       map-ac roamingNumberEnquiry (3)      version1 (1)
-- roamingNumberEnquiryContext-v2       map-ac roamingNumberEnquiry (3)      version2 (2)
-- locationInfoRetrievalContext-v1      map-ac locationInfoRetrieval (5)     version1 (1)
-- locationInfoRetrievalContext-v2      map-ac locationInfoRetrieval (5)     version2 (2)
-- resetContext-v1                      map-ac reset (10)                    version1 (1)
-- handoverControlContext-v1            map-ac handoverControl (11)          version1 (1)
-- equipmentMngtContext-v1              map-ac equipmentMngt (13)            version1 (1)
-- infoRetrievalContext-v1              map-ac infoRetrieval (14)            version1 (1)
-- subscriberDataMngtContext-v1         map-ac subscriberDataMngt (16)       version1 (1)
-- subscriberDataMngtContext-v2         map-ac subscriberDataMngt (16)       version2 (2)
-- tracingContext-v1                    map-ac tracing (17)                  version1 (1)
-- tracingContext-v2                    map-ac tracing (17)                  version2 (2)
-- networkFunctionalSsContext-v1        map-ac networkFunctionalSs (18)      version1 (1)
-- shortMsgGatewayContext-v1            map-ac shortMsgGateway (20)          version1 (1)
-- shortMsgGatewayContext-v2            map-ac shortMsgGateway (20)          version2 (2)
-- shortMsgRelayContext-v1              map-ac shortMsgRelay (21)            version1 (1)
-- shortMsgAlertContext-v1              map-ac shortMsgAlert (23)            version1 (1)
-- mwdMngtContext-v1                    map-ac mwdMngt (24)                  version1 (1)
-- mwdMngtContext-v2                    map-ac mwdMngt (24)                  version2 (2)
-- shortMsgMT-RelayContext-v2           map-ac shortMsgMT-Relay (25)         version2 (2)
-- msPurgingContext-v2                  map-ac msPurging (27)                version2 (2)
-- callControlTransferContext-v3        map-ac callControlTransferContext (6)  version3 (3)


END
```

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

17.5 MAP operation and error codes

```
MAP-Protocol {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Protocol (4) version6 (6)}

DEFINITIONS

::=

BEGIN

IMPORTS
   UpdateLocation,
   CancelLocation,
   PurgeMS,
   SendIdentification,
   UpdateGprsLocation,
```

```
    PrepareHandover,
    SendEndSignal,
    ProcessAccessSignalling,
    ForwardAccessSignalling,
    PrepareSubsequentHandover,
    SendAuthenticationInfo,
    CheckIMEI,
    InsertSubscriberData,
    DeleteSubscriberData,
    Reset,
    ForwardCheckSS-Indication,
    RestoreData,
    ProvideSubscriberInfo,
    AnyTimeInterrogation,
    SendRoutingInfoForGprs,
    FailureReport,
    NoteMsPresentForGprs


FROM MAP-MobileServiceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-MobileServiceOperations (5)
    version6 (6)}

    ActivateTraceMode,
    DeactivateTraceMode,
    SendIMSI
FROM MAP-OperationAndMaintenanceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-OperationAndMaintenanceOperations (6)
    version6 (6)}

    SendRoutingInfo,
    ProvideRoamingNumber,
    ResumeCallHandling,
    ProvideSIWFSNumber,
    SIWFSSignallingModify,
    SetReportingState,
    StatusReport,
    RemoteUserFree,
    IST-Alert,
    IST-Command
FROM MAP-CallHandlingOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-CallHandlingOperations (7)
    version6 (6)}

    RegisterSS,
    EraseSS,
    ActivateSS,
    DeactivateSS,
    InterrogateSS,
    ProcessUnstructuredSS-Request,
    UnstructuredSS-Request,
    UnstructuredSS-Notify,
    RegisterPassword,
    GetPassword,
    SS-InvocationNotification,
    RegisterCC-Entry,
    EraseCC-Entry
FROM MAP-SupplementaryServiceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-SupplementaryServiceOperations (8)
    version6 (6)}

    SendRoutingInfoForSM,
    MO-ForwardSM,
    MT-ForwardSM,
    ReportSM-DeliveryStatus,
    AlertServiceCentre,
    InformServiceCentre,
    ReadyForSM
FROM MAP-ShortMessageServiceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-ShortMessageServiceOperations (9)
    version6 (6)}

    PrepareGroupCall,
    ProcessGroupCallSignalling,
```

```
    ForwardGroupCallSignalling,
    SendGroupCallEndSignal
FROM MAP-Group-Call-Operations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-Group-Call-Operations (22)
    version6 (6)}

    LCSAssignTrafficChannel,
    LCSInformationReport,
    LCSInformationRequest,
    LCSRegistration,
    LCSReset,
    ProvideSubscriberLocation,
    PerformLocation,
    SendRoutingInfoForLCS,
    SubscriberLocationReport
FROM MAP-LocationServiceOperations {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-LocationServiceOperations (24)
    version6 (6)}

    SystemFailure,
    DataMissing,
    UnexpectedDataValue,
    FacilityNotSupported,
    UnknownSubscriber,
    NumberChanged,
    UnknownMSC,
    UnidentifiedSubscriber,
    UnknownEquipment,
    RoamingNotAllowed,
    IllegalSubscriber,
    IllegalEquipment,
    BearerServiceNotProvisioned,
    TeleserviceNotProvisioned,
    NoHandoverNumberAvailable,
    SubsequentHandoverFailure,
    TracingBufferFull,
    OR-NotAllowed,
    NoRoamingNumberAvailable,
    AbsentSubscriber,
    BusySubscriber,
    NoSubscriberReply,
    CallBarred,
    ForwardingViolation,
    ForwardingFailed,
    CUG-Reject,
    ATI-NotAllowed,
    IllegalSS-Operation,
    SS-ErrorStatus,
    SS-NotAvailable,
    SS-SubscriptionViolation,
    SS-Incompatibility,
    UnknownAlphabet,
    USSD-Busy,
    PW-RegistrationFailure,
    NegativePW-Check,
    NumberOfPW-AttemptsViolation,
    SubscriberBusyForMT-SMS,
    SM-DeliveryFailure,
    MessageWaitingListFull,
    AbsentSubscriberSM,
    ResourceLimitation,
    NoGroupCallNumberAvailable,
    ShortTermDenial,
    LongTermDenial,
    IncompatibleTerminal,
    UnauthorizedRequestingNetwork,
    UnauthorizedLCSClient,
    PositionMethodFailure,
    PositionMethodFailureWithRestart,
    LMUUnknownOrOffline,
    TrafficChannelEstablishmentFailure,
    UnknownOrUnreachableLCSClient

FROM MAP-Errors {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-Errors (10) version6 (6)}
;
```

```
-- location registration operation codes

updateLocation  UpdateLocation ::= localValue 2
cancelLocation  CancelLocation ::= localValue 3
purgeMS  PurgeMS ::= localValue 67
sendIdentification  SendIdentification ::= localValue 55


-- handover operation codes

prepareHandover  PrepareHandover ::= localValue 68
sendEndSignal  SendEndSignal ::= localValue 29
processAccessSignalling  ProcessAccessSignalling ::= localValue 33
forwardAccessSignalling  ForwardAccessSignalling ::= localValue 34
prepareSubsequentHandover  PrepareSubsequentHandover ::=
     localValue 69


-- authentication operation codes

sendAuthenticationInfo  SendAuthenticationInfo ::= localValue 56


-- IMEI MANAGEMENT operation codes

checkIMEI  CheckIMEI ::= localValue 43


-- subscriber management operation codes

insertSubscriberData  InsertSubscriberData ::= localValue 7
deleteSubscriberData  DeleteSubscriberData ::= localValue 8


-- fault recovery operation codes

reset  Reset ::= localValue 37
forwardCheckSS-Indication  ForwardCheckSS-Indication ::=
     localValue 38
restoreData  RestoreData ::= localValue 57


-- operation and maintenance operation codes

activateTraceMode  ActivateTraceMode ::= localValue 50
deactivateTraceMode  DeactivateTraceMode ::= localValue 51
sendIMSI  SendIMSI ::= localValue 58


-- call handling operation codes

sendRoutingInfo  SendRoutingInfo ::= localValue 22
provideRoamingNumber  ProvideRoamingNumber ::= localValue 4
resumeCallHandling  ResumeCallHandling ::= localValue 6
provideSIWFSNumber  ProvideSIWFSNumber ::= localValue 31
sIWFSSignallingModify  SIWFSSignallingModify ::= localValue 32
setReportingState  SetReportingState ::= localValue 73
statusReport StatusReport ::= localValue 74
remoteUserFree RemoteUserFree ::= localValue 75
istAlert IST-Alert ::= localValue 87
istCommand IST-Command ::= localValue 88


-- supplementary service handling operation codes
```

```
registerSS  RegisterSS ::= localValue 10
eraseSS  EraseSS ::= localValue 11
activateSS  ActivateSS ::= localValue 12
deactivateSS  DeactivateSS ::= localValue 13
interrogateSS  InterrogateSS ::= localValue 14
processUnstructuredSS-Request  ProcessUnstructuredSS-Request ::=
     localValue 59
unstructuredSS-Request  UnstructuredSS-Request ::= localValue 60
unstructuredSS-Notify  UnstructuredSS-Notify ::= localValue 61
registerPassword  RegisterPassword ::= localValue 17
getPassword  GetPassword ::= localValue 18
registerCC-Entry  RegisterCC-Entry ::= localValue 76
eraseCC-Entry  EraseCC-Entry ::= localValue 77


-- short message service operation codes

sendRoutingInfoForSM  SendRoutingInfoForSM ::= localValue 45
mo-forwardSM  MO-ForwardSM ::= localValue 46
mt-forwardSM  MT-ForwardSM ::= localValue 44
reportSM-DeliveryStatus  ReportSM-DeliveryStatus ::= localValue 47
informServiceCentre  InformServiceCentre ::= localValue 63
alertServiceCentre  AlertServiceCentre ::= localValue 64
readyForSM  ReadyForSM ::= localValue 66

-- provide subscriber info operation codes

provideSubscriberInfo  ProvideSubscriberInfo ::= localValue 70

-- any time interrogation operation codes

anyTimeInterrogation  AnyTimeInterrogation ::= localValue 71

-- supplementary service invocation notification operation codes

ss-InvocationNotification  SS-InvocationNotification ::= localValue 72


--Group Call operation codes

prepareGroupCall  PrepareGroupCall ::= localValue 39
sendGroupCallEndSignal  SendGroupCallEndSignal ::= localValue 40
processGroupCallSignalling  ProcessGroupCallSignalling ::= localValue 41
forwardGroupCallSignalling  ForwardGroupCallSignalling ::= localValue 42


-- gprs location updating operation codes

updateGprsLocation  UpdateGprsLocation ::= localValue 23

-- gprs location information retrieval operation codes

sendRoutingInfoForGprs  SendRoutingInfoForGprs ::= localValue 24

-- failure reporting operation codes

failureReport  FailureReport ::= localValue 25

-- GPRS notification operation codes

noteMsPresentForGprs  NoteMsPresentForGprs ::= localValue 26

-- Location service operation codes

lcsAssignTrafficChannel  LCSAssignTrafficChannel ::= localValue 78
lcsInformationReport  LCSInformationReport ::= localValue 79
lcsInformationRequest  LCSInformationRequest ::= localValue 80
lcsRegistration  LCSRegistration ::= localValue 81
lcsReset  LCSReset ::= localValue 82
provideSubscriberLocation  ProvideSubscriberLocation ::= localValue 83
performLocation  PerformLocation ::= localValue 84
sendRoutingInfoForLCS  SendRoutingInfoForLCS ::= localValue 85
subscriberLocationReport  SubscriberLocationReport ::= localValue 86


-- generic error codes

```

```
systemFailure  SystemFailure ::= localValue 34
dataMissing  DataMissing ::= localValue 35
unexpectedDataValue  UnexpectedDataValue ::= localValue 36
facilityNotSupported  FacilityNotSupported ::= localValue 21
incompatibleTerminal  IncompatibleTerminal ::= localValue 28
resourceLimitation  ResourceLimitation ::= localValue 51

-- identification and numbering error codes

unknownSubscriber  UnknownSubscriber ::= localValue 1
numberChanged  NumberChanged ::= localValue 44
unknownMSC  UnknownMSC ::= localValue 3
unidentifiedSubscriber  UnidentifiedSubscriber ::= localValue 5
unknownEquipment  UnknownEquipment ::= localValue 7

-- subscription error codes

roamingNotAllowed  RoamingNotAllowed ::= localValue 8
illegalSubscriber  IllegalSubscriber ::= localValue 9
illegalEquipment  IllegalEquipment ::= localValue 12
bearerServiceNotProvisioned  BearerServiceNotProvisioned ::=
     localValue 10
teleserviceNotProvisioned  TeleserviceNotProvisioned ::=
     localValue 11

-- handover error codes

noHandoverNumberAvailable  NoHandoverNumberAvailable ::=
     localValue 25
subsequentHandoverFailure  SubsequentHandoverFailure ::=
     localValue 26

-- operation and maintenance error codes

tracingBufferFull  TracingBufferFull ::= localValue 40

-- call handling error codes

noRoamingNumberAvailable  NoRoamingNumberAvailable ::= localValue 39
absentSubscriber  AbsentSubscriber ::= localValue 27
busySubscriber  BusySubscriber ::= localValue 45
noSubscriberReply  NoSubscriberReply ::= localValue 46
callBarred  CallBarred ::= localValue 13
forwardingFailed  ForwardingFailed ::= localValue 47
or-NotAllowed  OR-NotAllowed ::= localValue 48
forwardingViolation  ForwardingViolation ::= localValue 14
cug-Reject  CUG-Reject ::= localValue 15

-- any time interrogation error codes
ati-NotAllowed  ATI-NotAllowed ::= localValue 49

-- Group Call error codes
noGroupCallNumberAvailable  NoGroupCallNumberAvailable ::= localValue 50

-- supplementary service error codes
```

```
illegalSS-Operation  IllegalSS-Operation ::= localValue 16
ss-ErrorStatus  SS-ErrorStatus ::= localValue 17
ss-NotAvailable  SS-NotAvailable ::= localValue 18
ss-SubscriptionViolation  SS-SubscriptionViolation ::= localValue 19
ss-Incompatibility  SS-Incompatibility ::= localValue 20
unknownAlphabet  UnknownAlphabet ::= localValue 71
ussd-Busy  USSD-Busy ::= localValue 72
pw-RegistrationFailure  PW-RegistrationFailure ::= localValue 37
negativePW-Check  NegativePW-Check ::= localValue 38
numberOfPW-AttemptsViolation  NumberOfPW-AttemptsViolation ::=
     localValue 43
shortTermDenial  ShortTermDenial ::= localValue 29
longTermDenial  LongTermDenial ::= localValue 30


-- short message service error codes

subscriberBusyForMT-SMS  SubscriberBusyForMT-SMS ::= localValue 31
sm-DeliveryFailure  SM-DeliveryFailure ::= localValue 32
messageWaitingListFull  MessageWaitingListFull ::= localValue 33
absentsubscriberSM  AbsentSubscriberSM ::= localValue 6

-- location service error codes

unauthorizedRequestingNetwork  UnauthorizedRequestingNetwork::= localValue 52
unauthorizedLCSClient  UnauthorizedLCSClient ::= localValue 53
positionMethodFailure  PositionMethodFailure ::= localValue 54
positionMethodFailureWithRestart  PositionMethodFailureWithRestart ::= localValue 55
lmuUnknownOrOffline  LMUUnknownOrOffline ::= localValue 56
trafficChannelEstablishmentFailure  TrafficChannelEstablishmentFailure ::= localValue 57
unknownOrUnreachableLCSClient  UnknownOrUnreachableLCSClient ::= localValue 58


-- The following operation codes are reserved for operations
-- existing in previous versions of the protocol
```

-- Operation Name	AC used	Oper. Code
--		
-- sendParameters	map-ac infoRetrieval (14) version1 (1)	localValue 9
-- processUnstructuredSS-Data	map-ac networkFunctionalSs (18) version1 (1)	localValue 19
-- performHandover	map-ac handoverControl (11) version1 (1)	localValue 28
-- performSubsequentHandover	map-ac handoverControl (11) version1 (1)	localValue 30
-- noteInternalHandover	map-ac handoverControl (11) version1 (1)	localValue 35
-- noteSubscriberPresent	map-ac mwdMngt (24) version1 (1)	localValue 48
-- alertServiceCentreWithoutResult	map-ac shortMsgAlert (23) version1 (1)	localValue 49
-- traceSubscriberActivity	map-ac handoverControl (11) version1 (1)	localValue 52
-- beginSubscriberActivity	map-ac networkFunctionalSs (18) version1 (1)	localValue 54

```
-- The following error codes are reserved for errors
-- existing in previous versions of the protocol
```

-- Error Name	AC used	Error Code
--		
-- unknownBaseStation	map-ac handoverControl (11) version1 (1)	localValue 2
-- invalidTargetBaseStation	map-ac handoverControl (11) version1 (1)	localValue 23
-- noRadioResourceAvailable	map-ac handoverControl (11) version1 (1)	localValue 24

```


END
```

17.6 MAP operation and error type

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

17.6.6 Errors

```
MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version6 (6)}

DEFINITIONS

::=

BEGIN

EXPORTS

   -- generic errors
   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   IncompatibleTerminal,
   ResourceLimitation,

   -- identification and numbering errors
   UnknownSubscriber,
   NumberChanged,
   UnknownMSC,
   UnidentifiedSubscriber,
   UnknownEquipment,

   -- subscription errors
   RoamingNotAllowed,
   IllegalSubscriber,
   IllegalEquipment,
   BearerServiceNotProvisioned,
   TeleserviceNotProvisioned,

   -- handover errors
   NoHandoverNumberAvailable,
   SubsequentHandoverFailure,

   -- operation and maintenance errors
   TracingBufferFull,

   -- call handling errors
   OR-NotAllowed,
   NoRoamingNumberAvailable,
   BusySubscriber,
   NoSubscriberReply,
   AbsentSubscriber,
   CallBarred,
   ForwardingViolation,
   ForwardingFailed,
   CUG-Reject,

   -- any time interrogation errors
   ATI-NotAllowed,

   -- supplementary service errors
   IllegalSS-Operation,
   SS-ErrorStatus,
   SS-NotAvailable,
   SS-SubscriptionViolation,
   SS-Incompatibility,
   UnknownAlphabet,
   USSD-Busy,
   PW-RegistrationFailure,
   NegativePW-Check,
   NumberOfPW-AttemptsViolation,
   ShortTermDenial,
   LongTermDenial,

   -- short message service errors
   SubscriberBusyForMT-SMS,
   SM-DeliveryFailure,
   MessageWaitingListFull,
   AbsentSubscriberSM,

   -- Group Call errors
   NoGroupCallNumberAvailable,

   -- location service errors
```

```
   UnauthorizedRequestingNetwork,
   UnauthorizedLCSClient,
   PositionMethodFailure,
   PositionMethodFailureWithRestart,
   LMUUnknownOrOffline,
   TrafficChannelEstablishmentFailure,
   UnknownOrUnreachableLCSClient

;

IMPORTS
   ERROR
FROM TCAPMessages {
   ccitt recommendation q 773 modules (2) messages (1) version2 (2)}

   SS-Status
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}

   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   RoamingNotAllowedParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   OR-NotAllowedParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   CallBarredParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   CUG-RejectParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam,
   UnauthorizedRequestingNetwork-Param,
   UnauthorizedLCSClient-Param,
   PositionMethodFailure-Param,
   PositionMethodFailureWithRestart-Param,
   LMUUnknownOrOffline-Param,
   TrafficChannelEstablishmentFailure-Param,
   UnknownOrUnreachableLCSClient-Param


FROM MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version6 (6)}
;


-- generic errors

SystemFailure ::= ERROR
    PARAMETER
         systemFailureParam             SystemFailureParam
         -- optional

```

```
DataMissing ::= ERROR
    PARAMETER
         dataMissingParam                DataMissingParam
         -- optional
         -- dataMissingParam must not be used in version <3
```

```
UnexpectedDataValue ::= ERROR
    PARAMETER
         unexpectedDataParam             UnexpectedDataParam
         -- optional
         -- unexpectedDataParam must not be used in version <3
```

```
FacilityNotSupported ::= ERROR
    PARAMETER
         facilityNotSupParam             FacilityNotSupParam
         -- optional
         -- facilityNotSupParam must not be used in version <3
```

```
IncompatibleTerminal ::= ERROR
    PARAMETER
         incompatibleTerminalParam       IncompatibleTerminalParam
         -- optional
```

```
ResourceLimitation ::= ERROR
    PARAMETER
         resourceLimitationParam         ResourceLimitationParam
         -- optional
```

```
-- identification and numbering errors
```

```
UnknownSubscriber ::= ERROR
    PARAMETER
         unknownSubscriberParam          UnknownSubscriberParam
         -- optional
         -- unknownSubscriberParam must not be used in version <3
```

```
NumberChanged ::= ERROR
    PARAMETER
         numberChangedParam              NumberChangedParam
         -- optional
```

```
UnknownMSC ::= ERROR
```

```
UnidentifiedSubscriber ::= ERROR
    PARAMETER
         unidentifiedSubParam            UnidentifiedSubParam
         -- optional
         -- unidentifiedSubParam must not be used in version <3
```

```
UnknownEquipment ::= ERROR
```

```
-- subscription errors
```

```
RoamingNotAllowed ::= ERROR
    PARAMETER
         roamingNotAllowedParam          RoamingNotAllowedParam
```

```
IllegalSubscriber ::= ERROR
    PARAMETER
         illegalSubscriberParam          IllegalSubscriberParam
         -- optional
         -- illegalSubscriberParam must not be used in version <3
```

```
IllegalEquipment ::= ERROR
    PARAMETER
         illegalEquipmentParam           IllegalEquipmentParam
         -- optional
         -- illegalEquipmentParam must not be used in version <3
```

```
BearerServiceNotProvisioned ::= ERROR
    PARAMETER
         bearerServNotProvParam          BearerServNotProvParam
         -- optional
         -- bearerServNotProvParam must not be used in version <3
```

```
TeleserviceNotProvisioned ::= ERROR
```

```
    PARAMETER
         teleservNotProvParam            TeleservNotProvParam
         -- optional
         -- teleservNotProvParam must not be used in version <3

-- handover errors

NoHandoverNumberAvailable ::= ERROR

SubsequentHandoverFailure ::= ERROR


-- operation and maintenance errors

TracingBufferFull ::= ERROR
    PARAMETER
         tracingBufferFullParam          TracingBufferFullParam
         -- optional


-- call handling errors

NoRoamingNumberAvailable ::= ERROR
    PARAMETER
         noRoamingNbParam                NoRoamingNbParam
         -- optional

AbsentSubscriber ::= ERROR
    PARAMETER
         absentSubscriberParam           AbsentSubscriberParam
         -- optional

      -- absentSubscriberParam must not be used in version <3

BusySubscriber ::= ERROR
    PARAMETER
         busySubscriberParam             BusySubscriberParam
         -- optional

NoSubscriberReply ::= ERROR
    PARAMETER
         noSubscriberReplyParam          NoSubscriberReplyParam
         -- optional

CallBarred ::= ERROR
    PARAMETER
         callBarredParam                 CallBarredParam
         -- optional

ForwardingViolation ::= ERROR
    PARAMETER
         forwardingViolationParam        ForwardingViolationParam
         -- optional

ForwardingFailed ::= ERROR
    PARAMETER
         forwardingFailedParam           ForwardingFailedParam
         -- optional

CUG-Reject ::= ERROR
    PARAMETER
         cug-RejectParam                 CUG-RejectParam
         -- optional

OR-NotAllowed ::= ERROR
    PARAMETER
         or-NotAllowedParam              OR-NotAllowedParam
         -- optional


-- any time interrogation errors
ATI-NotAllowed ::= ERROR
    PARAMETER
         ati-NotAllowedParam             ATI-NotAllowedParam
         -- optional
```

```
-- supplementary service errors

IllegalSS-Operation ::= ERROR

SS-ErrorStatus ::= ERROR
     PARAMETER
          ss-Status                      SS-Status
          -- optional

SS-NotAvailable ::= ERROR

SS-SubscriptionViolation ::= ERROR

SS-Incompatibility ::= ERROR
     PARAMETER
          ss-IncompatibilityCause        SS-IncompatibilityCause
          -- optional

UnknownAlphabet ::= ERROR

USSD-Busy ::= ERROR

PW-RegistrationFailure ::= ERROR
     PARAMETER
          pw-RegistrationFailureCause    PW-RegistrationFailureCause

NegativePW-Check ::= ERROR

NumberOfPW-AttemptsViolation ::= ERROR

ShortTermDenial ::= ERROR
     PARAMETER
          shortTermDenialParam                ShortTermDenialParam
          -- optional

LongTermDenial ::= ERROR
     PARAMETER
          longTermDenialParam                 LongTermDenialParam
          -- optional


-- short message service errors

SubscriberBusyForMT-SMS ::= ERROR
     PARAMETER
          subBusyForMT-SMS-Param         SubBusyForMT-SMS-Param
          -- optional

SM-DeliveryFailure ::= ERROR
     PARAMETER
          sm-DeliveryFailureCause        SM-DeliveryFailureCause

MessageWaitingListFull ::= ERROR
     PARAMETER
          messageWaitListFullParam       MessageWaitListFullParam
          -- optional

AbsentSubscriberSM ::= ERROR
     PARAMETER
          absentSubscriberSM-Param       AbsentSubscriberSM-Param
          -- optional

-- Group Call errors

NoGroupCallNumberAvailable ::= ERROR
     PARAMETER
          noGroupCallNbParam             NoGroupCallNbParam
          -- optional

-- location service errors
```

```
UnauthorizedRequestingNetwork ::= ERROR
     PARAMETER
          unauthorizedRequestingNetwork-Param  UnauthorizedRequestingNetwork-Param
          -- optional

UnauthorizedLCSClient ::= ERROR
     PARAMETER
          unauthorizedLCSClient-Param     UnauthorizedLCSClient-Param
          -- optional

PositionMethodFailure ::= ERROR
     PARAMETER
          positionMethodFailure-Param     PositionMethodFailure-Param
          -- optional

PositionMethodFailureWithRestart ::= ERROR
     PARAMETER
          positionMethodFailureWithRestart-Param    PositionMethodFailureWithRestart-Param
          -- optional

LMUUnknownOrOffline ::= ERROR
     PARAMETER
          lmuUnknownOrOffline-Param         LMUUnknownOrOffline-Param
          -- optional

TrafficChannelEstablishmentFailure ::= ERROR
     PARAMETER
          trafficChannelEstablishmentFailure   TrafficChannelEstablishmentFailure-Param
          -- optional

UnknownOrUnreachableLCSClient ::= ERROR
     PARAMETER
          unknownOrUnreachableLCSClient-Param   UnknownOrUnreachableLCSClient-Param
          -- optional

END
```

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

17.6.8 Location service operations

```
MAP-LocationServiceOperations {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LocationServiceOperations (24)
   version6 (6)}

DEFINITIONS

::=

BEGIN

EXPORTS
   LCSAssignTrafficChannel,
   LCSInformationReport,
   LCSInformationRequest,
   LCSRegistration,
   LCSReset,
   ProvideSubscriberLocation,
   PerformLocation,
   SendRoutingInfoForLCS,
   SubscriberLocationReport
;
```

```
IMPORTS
   OPERATION
FROM TCAPMessages {
   ccitt recommendation q 773 modules (2) messages (1) version2 (2)}

   SystemFailure,
   DataMissing,
   UnexpectedDataValue,
   FacilityNotSupported,
   UnknownSubscriber,
   AbsentSubscriber,
   UnauthorizedRequestingNetwork,
   UnauthorizedLCSClient,
   PositionMethodFailure,
   PositionMethodFailureWithRestart,
   ResourceLimitation,
   LMUUnknownOrOffline,
   TrafficChannelEstablishmentFailure,
   UnknownOrUnreachableLCSClient
FROM MAP-Errors {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-Errors (10) version6 (6)}

   LCSAssignTrafficChannel-Arg,
   LCSAssignTrafficChannel-Res,
   LCSInformationReport-Arg,
   LCSInformationRequest-Arg,
   LCSRegistration-Arg,
   LCSRegistration-Res,
   LCSReset-Arg,
   RoutingInfoForLCS-Arg,
   RoutingInfoForLCS-Res,
   ProvideSubscriberLocation-Arg,
   ProvideSubscriberLocation-Res,
   PerformLocation-Arg,
   PerformLocation-Res,
   SubscriberLocationReport-Arg,
   SubscriberLocationReport-Res
FROM MAP-LCS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LCS-DataTypes (25) version6 (6)}
;

SendRoutingInfoForLCS ::= OPERATION                --Timer m
    ARGUMENT
        routingInfoForLCS-Arg           RoutingInfoForLCS-Arg
    RESULT
        routingInfoForLCS-Res           RoutingInfoForLCS-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        FacilityNotSupported,
        UnknownSubscriber,
        AbsentSubscriber,
        UnauthorizedRequestingNetwork }

ProvideSubscriberLocation ::= OPERATION       --Timer ml
    ARGUMENT
        provideSubscriberLocation-Arg   ProvideSubscriberLocation-Arg
    RESULT
        provideSubscriberLocation-Res   ProvideSubscriberLocation-Res
    ERRORS {
        SystemFailure,
        DataMissing,
        UnexpectedDataValue,
        FacilityNotSupported,
        UnknownSubscriber,
        UnidentifiedSubscriber,
        IllegalSubscriber,
        IllegalEquipment,
        AbsentSubscriber,
        UnauthorizedRequestingNetwork,
        UnauthorizedLCSClient,
        PositionMethodFailure }
```

```
SubscriberLocationReport ::= OPERATION        --Timer m
    ARGUMENT
         subscriberLocationReport-Arg    SubscriberLocationReport-Arg
    RESULT
         subscriberLocationReport-Res    SubscriberLocationReport-Res
    ERRORS {
         SystemFailure,
         DataMissing,
         UnexpectedDataValue,
         ResourceLimitation,
         UnknownSubscriber,
         UnauthorizedRequestingNetwork,
         UnknownOrUnreachableLCSClient}
```

```
PerformLocation ::= OPERATION                    --Timer ml
    ARGUMENT
         performLocation-Arg              PerformLocation-Arg
    RESULT
         performLocation-Res              PerformLocation-Res
    ERRORS {
         SystemFailure,
         DataMissing,
         UnexpectedDataValue,
         PositionMethodFailure,
         PositionMethodFailureWithRestart }
```

```
LCSRegistration ::= OPERATION                    --Timer m
    ARGUMENT
         lcsRegistration-Arg              LCSRegistration-Arg
    RESULT
         lcsRegistration-Res              LCSRegistration-Res
    ERRORS {
         SystemFailure,
         LMUUnknownOrOffline,
         DataMissing,
         UnexpectedDataValue }
```

```
LCSInformationRequest ::= OPERATION              --Timer s
    ARGUMENT
         lcsInformationRequest-Arg        LCSInformationRequest-Arg
```

```
LCSInformationReport ::= OPERATION               --Timer s
    ARGUMENT
         lcsInformationReport-Arg         LCSInformationReport-Arg
```

```
LCSReset ::= OPERATION                           --Timer s
    ARGUMENT
         lcsReset-Arg                     LCSReset-Arg
```

```
LCSAssignTrafficChannel ::= OPERATION            --Timer m
    ARGUMENT
         lcsAssignTrafficChannel-Arg      LCSAssignTrafficChannel-Arg
    RESULT
         lcsAssignTrafficChannel-Res      LCSAssignTrafficChannel-Res
    ERRORS {
         SystemFailure,
         DataMissing,
         UnexpectedDataValue,
         TrafficChannelEstablishmentFailure }
```

```
END
```

17.7 MAP constants and data types

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

17.7.1 Mobile Service data types

```
MAP-MS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-MS-DataTypes (11) version6 (6)}

DEFINITIONS
```

```
IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- location registration types
   UpdateLocationArg,
   UpdateLocationRes,
   CancelLocationArg,
   CancelLocationRes,
   PurgeMS-Arg,
   PurgeMS-Res,
   SendIdentificationRes,
   UpdateGprsLocationArg,
   UpdateGprsLocationRes,
   IST-SupportIndicator,


   -- handover types
   PrepareHO-Arg,
   PrepareHO-Res,
   PrepareSubsequentHO-Arg,

   -- authentication management types
   SendAuthenticationInfoArg,
   SendAuthenticationInfoRes,

   -- security management types
   EquipmentStatus,
   Kc,

   -- subscriber management types
   InsertSubscriberDataArg,
   InsertSubscriberDataRes,
   DeleteSubscriberDataArg,
   DeleteSubscriberDataRes,
   SubscriberData,
   ODB-Data,
   SubscriberStatus,
   ZoneCodeList,
   maxNumOfZoneCodes,
   O-CSI,
   O-BcsmCamelTDPCriteriaList,
   SS-CSI,
   ServiceKey,
   DefaultCallHandling,
   CamelCapabilityHandling,
   BasicServiceCriteria,
   SupportedCamelPhases,
   maxNumOfCamelTDPData,
   CUG-Index,
   CUG-Interlock,
   InterCUG-Restrictions,
   IntraCUG-Options,
   IST-AlertTimerValue,


   -- fault recovery types
   ResetArg,
   RestoreDataArg,
   RestoreDataRes,

   -- subscriber information enquiry types
   ProvideSubscriberInfoArg,
   ProvideSubscriberInfoRes,
   SubscriberInfo,
   LocationInformation,
   SubscriberState,

   -- any time information enquiry types
   AnyTimeInterrogationArg,
   AnyTimeInterrogationRes,

   -- gprs location information retrieval types
   SendRoutingInfoForGprsArg,
```

```
    SendRoutingInfoForGprsRes,

    -- failure reporting types
    FailureReportArg,
    FailureReportRes,

    -- gprs notification types
    NoteMsPresentForGprsArg,
    NoteMsPresentForGprsRes


;

IMPORTS
    IST-SupportIndicator,
    IST-AlertTimerValue
FROM MAP-CH-DataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-CH-DataTypes (13) version5 (5) }
    maxNumOfSS,
    SS-SubscriptionOption,
    SS-List
FROM MAP-SS-DataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}

    SS-Code
FROM MAP-SS-Code {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}

    Ext-BearerServiceCode
FROM MAP-BS-Code {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-BS-Code (20) version6 (6)}

    Ext-TeleserviceCode
FROM MAP-TS-Code {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-TS-Code (19) version6 (6)}


    ISDN-AddressString,
    maxISDN-AddressLength,
    ISDN-SubaddressString,
    ExternalSignalInfo,
    IMSI,
    HLR-List,
    LMSI,
    Identity,
    GlobalCellId,
    CellIdOrLAI,
    Ext-BasicServiceCode,
    NAEA-PreferredCI,
    EMLPP-Info,
    SubscriberIdentity,
    AgeOfLocationInformation,
    LCSClientExternalID,
    LCSClientInternalID



FROM MAP-CommonDataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}

    ExtensionContainer
FROM MAP-ExtensionDataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}

    AbsentSubscriberDiagnosticSM
FROM MAP-ER-DataTypes {
    ccitt identified-organization (4) etsi (0) mobileDomain (0)
    gsm-Network (1) modules (3) map-ER-DataTypes (17) version6 (6)}


;

```

```
-- location registration types

UpdateLocationArg ::= SEQUENCE {
     imsi                              IMSI,

     msc-Number                        [1] ISDN-AddressString,
     vlr-Number                        ISDN-AddressString,
     lmsi                              [10] LMSI OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ... ,
     vlr-Capability                    [6] VLR-Capability                OPTIONAL }

VLR-Capability ::= SEQUENCE{
     supportedCamelPhases              [0] SupportedCamelPhases          OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ... ,
     solsaSupportIndicator             [2] NULL                          OPTIONAL,
     istSupportIndicator               [1] IST-SupportIndicator          OPTIONAL }

IST-SupportIndicator ::=  ENUMERATED {
     basicISTSupported                 (0),
     istCommandSupported               (1), ...}
-- exception handling:
-- reception of values > 1 shall be mapped to ' istCommandSupported '


UpdateLocationRes ::= SEQUENCE {
     hlr-Number                        ISDN-AddressString,

     extensionContainer                ExtensionContainer                OPTIONAL,
     ... }

CancelLocationArg ::= [3] SEQUENCE {
     identity                          Identity,
     cancellationType                  CancellationType                  OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}


CancellationType ::= ENUMERATED {
     updateProcedure                   (0),
     subscriptionWithdraw              (1),
     ...}
     -- The HLR shall not send values other than listed above


CancelLocationRes ::= SEQUENCE {
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}

PurgeMS-Arg ::= [3] SEQUENCE {
     imsi                              IMSI,
     vlr-Number                        [0] ISDN-AddressString            OPTIONAL,
     sgsn-Number                       [1]  ISDN-AddressString           OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}

PurgeMS-Res ::= SEQUENCE {
     freezeTMSI                        [0]  NULL                         OPTIONAL,
     freezeP-TMSI                      [1]  NULL                         OPTIONAL,
     extensionContainer                ExtensionContainer                OPTIONAL,
     ...}

SendIdentificationRes ::= SEQUENCE {
     imsi                              IMSI,
     authenticationSetList             AuthenticationSetList             OPTIONAL,
     ...}

AuthenticationSetList ::= SEQUENCE SIZE (1..5) OF
                                       AuthenticationSet
```

```
AuthenticationSet ::= SEQUENCE {
     rand                                RAND,
     sres                                SRES,
     kc                                  Kc,
     ...}

RAND ::= OCTET STRING (SIZE (16))

SRES ::= OCTET STRING (SIZE (4))

Kc ::= OCTET STRING (SIZE (8))

-- gprs location registration types

UpdateGprsLocationArg ::= SEQUENCE {
     imsi                                IMSI,
     sgsn-Number                         ISDN-AddressString,
     sgsn-Address                        GSN-Address,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ... ,
     sgsn-Capability                     [0] SGSN-Capability               OPTIONAL }

SGSN-Capability ::= SEQUENCE{
     solsaSupportIndicator               NULL                              OPTIONAL,
     extensionContainer                  [1] ExtensionContainer            OPTIONAL,
     ... }

GSN-Address ::= OCTET STRING (SIZE (5..17))
     -- Octets are coded according to TS GSM 03.03

UpdateGprsLocationRes ::= SEQUENCE {
     hlr-Number                          ISDN-AddressString,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

-- handover types

PrepareHO-Arg ::= SEQUENCE {
     targetCellId                        GlobalCellId                      OPTIONAL,
     ho-NumberNotRequired                NULL                              OPTIONAL,
     bss-APDU                            ExternalSignalInfo                OPTIONAL,
     ...}

PrepareHO-Res ::= SEQUENCE {
     handoverNumber                      ISDN-AddressString                OPTIONAL,
     bss-APDU                            ExternalSignalInfo                OPTIONAL,
     ...}

PrepareSubsequentHO-Arg ::= SEQUENCE {
     targetCellId                        GlobalCellId,
     targetMSC-Number                    ISDN-AddressString,
     bss-APDU                            ExternalSignalInfo,
     ...}

-- authentication management types

SendAuthenticationInfoArg ::= IMSI

SendAuthenticationInfoRes ::= AuthenticationSetList


-- security management types

EquipmentStatus ::= ENUMERATED {
     whiteListed  (0),
     blackListed  (1),
     greyListed  (2)}


-- subscriber management types
```

```
InsertSubscriberDataArg ::= SEQUENCE {
     imsi                                [0] IMSI                                OPTIONAL,
     COMPONENTS OF                       SubscriberData,
     extensionContainer                  [14] ExtensionContainer                 OPTIONAL,
     ... ,
     naea-PreferredCI                    [15] NAEA-PreferredCI                   OPTIONAL,
     -- naea-PreferredCI is included at the discretion of the HLR operator.
     gprsSubscriptionData                [16] GPRSSubscriptionData               OPTIONAL,
     roamingRestrictedInSgsnDueToUnsupportedFeature [23]                         NULL
                                                                                 OPTIONAL,
     networkAccessMode                   [24] NetworkAccessMode                  OPTIONAL,
     lsaInformation                      [25] LSAInformation                     OPTIONAL,
     lmu-Indicator                       [21] NULL                               OPTIONAL,
     lcsInformation                      [22] LCSInformation                     OPTIONAL,
     istAlertTimer                       [26] IST-AlertTimerValue                OPTIONAL
      }
     -- If the Network Access Mode parameter is sent, it shall be present only in
     -- the first sequence if the seqmentation is used

IST-AlertTimerValue ::= INTEGER (15..255)

LCSInformation ::= SEQUENCE {
     ~~hplmn-~~GMLC-List                 [0]  ~~HPLMN-~~GMLC-List                OPTIONAL,
     lcs-PrivacyExceptionList            [1]  LCS-PrivacyExceptionList           OPTIONAL,
     molr-List                           [2]  MOLR-List                          OPTIONAL,
...}

~~HPLMN-~~GMLC-List ::= SEQUENCE SIZE (1..maxNumOfGMLC) OF
                                         ISDN-AddressString
     -- if segmentation is used, the complete GMLC-List shall be sent in one segment

maxNumOfGMLC  INTEGER ::= 5


NetworkAccessMode ::= ENUMERATED {
     bothMSCAndSGSN                      (0),
     onlyMSC                             (1),
     onlySGSN                            (2),
     ...}
     -- if unknown values are received in NetworkAccessMode
     -- they shall be discarded.

GPRSDataList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                         PDP-Context

maxNumOfPDP-Contexts  INTEGER ::= 50

PDP-Context ::= SEQUENCE {
     pdp-ContextId                       ContextId,
     pdp-Type                            [16] PDP-Type,
     pdp-Address                         [17] PDP-Address                        OPTIONAL,
     qos-Subscribed                      [18] QoS-Subscribed,
     vplmnAddressAllowed                 [19] NULL OPTIONAL,
     apn                                 [20] APN  ,
     extensionContainer                  [21] ExtensionContainer                 OPTIONAL,
     ...}

ContextId ::= INTEGER (1..maxNumOfPDP-Contexts)


GPRSSubscriptionData ::= SEQUENCE {
     completeDataListIncluded            NULL                                    OPTIONAL,

          -- If segmentation is used, completeDataListIncluded may only be present in the
          -- first segment.
     gprsDataList                        [1]  GPRSDataList,
     extensionContainer                  [2] ExtensionContainer                  OPTIONAL,
     ...}


APN ::=  OCTET STRING (SIZE (2..63))
          -- Octets are coded according to TS GSM 03.03
```

```
PDP-Type ::= OCTET STRING (SIZE (2))
-- Octets are coded according to TS GSM 09.60
```

```
PDP-Address ::= OCTET STRING (SIZE (1..16))
-- Octets are coded according to TS GSM 09.60

-- The possible size values are:
-- 1-7 octets  X.25 address type
--  4  octets  IPv4 address type
-- 16  octets  Ipv6 address type
```

```
QoS-Subscribed ::= OCTET STRING (SIZE (3))
     -- Octets are coded according to TS GSM 04.08.
```

```
LSAOnlyAccessIndicator ::= ENUMERATED {
     accessOutsideLSAsAllowed  (0),
     accessOutsideLSAsRestricted (1)}
```

```
LSADataList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
                                        LSAData
```

```
maxNumOfLSAs  INTEGER ::= 20
```

```
LSAData ::= SEQUENCE {
     lsaIdentity                        [0] LSAIdentity,
     lsaPriority                        [1] LSAPriority,
     lsaActiveModeIndicator             [2] NULL                          OPTIONAL,
     lsaActiveModeSupportIndicator      [3] NULL                          OPTIONAL,
     extensionContainer                 [4] ExtensionContainer            OPTIONAL,
     ...}
```

```
LSAInformation ::= SEQUENCE {
     completeDataListIncluded           NULL                              OPTIONAL,

          -- If segmentation is used, completeDataListIncluded may only be present in the
          -- first segment.
     lsaOnlyAccessIndicator             [1]  LSAOnlyAccessIndicator       OPTIONAL,
     lsaDataList                        [2]  LSADataList                  OPTIONAL,
     extensionContainer                 [3] ExtensionContainer            OPTIONAL,
     ...}
```

```
LSAIdentity ::= OCTET STRING (SIZE (3))
-- Octets are coded according to TS GSM 03.03
```

```
LSAPriority ::= OCTET STRING (SIZE (1))
-- Octets are coded according to TS GSM 08.08
```

```
SubscriberData ::= SEQUENCE {
     msisdn                             [1] ISDN-AddressString            OPTIONAL,
     category                           [2] Category                      OPTIONAL,
     subscriberStatus                   [3] SubscriberStatus              OPTIONAL,
     bearerServiceList                  [4] BearerServiceList             OPTIONAL,
     -- The exception handling for reception of unsupported / not allocated
     -- bearerServiceCodes is defined in section 6.8.1
     teleserviceList                    [6] TeleserviceList               OPTIONAL,
     -- The exception handling for reception of unsupported / not allocated
     -- teleserviceCodes is defined in section 6.8.1
     provisionedSS                      [7] Ext-SS-InfoList               OPTIONAL,
     odb-Data                           [8] ODB-Data                      OPTIONAL,
     roamingRestrictionDueToUnsupportedFeature  [9] NULL                  OPTIONAL,
     regionalSubscriptionData           [10] ZoneCodeList                 OPTIONAL,
     vbsSubscriptionData                [11] VBSDataList                  OPTIONAL,
     vgcsSubscriptionData               [12] VGCSDataList                 OPTIONAL,
     vlrCamelSubscriptionInfo           [13] VlrCamelSubscriptionInfo     OPTIONAL
     }
```

```
Category ::= OCTET STRING (SIZE (1))
     -- The internal structure is defined in CCITT Rec Q.763.
```

```
SubscriberStatus ::= ENUMERATED {
     serviceGranted  (0),
     operatorDeterminedBarring  (1)}
```

```
BearerServiceList ::= SEQUENCE SIZE (1..maxNumOfBearerServices) OF
                                        Ext-BearerServiceCode

maxNumOfBearerServices  INTEGER ::= 50

TeleserviceList ::= SEQUENCE SIZE (1..maxNumOfTeleservices) OF
                                        Ext-TeleserviceCode

maxNumOfTeleservices  INTEGER ::= 20

ODB-Data ::= SEQUENCE {
     odb-GeneralData                    ODB-GeneralData,
     odb-HPLMN-Data                     ODB-HPLMN-Data                  OPTIONAL,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}

ODB-GeneralData ::= BIT STRING {
     allOG-CallsBarred  (0),
     internationalOGCallsBarred  (1),
     internationalOGCallsNotToHPLMN-CountryBarred  (2),
     interzonalOGCallsBarred (6),
     interzonalOGCallsNotToHPLMN-CountryBarred (7),
     interzonalOGCallsAndInternationalOGCallsNotToHPLMN-CountryBarred (8),
     premiumRateInformationOGCallsBarred  (3),
     premiumRateEntertainementOGCallsBarred  (4),
     ss-AccessBarred  (5),
     allECT-Barred (9),
     chargeableECT-Barred (10),
     internationalECT-Barred (11),
     interzonalECT-Barred (12),
     doublyChargeableECT-Barred (13),
     multipleECT-Barred (14)} (SIZE (15..32))
     -- exception handling: reception of unknown bit assignments in the
     -- ODB-GeneralData type shall be treated like unsupported ODB-GeneralData

ODB-HPLMN-Data ::= BIT STRING {
     plmn-SpecificBarringType1  (0),
     plmn-SpecificBarringType2  (1),
     plmn-SpecificBarringType3  (2),
     plmn-SpecificBarringType4  (3)} (SIZE (4..32))
     -- exception handling: reception of unknown bit assignments in the
     -- ODB-HPLMN-Data type shall be treated like unsupported ODB-HPLMN-Data

Ext-SS-InfoList ::= SEQUENCE SIZE (1..maxNumOfSS) OF
                                        Ext-SS-Info

Ext-SS-Info ::= CHOICE {
     forwardingInfo                     [0] Ext-ForwInfo,
     callBarringInfo                    [1] Ext-CallBarInfo,
     cug-Info                           [2] CUG-Info,
     ss-Data                            [3] Ext-SS-Data,
     emlpp-Info                         [4] EMLPP-Info}


Ext-ForwInfo ::= SEQUENCE {
     ss-Code                            SS-Code,
     forwardingFeatureList              Ext-ForwFeatureList,
     extensionContainer                 [0] ExtensionContainer          OPTIONAL,
     ...}

Ext-ForwFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                        Ext-ForwFeature

Ext-ForwFeature ::= SEQUENCE {
     basicService                       Ext-BasicServiceCode            OPTIONAL,
     ss-Status [4] Ext-SS-Status,
     forwardedToNumber                  [5] ISDN-AddressString          OPTIONAL,
     -- When this data type is sent from an HLR which supports CAMEL Phase 2
     -- to a VLR that supports CAMEL Phase 2 the VLR shall not check the
     -- format of the number
     forwardedToSubaddress              [8] ISDN-SubaddressString       OPTIONAL,
     forwardingOptions                  [6] Ext-ForwOptions             OPTIONAL,
     noReplyConditionTime               [7] Ext-NoRepCondTime           OPTIONAL,
     extensionContainer                 [9] ExtensionContainer          OPTIONAL,
     ...}
```

```
Ext-SS-Status ::= OCTET STRING (SIZE (1..5))

     -- OCTET 1:
     --
     -- bits 8765: 0000 (unused)
     -- bits 4321: Used to convey the "P bit","R bit","A bit" and "Q bit",
     --            representing supplementary service state information
     --            as defined in TS GSM 03.11

     -- bit 4: "Q bit"

     -- bit 3: "P bit"

     -- bit 2: "R bit"

     -- bit 1: "A bit"

     -- OCTETS 2-5: reserved for future use. They shall be discarded if
     -- received and not understood.
```

```
Ext-ForwOptions ::= OCTET STRING (SIZE (1..5))

     -- OCTET 1:

     --  bit 8: notification to forwarding party
     --   0  no notification
     --   1  notification

     --  bit 7: redirecting presentation
     --   0 no presentation
     --   1  presentation

     --  bit 6: notification to calling party
     --   0  no notification
     --   1  notification

     --  bit 5: 0 (unused)

     --  bits 43: forwarding reason
     --   00  ms not reachable
     --   01  ms busy
     --   10  no reply
     --   11  unconditional

     -- bits 21: 00 (unused)

     -- OCTETS 2-5: reserved for future use. They shall be discarded if
     -- received and not understood.
```

```
Ext-NoRepCondTime ::= INTEGER (1..100)
     -- Only values 5-30 are used.
     -- Values in the ranges 1-4 and 31-100 are reserved for future use
     -- If received:
     --       values 1-4 shall be mapped on to value 5
     --       values 31-100 shall be mapped on to value 30
```

```
Ext-CallBarInfo ::= SEQUENCE {
     ss-Code                         SS-Code,
     callBarringFeatureList          Ext-CallBarFeatureList,
     extensionContainer              ExtensionContainer              OPTIONAL,
     ...}
```

```
Ext-CallBarFeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                     Ext-CallBarringFeature
```

```
Ext-CallBarringFeature ::= SEQUENCE {
     basicService                    Ext-BasicServiceCode            OPTIONAL,
     ss-Status [4] Ext-SS-Status,
     extensionContainer              ExtensionContainer              OPTIONAL,
     ...}
```

```
CUG-Info ::= SEQUENCE {
     cug-SubscriptionList            CUG-SubscriptionList,
     cug-FeatureList                 CUG-FeatureList                 OPTIONAL,
     extensionContainer              [0] ExtensionContainer          OPTIONAL,
     ...}
```

```
CUG-SubscriptionList ::= SEQUENCE SIZE (0..maxNumOfCUG) OF
                                        CUG-Subscription

CUG-Subscription ::= SEQUENCE {
     cug-Index CUG-Index,
     cug-Interlock                      CUG-Interlock,
     intraCUG-Options                   IntraCUG-Options,
     basicServiceGroupList              Ext-BasicServiceGroupList         OPTIONAL,
     extensionContainer                 [0] ExtensionContainer            OPTIONAL,
     ...}

CUG-Index ::= INTEGER (0..32767)
     -- The internal structure is defined in ETS 300 138.

CUG-Interlock ::= OCTET STRING (SIZE (4))

IntraCUG-Options ::= ENUMERATED {
     noCUG-Restrictions  (0),
     cugIC-CallBarred  (1),
     cugOG-CallBarred  (2)}

maxNumOfCUG  INTEGER ::= 10

CUG-FeatureList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups) OF
                                        CUG-Feature

Ext-BasicServiceGroupList ::= SEQUENCE SIZE (1..maxNumOfExt-BasicServiceGroups)          OF
                                        Ext-BasicServiceCode

maxNumOfExt-BasicServiceGroups  INTEGER ::= 32

CUG-Feature ::= SEQUENCE {
     basicService                       Ext-BasicServiceCode              OPTIONAL,
     preferentialCUG-Indicator          CUG-Index OPTIONAL,
     interCUG-Restrictions              InterCUG-Restrictions,
     extensionContainer                 ExtensionContainer                OPTIONAL,
     ...}

InterCUG-Restrictions ::= OCTET STRING (SIZE (1))

     -- bits 876543: 000000 (unused)
     -- Exception handling:
     -- bits 876543 shall be ignored if received and not understood

     -- bits 21
     --   00  CUG only facilities
     --   01  CUG with outgoing access
     --   10  CUG with incoming access
     --   11  CUG with both outgoing and incoming access

Ext-SS-Data ::= SEQUENCE {
     ss-Code                            SS-Code,
     ss-Status [4] Ext-SS-Status,
     ss-SubscriptionOption              SS-SubscriptionOption             OPTIONAL,
     basicServiceGroupList              Ext-BasicServiceGroupList         OPTIONAL,
     extensionContainer                 [5] ExtensionContainer            OPTIONAL,
     ...}

LCS-PrivacyExceptionList ::= SEQUENCE SIZE (1..maxNumOfPrivacyClass) OF
                                        LCS-PrivacyClass

maxNumOfPrivacyClass  INTEGER ::= 4
```

```
LCS-PrivacyClass ::= SEQUENCE {
    ss-Code                          SS-Code,
    ss-Status                        Ext-SS-Status,
    privacyVerificationByMSuser      [0] NULL                        OPTIONAL,
    -- privacyVerificationByMSUser is expected only for SS-code = callunrelated
    externalClientList               [10] ExternalClientList         OPTIONAL,
    -- externalClientList is expected only for SS-code = callunrelated
    plmnClientList                   [21] PLMNClientList             OPTIONAL,
    -- plmnClientList is expected only for SS-code - plmn
    extensionContainer               [32] ExtensionContainer         OPTIONAL,
-- if segmentation is used, the complete LCS-PrivacyClass shall be sent in one segment
    ...}

ExternalClientList ::= SEQUENCE SIZE (01..maxNumOfExternalClient) OF
                                     ExternalClient

maxNumOfExternalClient  INTEGER ::= 5

PLMNClientList ::= SEQUENCE SIZE (1..maxNumOfPLMNClient) OF
                                     LCSClientInternalID

maxNumOfPLMNClient  INTEGER ::= 5

ExternalClient ::= SEQUENCE {
    clientIdentity                   LCSClientExternalID,
    gmlc-Restriction                 [0] GMLC-Restriction            OPTIONAL,
    notificationToMSUser             [1] NotificationToMSUser        OPTIONAL,
    extensionContainer               [21] ExtensionContainer         OPTIONAL,
    ... }

GMLC-Restriction ::= ENUMERATED {
    hplmngmlc-List                       (0),
    home-Country                     (1)}

NotificationToMSUser ::= ENUMERATED {
    notification                     (0),
    notificationWithPrivacyVerification  (1)}

MOLR-List ::= SEQUENCE SIZE (1..maxNumOfMOLR-Class) OF
                                     MOLR-Class

maxNumOfMOLR-Class  INTEGER ::= 3

MOLR-Class ::= SEQUENCE {
    ss-Code                          SS-Code,
    ss-Status                        Ext-SS-Status,
    extensionContainer               [0] ExtensionContainer          OPTIONAL,
    ...}

ZoneCodeList ::= SEQUENCE SIZE (1..maxNumOfZoneCodes)
                                     OF ZoneCode

ZoneCode ::= OCTET STRING (SIZE (2))
    -- internal structure is defined in TS GSM 03.03

maxNumOfZoneCodes  INTEGER ::= 10

InsertSubscriberDataRes ::= SEQUENCE {
    teleserviceList                  [1] TeleserviceList             OPTIONAL,
    bearerServiceList                [2] BearerServiceList           OPTIONAL,
    ss-List                          [3] SS-List                     OPTIONAL,
    odb-GeneralData                  [4] ODB-GeneralData             OPTIONAL,
    regionalSubscriptionResponse     [5]
              RegionalSubscriptionResponse       OPTIONAL,
    supportedCamelPhases             [6] SupportedCamelPhases        OPTIONAL,
    extensionContainer               [7] ExtensionContainer          OPTIONAL,
    ...}

RegionalSubscriptionResponse ::= ENUMERATED {
    networkNode-AreaRestricted       (0),
    tooManyZoneCodes                 (1),
    zoneCodesConflict                (2),
    regionalSubscNotSupported        (3)}
```

```
DeleteSubscriberDataArg ::= SEQUENCE {
    imsi                                [0] IMSI,
    basicServiceList                    [1] BasicServiceList              OPTIONAL,
    -- The exception handling for reception of unsupported/not allocated
    -- basicServiceCodes is defined in section 6.8.2
    ss-List                             [2] SS-List                       OPTIONAL,
    roamingRestrictionDueToUnsupportedFeature [4] NULL                    OPTIONAL,
    regionalSubscriptionIdentifier      [5] ZoneCode                      OPTIONAL,
    vbsGroupIndication                  [7] NULL                          OPTIONAL,
    vgcsGroupIndication                 [8] NULL   OPTIONAL,
    camelSubscriptionInfoWithdraw       [9] NULL   OPTIONAL,
    extensionContainer                  [6] ExtensionContainer OPTIONAL,
    ...,
    gprsSubscriptionDataWithdraw        [10] GPRSSubscriptionDataWithdraw OPTIONAL,
    roamingRestrictedInSgsnDueToUnsuppportedFeature [11] NULL             OPTIONAL,
    lsaInformationWithdraw              [12] LSAInformationWithdraw       OPTIONAL,
    istInformationWithdraw              [13] NULL                         OPTIONAL,
    gmlc-ListWithdraw                   [14] NULL                         OPTIONAL }
EDITORIAL NOTE: gmlc-ListWithdraw ASN.1 tag for Release 98 is 13
GPRSSubscriptionDataWithdraw ::= CHOICE {
    allGPRSData                         NULL,
    contextIdList                       ContextIdList}

ContextIdList ::= SEQUENCE SIZE (1..maxNumOfPDP-Contexts) OF
                                        ContextId

LSAInformationWithdraw ::= CHOICE {
    allLSAData                          NULL,
    lsaIdentityList                     LSAIdentityList }

LSAIdentityList ::= SEQUENCE SIZE (1..maxNumOfLSAs) OF
                                        LSAIdentity

BasicServiceList ::= SEQUENCE SIZE (1..maxNumOfBasicServices) OF
                                        Ext-BasicServiceCode

maxNumOfBasicServices  INTEGER ::= 70

DeleteSubscriberDataRes ::= SEQUENCE {
    regionalSubscriptionResponse        [0]
                                        RegionalSubscriptionResponse      OPTIONAL,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

VlrCamelSubscriptionInfo ::= SEQUENCE {
    o-CSI                               [0] O-CSI                         OPTIONAL,
    extensionContainer                  [1] ExtensionContainer            OPTIONAL,
    ...,
    ss-CSI                              [2]  SS-CSI                       OPTIONAL,
    o-BcsmCamelTDP-CriteriaList         [4] O-BcsmCamelTDPCriteriaList    OPTIONAL,
    tif-CSI                             [3]  NULL                         OPTIONAL
    }

SS-CSI ::= SEQUENCE {
    ss-CamelData                        SS-CamelData,
    extensionContainer                  ExtensionContainer                OPTIONAL,
    ...}

SS-CamelData  ::= SEQUENCE {
    ss-EventList                        SS-EventList,
    gsmSCF-Address                      ISDN-AddressString,
    extensionContainer                  [0] ExtensionContainer            OPTIONAL,
    ...
    }

SS-EventList  ::= SEQUENCE SIZE (1..maxNumOfCamelSSEvents) OF SS-Code
    -- Actions for the following SS-Code values are defined in CAMEL Phase 2:
    -- ect                              SS-Code ::= '00110001'B
    -- multiPTY                         SS-Code ::= '01010001'B
    -- cd                               SS-Code ::= '00100100'B
    -- all other SS codes shall be ignored

maxNumOfCamelSSEvents INTEGER ::= 10
```

```
O-CSI ::= SEQUENCE {
     o-BcsmCamelTDPDataList              O-BcsmCamelTDPDataList,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...,
     camelCapabilityHandling             [0] CamelCapabilityHandling       OPTIONAL
     }
```

```
O-BcsmCamelTDPDataList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDPData
--- O-BcsmCamelTDPDataList shall not contain more than one instance of
--- O-BcsmCamelTDPData containing the same value for o-BcsmTriggerDetectionPoint.
--- For CAMEL Phase 2, this means that only one instance of O-BcsmCamelTDPData is allowed
--- with o-BcsmTriggerDetectionPoint being equal to DP2.
```

```
maxNumOfCamelTDPData  INTEGER ::= 10
```

```
O-BcsmCamelTDPData ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint         O-BcsmTriggerDetectionPoint,
     serviceKey                          ServiceKey,
     gsmSCF-Address                      [0] ISDN-AddressString,
     defaultCallHandling                 [1] DefaultCallHandling,
     extensionContainer                  [2] ExtensionContainer            OPTIONAL,
     ...
     }
```

```
ServiceKey ::= INTEGER (0..2147483647)
```

```
O-BcsmTriggerDetectionPoint ::= ENUMERATED {
     collectedInfo (2),
     ... }
-- exception handling:
-- For O-BcsmCamelTDPData sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- O-BcsmCamelTDPDatasequence.
-- For O-BcsmCamelTDP-Criteria sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- O-BcsmCamelTDP-Criteria sequence.
```

```
O-BcsmCamelTDPCriteriaList ::= SEQUENCE SIZE (1..maxNumOfCamelTDPData) OF
     O-BcsmCamelTDP-Criteria
```

```
O-BcsmCamelTDP-Criteria ::= SEQUENCE {
     o-BcsmTriggerDetectionPoint         O-BcsmTriggerDetectionPoint,
     destinationNumberCriteria           [0] DestinationNumberCriteria     OPTIONAL,
     basicServiceCriteria                [1] BasicServiceCriteria          OPTIONAL,
     callTypeCriteria                    [2] CallTypeCriteria              OPTIONAL,
     ... }
```

```
DestinationNumberCriteria  ::= SEQUENCE {
     matchType                           [0] MatchType,
     destinationNumberList               [1] DestinationNumberList         OPTIONAL,
     destinationNumberLengthList         [2] DestinationNumberLengthList   OPTIONAL,
     -- one or both of destinationNumberList and destinationNumberLengthList
     -- shall be present
     ... }
```

```
DestinationNumberList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumbers) OF
                                         ISDN-AddressString
-- The receiving entity shall not check the format of a number in
-- the dialled number list
```

```
DestinationNumberLengthList  ::= SEQUENCE SIZE (1..maxNumOfCamelDestinationNumberLengths) OF
                                           INTEGER(1..maxNumOfISDN-AddressDigits)
```

```
BasicServiceCriteria   ::= SEQUENCE SIZE(1..maxNumOfCamelBasicServiceCriteria) OF
     Ext-BasicServiceCode
```

```
maxNumOfISDN-AddressDigits  INTEGER ::= 15
```

```
maxNumOfCamelDestinationNumbers  INTEGER ::= 10
```

```
maxNumOfCamelDestinationNumberLengths  INTEGER ::= 3
```

```
maxNumOfCamelBasicServiceCriteria  INTEGER ::= 5
```

```
CallTypeCriteria       ::= ENUMERATED {
     forwarded                          (0),
     notForwarded                       (1)}

MatchType       ::= ENUMERATED {
     inhibiting                         (0),
     enabling                           (1)}


DefaultCallHandling ::= ENUMERATED {
     continueCall (0) ,
     releaseCall (1) ,
     ...}
-- exception handling:
-- reception of values in range 2-31 shall be treated as "continueCall"
-- reception of values greater than 31 shall be treated as "releaseCall"

CamelCapabilityHandling ::= INTEGER(1..16)
-- value 1 = CAMEL phase 1,
-- value 2 = CAMEL phase 2:
-- reception of values greater than 2 shall be treated as CAMEL phase 2

SupportedCamelPhases ::= BIT STRING {
     phase1 (0),
     phase2 (1) } (SIZE (1..16))


-- gprs location information retrieval types

SendRoutingInfoForGprsArg ::= SEQUENCE {
     imsi                                   [0] IMSI,
     ggsn-Address                           [1] GSN-Address             OPTIONAL,
     extensionContainer                     [2] ExtensionContainer      OPTIONAL,
     ...}

SendRoutingInfoForGprsRes ::= SEQUENCE {
     sgsn-Address                           [0] GSN-Address,
     ggsn-Address                           [1]  GSN-Address            OPTIONAL,
     mobileNotReachableReason               [2]  AbsentSubscriberDiagnosticSM    OPTIONAL,
     extensionContainer                     [3] ExtensionContainer      OPTIONAL,
     ...}

-- failure report types

FailureReportArg ::= SEQUENCE {
     imsi                                   [0] IMSI,
     ggsn-Number                            [1] ISDN-AddressString      ,
     ggsn-Address                           [2] GSN-Address             OPTIONAL,
     extensionContainer                     [3] ExtensionContainer      OPTIONAL,
     ...}

FailureReportRes ::= SEQUENCE {
     ggsn-Address                           [0] GSN-Address             OPTIONAL,
     extensionContainer                     [1] ExtensionContainer      OPTIONAL,
     ...}

-- gprs notification types

NoteMsPresentForGprsArg ::= SEQUENCE {
     imsi                                   [0] IMSI,
     sgsn-Address                           [1] GSN-Address,
     ggsn-Address                           [2] GSN-Address             OPTIONAL,
     extensionContainer                     [3] ExtensionContainer      OPTIONAL,
     ...}

NoteMsPresentForGprsRes ::= SEQUENCE {
     extensionContainer                     [0] ExtensionContainer      OPTIONAL,
     ...}


-- fault recovery types

ResetArg ::= SEQUENCE {
     hlr-Number                         ISDN-AddressString,
     hlr-List                           HLR-List                        OPTIONAL,
     ...}
```

```
RestoreDataArg ::= SEQUENCE {
    imsi                            IMSI,
    lmsi                            LMSI                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ... ,
    vlr-Capability                  [6] VLR-Capability              OPTIONAL }

RestoreDataRes ::= SEQUENCE {
    hlr-Number                      ISDN-AddressString,
    msNotReachable                  NULL                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

-- VBS/VGCS types
VBSDataList ::= SEQUENCE SIZE (1..maxNumOfVBSGroupIds) OF
                                    VoiceBroadcastData

VGCSDataList ::= SEQUENCE SIZE (1..maxNumOfVGCSGroupIds) OF
                                    VoiceGroupCallData

maxNumOfVBSGroupIds  INTEGER ::= 50

maxNumOfVGCSGroupIds  INTEGER ::= 50

VoiceGroupCallData  ::= SEQUENCE {
    groupId                         GroupId,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

VoiceBroadcastData ::= SEQUENCE {
    groupid                         GroupId,
    broadcastInitEntitlement        NULL                            OPTIONAL,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

GroupId  ::= OCTET STRING (SIZE (3))
    -- Refers to the Group Identification as specified in GSM TS 03.03
    -- and 03.68/ 03.69

-- provide subscriber info types

ProvideSubscriberInfoArg ::= SEQUENCE {
    imsi     [0] IMSI,
    lmsi     [1] LMSI               OPTIONAL,
    requestedInfo                   [2] RequestedInfo,
    extensionContainer              [3] ExtensionContainer          OPTIONAL,
    ...}

ProvideSubscriberInfoRes ::= SEQUENCE {
    subscriberInfo                  SubscriberInfo,
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}

SubscriberInfo ::= SEQUENCE {
    locationInformation             [0] LocationInformation         OPTIONAL,
    subscriberState                 [1] SubscriberState             OPTIONAL,
    extensionContainer              [2] ExtensionContainer          OPTIONAL,
    ...}

RequestedInfo ::= SEQUENCE {
    locationInformation             [0] NULL                        OPTIONAL,
    subscriberState                 [1] NULL                        OPTIONAL,
    extensionContainer              [2] ExtensionContainer          OPTIONAL,
    ...}

LocationInformation ::= SEQUENCE {
    ageOfLocationInformation        AgeOfLocationInformation        OPTIONAL,
    geographicalInformation         [0] GeographicalInformation     OPTIONAL,
    vlr-number                      [1] ISDN-AddressString          OPTIONAL,
    locationNumber                  [2] LocationNumber              OPTIONAL,
    cellIdOrLAI                     [3] CellIdOrLAI                 OPTIONAL,
    extensionContainer              [4] ExtensionContainer          OPTIONAL,
    ...}
```

```
GeographicalInformation ::= OCTET STRING (SIZE (8))
-- Refers to geographical Information defined in GSM 03.32.
-- Only the description of an ellipsoid point with uncertainty circle
--as specified in GSM 03.32 is allowed to be used
-- The internal structure according to GSM 03.32 is as follows:
--        Type of shape (ellipsoid point with uncertainty circle)          1 octet
--        Degrees of Latitude                                              3 octets
--        Degrees of Longitude                                             3 octets
--        Uncertainty code                                                 1 octet
```

```
LocationNumber ::= OCTET STRING (SIZE (2..10))
     -- the internal structure is defined in CCITT Rec Q.763
```

```
SubscriberState ::= CHOICE {
     assumedIdle                         [0] NULL,
     camelBusy [1] NULL,
     netDetNotReachable                  NotReachableReason,
     notProvidedFromVLR                  [2] NULL}
```

```
NotReachableReason ::= ENUMERATED {
     msPurged (0),
     imsiDetached (1),
     restrictedArea (2),
     notRegistered (3)}
```

```
-- any time interrogation info types
```

```
AnyTimeInterrogationArg ::= SEQUENCE {
     subscriberIdentity                  [0] SubscriberIdentity,
     requestedInfo                       [1] RequestedInfo,
     gsmSCF-Address                      [3] ISDN-AddressString,
     extensionContainer                  [2] ExtensionContainer           OPTIONAL,
     ...}
```

```
AnyTimeInterrogationRes ::= SEQUENCE {
     subscriberInfo                      SubscriberInfo,
     extensionContainer                  ExtensionContainer               OPTIONAL,
     ...}
```

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

17.7.5 Supplementary service codes

```
MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}

DEFINITIONS

::=

BEGIN
```

```
SS-Code ::= OCTET STRING (SIZE (1))
     -- This type is used to represent the code identifying a single
     -- supplementary service, a group of supplementary services, or
     -- all supplementary services. The services and abbreviations
     -- used are defined in TS GSM 02.04. The internal structure is
     -- defined as follows:
     --
     -- bits 87654321: group (bits 8765), and specific service
     -- (bits 4321)
```

```
allSS                                    SS-Code ::= '00000000'B
     -- reserved for possible future use
     -- all SS
```

```
allLineIdentificationSS                 SS-Code ::= '00010000'B
     -- reserved for possible future use
     -- all line identification SS
clip                                    SS-Code ::= '00010001'B
     -- calling line identification presentation
clir                                    SS-Code ::= '00010010'B
     -- calling line identification restriction
colp                                    SS-Code ::= '00010011'B
     -- connected line identification presentation
colr                                    SS-Code ::= '00010100'B
     -- connected line identification restriction
mci                                     SS-Code ::= '00010101'B
     -- reserved for possible future use
     -- malicious call identification

allNameIdentificationSS                 SS-Code ::= '00011000'B
     -- all name identification SS
cnap                                    SS-Code ::= '00011001'B
     -- calling name presentation

     -- SS-Codes '00011010'B to '00011111'B are reserved for future
     -- NameIdentification Supplementary Service use.
```

```
allForwardingSS                         SS-Code ::= '00100000'B
     -- all forwarding SS
cfu                                     SS-Code ::= '00100001'B
     -- call forwarding unconditional
allCondForwardingSS                     SS-Code ::= '00101000'B
     -- all conditional forwarding SS
cfb                                     SS-Code ::= '00101001'B
     -- call forwarding on mobile subscriber busy
cfnry                                   SS-Code ::= '00101010'B
     -- call forwarding on no reply
cfnrc                                   SS-Code ::= '00101011'B
     -- call forwarding on mobile subscriber not reachable
cd                                      SS-Code ::= '00100100'B
     -- call deflection
```

```
allCallOfferingSS                       SS-Code ::= '00110000'B
     -- reserved for possible future use
     -- all call offering SS includes also all forwarding SS
ect                                     SS-Code ::= '00110001'B
        -- explicit call transfer
mah                                     SS-Code ::= '00110010'B
     -- reserved for possible future use
     -- mobile access hunting
```

```
allCallCompletionSS                     SS-Code ::= '01000000'B
     -- reserved for possible future use
     -- all Call completion SS
cw                                      SS-Code ::= '01000001'B
     -- call waiting
hold                                    SS-Code ::= '01000010'B
     -- call hold
ccbs-A                                  SS-Code ::= '01000011'B
     -- completion of call to busy subscribers, originating side
ccbs-B                                  SS-Code ::= '01000100'B
     -- completion of call to busy subscribers, destination side
     -- this SS-Code is used only in InsertSubscriberData
```

```
allMultiPartySS                         SS-Code ::= '01010000'B
     -- reserved for possible future use
     -- all multiparty SS
multiPTY                                SS-Code ::= '01010001'B
     -- multiparty
```

```
allCommunityOfInterest-SS               SS-Code ::= '01100000'B
     -- reserved for possible future use
     -- all community of interest SS
cug                                     SS-Code ::= '01100001'B
     -- closed user group
```

```
allChargingSS                           SS-Code ::= '01110000'B
     -- reserved for possible future use
     -- all charging SS
aoci                                    SS-Code ::= '01110001'B
     -- advice of charge information
aocc                                    SS-Code ::= '01110010'B
     -- advice of charge charging

allAdditionalInfoTransferSS             SS-Code ::= '10000000'B
     -- reserved for possible future use
     -- all additional information transfer SS
uus1                                    SS-Code ::= '10000001'B
     -- UUS1 user-to-user signalling
uus2                                    SS-Code ::= '10000010'B
     -- UUS2 user-to-user signalling
uus3                                    SS-Code ::= '10000011'B
     -- UUS3 user-to-user signalling

allBarringSS                            SS-Code ::= '10010000'B
     -- all barring SS
barringOfOutgoingCalls                  SS-Code ::= '10010001'B
     -- barring of outgoing calls
baoc                                    SS-Code ::= '10010010'B
     -- barring of all outgoing calls
boic                                    SS-Code ::= '10010011'B
     -- barring of outgoing international calls
boicExHC                                SS-Code ::= '10010100'B
     -- barring of outgoing international calls except those directed
     -- to the home PLMN
barringOfIncomingCalls                  SS-Code ::= '10011001'B
     -- barring of incoming calls
baic                                    SS-Code ::= '10011010'B
     -- barring of all incoming calls
bicRoam                                 SS-Code ::= '10011011'B
     -- barring of incoming calls when roaming outside home PLMN
     -- Country

allPLMN-specificSS                      SS-Code ::= '11110000'B
plmn-specificSS-1                       SS-Code ::= '11110001'B
plmn-specificSS-2                       SS-Code ::= '11110010'B
plmn-specificSS-3                       SS-Code ::= '11110011'B
plmn-specificSS-4                       SS-Code ::= '11110100'B
plmn-specificSS-5                       SS-Code ::= '11110101'B
plmn-specificSS-6                       SS-Code ::= '11110110'B
plmn-specificSS-7                       SS-Code ::= '11110111'B
plmn-specificSS-8                       SS-Code ::= '11111000'B
plmn-specificSS-9                       SS-Code ::= '11111001'B
plmn-specificSS-A                       SS-Code ::= '11111010'B
plmn-specificSS-B                       SS-Code ::= '11111011'B
plmn-specificSS-C                       SS-Code ::= '11111100'B
plmn-specificSS-D                       SS-Code ::= '11111101'B
plmn-specificSS-E                       SS-Code ::= '11111110'B
plmn-specificSS-F                       SS-Code ::= '11111111'B

allCallPrioritySS                       SS-Code ::= '10100000'B
     -- reserved for possible future use
     -- all call priority SS
emlpp                                   SS-Code ::= '10100001'B
     -- enhanced Multilevel Precedence Pre-emption (EMLPP) service

allLCSPrivacyException                  SS-Code ::= '10110000'B
     -- all LCS Privacy Exception Classes
universal                               SS-Code ::= '10110001'B
     -- allow location by any LCS client
callrelated                             SS-Code ::= '10110010'B
     -- allow location by any value added LCS client to which a call
     -- is established from the target MS
callunrelated                           SS-Code ::= '10110011'B
     -- allow location by designated external value added LCS clients
plmnoperator                            SS-Code ::= '10110100'B
     -- allow location by designated PLMN operator LCS clients
```

```
allMOLR-SS                                SS-Code ::= '10110000'B
    -- all Mobile Originating Location Request Classes
basicSelfLocation                         SS-Code ::= '10110001'B
    -- allow an MS to request its own location
autonomousSelfLocation                    SS-Code ::= '10110010'B
    -- allow an MS to perform self location without interaction
    -- with the PLMN for a predetermined period of time
transferToThirdParty                      SS-Code ::= '10110011'B
    -- allow an MS to request transfer of its location to another LCS client
EDITORIAL NOTE: the above MOLR codes also need to be added to Release 98 09.02

END
```

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

17.7.7 Error data types

```
MAP-ER-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ER-DataTypes (17) version6 (6)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS
   RoamingNotAllowedParam,
   CallBarredParam,
   CUG-RejectParam,
   SS-IncompatibilityCause,
   PW-RegistrationFailureCause,
   SM-DeliveryFailureCause,
   SystemFailureParam,
   DataMissingParam,
   UnexpectedDataParam,
   FacilityNotSupParam,
   OR-NotAllowedParam,
   UnknownSubscriberParam,
   NumberChangedParam,
   UnidentifiedSubParam,
   IllegalSubscriberParam,
   IllegalEquipmentParam,
   BearerServNotProvParam,
   TeleservNotProvParam,
   TracingBufferFullParam,
   NoRoamingNbParam,
   AbsentSubscriberParam,
   BusySubscriberParam,
   NoSubscriberReplyParam,
   ForwardingViolationParam,
   ForwardingFailedParam,
   ATI-NotAllowedParam,
   SubBusyForMT-SMS-Param,
   MessageWaitListFullParam,
   AbsentSubscriberSM-Param,
   AbsentSubscriberDiagnosticSM,
   ResourceLimitationParam,
   NoGroupCallNbParam,
   IncompatibleTerminalParam,
   ShortTermDenialParam,
   LongTermDenialParam,
   UnauthorizedRequestingNetwork-Param,
   UnauthorizedLCSClient-Param,
   PositionMethodFailure-Param,
   PositionMethodFailureWithRestart-Param,
   LMUUnknownOrOffline-Param,
   TrafficChannelEstablishmentFailure-Param,
   UnknownOrUnreachableLCSClient-Param
```

```
;

IMPORTS
   SS-Status
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-DataTypes (14) version6 (6)}

   SignalInfo,
   BasicServiceCode,
   NetworkResource
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}

   SS-Code
FROM MAP-SS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-SS-Code (15) version6 (6)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
;

RoamingNotAllowedParam ::= SEQUENCE {
     roamingNotAllowedCause              RoamingNotAllowedCause,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

RoamingNotAllowedCause ::= ENUMERATED {
     plmnRoamingNotAllowed  (0),
     operatorDeterminedBarring  (3)}

CallBarredParam ::= CHOICE {
     callBarringCause                    CallBarringCause,
     -- call BarringCause must not be used in version 3
     extensibleCallBarredParam           ExtensibleCallBarredParam
     -- extensibleCallBarredParam must not be used in version <3
     }

CallBarringCause ::= ENUMERATED {
     barringServiceActive  (0),
     operatorBarring  (1)}

ExtensibleCallBarredParam ::= SEQUENCE {
     callBarringCause                    CallBarringCause                  OPTIONAL,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ... ,
     unauthorisedMessageOriginator       [1] NULL                          OPTIONAL }

CUG-RejectParam ::= SEQUENCE {
     cug-RejectCause                     CUG-RejectCause                   OPTIONAL,
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

CUG-RejectCause ::= ENUMERATED {
     incomingCallsBarredWithinCUG  (0),
     subscriberNotMemberOfCUG  (1),
     requestedBasicServiceViolatesCUG-Constraints  (5),
     calledPartySS-InteractionViolation  (7)}

SS-IncompatibilityCause ::= SEQUENCE {
     ss-Code                             [1] SS-Code                       OPTIONAL,
     basicService                        BasicServiceCode                  OPTIONAL,
     ss-Status [4] SS-Status             OPTIONAL,
     ...}

PW-RegistrationFailureCause ::= ENUMERATED {
     undetermined  (0),
     invalidFormat  (1),
     newPasswordsMismatch  (2)}
```

```
SM-EnumeratedDeliveryFailureCause ::= ENUMERATED {
     memoryCapacityExceeded  (0),
     equipmentProtocolError  (1),
     equipmentNotSM-Equipped  (2),
     unknownServiceCentre  (3),
     sc-Congestion  (4),
     invalidSME-Address  (5),
     subscriberNotSC-Subscriber  (6)}
```

```
SM-DeliveryFailureCause ::= SEQUENCE {
     sm-EnumeratedDeliveryFailureCause    SM-EnumeratedDeliveryFailureCause,
     diagnosticInfo                       SignalInfo                          OPTIONAL,
     extensionContainer                   ExtensionContainer                  OPTIONAL,
     ...}
```

```
AbsentSubscriberSM-Param ::= SEQUENCE {
     absentSubscriberDiagnosticSM         AbsentSubscriberDiagnosticSM      OPTIONAL,
     -- AbsentSubscriberDiagnosticSM can be either for non-GPRS
     -- or for GPRS
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...,
     additionalAbsentSubscriberDiagnosticSM   [0]  AbsentSubscriberDiagnosticSM OPTIONAL }
     -- if received, additionalAbsentSubscriberDiagnosticSM
     -- is for GPRS and absentSubscriberDiagnosticSM is
     -- for non-GPRS
```

```
AbsentSubscriberDiagnosticSM ::= INTEGER (0..255)
     -- AbsentSubscriberDiagnosticSM values are defined in ETS 300 536 (GSM 03.40)
```

```
SystemFailureParam ::= CHOICE {
     networkResource                      NetworkResource,
     -- networkResource must not be used in version 3
     extensibleSystemFailureParam         ExtensibleSystemFailureParam
     -- extensibleSystemFailureParam must not be used in version <3
     }
```

```
ExtensibleSystemFailureParam ::= SEQUENCE {
     networkResource                      NetworkResource                   OPTIONAL,
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}
```

```
DataMissingParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}
```

```
UnexpectedDataParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}
```

```
FacilityNotSupParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}
```

```
OR-NotAllowedParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}
```

```
UnknownSubscriberParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...,
     unknownSubscriberDiagnostic          UnknownSubscriberDiagnostic       OPTIONAL}
```

```
UnknownSubscriberDiagnostic ::= ENUMERATED {
     imsiUnknown  (0),
     gprsSubscriptionUnknown  (1),
     ...}
     -- if unknown values are received in
     -- unknownSubscriberDiagnostic they shall be discarded
```

```
NumberChangedParam ::= SEQUENCE {
     extensionContainer                   ExtensionContainer                OPTIONAL,
     ...}
```

```
UnidentifiedSubParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

IllegalSubscriberParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

IllegalEquipmentParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

BearerServNotProvParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

TeleservNotProvParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

TracingBufferFullParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

NoRoamingNbParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

AbsentSubscriberParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...,
    absentSubscriberReason              [0] AbsentSubscriberReason          OPTIONAL}

AbsentSubscriberReason ::= ENUMERATED {
    imsiDetach (0),
    restrictedArea (1),
    noPageResponse (2),
    ...}
-- exception handling: at reception of other values than the ones listed the
-- AbsentSubscriberReason shall be ignored.

BusySubscriberParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...,
    ccbs-Possible                       [0] NULL                            OPTIONAL,
    ccbs-Busy [1] NULL                       OPTIONAL}

NoSubscriberReplyParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

ForwardingViolationParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

ForwardingFailedParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

ATI-NotAllowedParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}

SubBusyForMT-SMS-Param ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ... ,
    gprsConnectionSuspended             NULL     OPTIONAL }
    -- If GprsConnectionSuspended is not understood it shall
    -- be discarded

MessageWaitListFullParam ::= SEQUENCE {
    extensionContainer                  ExtensionContainer                  OPTIONAL,
    ...}
```

```
ResourceLimitationParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

NoGroupCallNbParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

IncompatibleTerminalParam ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

ShortTermDenialParam ::= SEQUENCE {
     ...}

LongTermDenialParam ::= SEQUENCE {
     ...}

UnauthorizedRequestingNetwork-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

UnauthorizedLCSClient-Param ::= SEQUENCE {
     unauthorizedLCSClient-Diagnostic    [0] UnauthorizedLCSClient-Diagnostic  OPTIONAL,
     extensionContainer                  [1] ExtensionContainer                OPTIONAL,
     ... }

UnauthorizedLCSClient-Diagnostic ::= ENUMERATED {
     noAdditionalInformation (0),
     clientNotInMSPrivacyExceptionList (1),
     callToClientNotSetup (2),
     privacyOverrideNotApplicable (3),
     disallowedByLocalRegulatoryRequirements (4),
     ... }
--   exception handling:
--   any unrecognized value shall be ignored

PositionMethodFailure-Param ::= SEQUENCE {
     positionMethodFailure-Diagnostic    [0] PositionMethodFailure-Diagnostic  OPTIONAL,
     extensionContainer                  [1] ExtensionContainer                OPTIONAL,
     ... }

PositionMethodFailure-Diagnostic ::= ENUMERATED {
     congestion  (0),
     insufficientResources  (1),
     insufficientMeasurementData  (2),
     inconsistentMeasurementData  (3),
     locationProcedureNotCompleted  (4),
     locationProcedureNotSupportedByTargetMS  (5),
     qoSNotAttainable  (6),
     ... }
--   exception handling:
--   any unrecognized value shall be ignored

PositionMethodFailureWithRestart-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ... }

LMUUnknownOrOffline-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

TrafficChannelEstablishmentFailure-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}

UnknownOrUnreachableLCSClient-Param ::= SEQUENCE {
     extensionContainer                  ExtensionContainer                OPTIONAL,
     ...}


END
```

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

17.7.8 Common data types

```
MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}

DEFINITIONS

IMPLICIT TAGS

::=

BEGIN

EXPORTS

   -- general data types and values
   AddressString,
   ISDN-AddressString,
   maxISDN-AddressLength,
   ISDN-SubaddressString,
   ExternalSignalInfo,
   Ext-ExternalSignalInfo,
   SignalInfo,
   maxSignalInfoLength,
   AlertingPattern,

   -- data types for numbering and identification
   IMSI,
   TMSI,
   Identity,
   SubscriberId,
   IMEI,
   HLR-List,
   LMSI,
   GlobalCellId,
   NetworkResource,
   NAEA-PreferredCI,
   NAEA-CIC,
   ASCI-CallReference,
   SubscriberIdentity,

   -- data types for CAMEL
   CellIdOrLAI,

   -- data types for subscriber management
   BasicServiceCode,
   Ext-BasicServiceCode,
   EMLPP-Info,
   EMLPP-Priority,

   -- data types for geographic location
   AgeOfLocationInformation,
   LCSClientExternalID,
   LCSClientInternalID
;

IMPORTS
   TeleserviceCode,
   Ext-TeleserviceCode
FROM MAP-TS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-TS-Code (19) version6 (6)}

   BearerServiceCode,
   Ext-BearerServiceCode
FROM MAP-BS-Code {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-BS-Code (20) version6 (6)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}
;


```

```
-- general data types

TBCD-STRING ::= OCTET STRING
     -- This type (Telephony Binary Coded Decimal String) is used to
     -- represent several digits from 0 through 9, *, #, a, b, c, two
     -- digits per octet, each digit encoded 0000 to 1001 (0 to 9),
     -- 1010 (*), 1011 (#), 1100 (a), 1101 (b) or 1110 (c); 1111 used
     -- as filler when there is an odd number of digits.

     -- bits 8765 of octet n encoding digit 2n
     -- bits 4321 of octet n encoding digit 2(n-1) +1

AddressString ::= OCTET STRING (SIZE (1..maxAddressLength))
     -- This type is used to represent a number for addressing
     -- purposes. It is composed of
     --   a)   one octet for nature of address, and numbering plan
     --        indicator.
     --   b)   digits of an address encoded as TBCD-String.

     -- a)     The first octet includes a one bit extension indicator, a
     --        3 bits nature of address indicator and a 4 bits numbering
     --        plan indicator, encoded as follows:

     -- bit 8: 1  (no extension)

     -- bits 765: nature of address indicator
     --   000  unknown
     --   001  international number
     --   010  national significant number
     --   011  network specific number
     --   100  subscriber number
     --   101  reserved
     --   110  abbreviated number
     --   111  reserved for extension

     -- bits 4321: numbering plan indicator
     --   0000  unknown
     --   0001  ISDN/Telephony Numbering Plan (Rec CCITT E.164)
     --   0010  spare
     --   0011  data numbering plan (CCITT Rec X.121)
     --   0100  telex numbering plan (CCITT Rec F.69)
     --   0101  spare
     --   0110  land mobile numbering plan (CCITT Rec E.212)
     --   0111  spare
     --   1000  national numbering plan
     --   1001  private numbering plan
     --   1111  reserved for extension

     --   all other values are reserved.

     -- b)     The following octets representing digits of an address
     --        encoded as a TBCD-STRING.

maxAddressLength  INTEGER ::= 20

ISDN-AddressString ::=
              AddressString (SIZE (1..maxISDN-AddressLength))
     -- This type is used to represent ISDN numbers.

maxISDN-AddressLength  INTEGER ::= 9
```

```
ISDN-SubaddressString ::=
            OCTET STRING (SIZE (1..maxISDN-SubaddressLength))
    -- This type is used to represent ISDN subaddresses.
    -- It is composed of
    --   a)   one octet for type of subaddress and odd/even indicator.
    --   b)   20 octets for subaddress information.

    --   a)   The first octet includes a one bit extension indicator, a
    --        3 bits type of subaddress and a one bit odd/even indicator,
    --        encoded as follows:

    --   bit 8: 1  (no extension)

    --   bits 765: type of subaddress
    --        000  NSAP (X.213/ISO 8348 AD2)
    --        010  User Specified
    --        All other values are reserved

    --   bit 4: odd/even indicator
    --        0  even number of address signals
    --        1  odd number of address signals
    --        The odd/even indicator is used when the type of subaddress
    --        is "user specified" and the coding is BCD.

    --   bits 321: 000 (unused)

    --   b) Subaddress information.
    --   The NSAP X.213/ISO8348AD2 address shall be formatted as specified
    --   by octet 4 which contains the Authority and Format Identifier
    --   (AFI). The encoding is made according to the "preferred binary
    --   encoding" as defined in X.213/ISO834AD2. For the definition
    --   of this type of subaddress, see CCITT Rec I.334.

    --   For User-specific subaddress, this field is encoded according
    --   to the user specification, subject to a maximum length of 20
    --   octets. When interworking with X.25 networks BCD coding should
    --   be applied.

maxISDN-SubaddressLength  INTEGER ::= 21

ExternalSignalInfo ::= SEQUENCE {
    protocolId                      ProtocolId,
    signalInfo                      SignalInfo,
    -- Information about the internal structure is given in
    -- subclause 7.6.9.
    extensionContainer              ExtensionContainer              OPTIONAL,
    -- extensionContainer must not be used in version 2
    ...}

SignalInfo ::= OCTET STRING (SIZE (1..maxSignalInfoLength))

maxSignalInfoLength  INTEGER ::= 200
    -- This NamedValue represents the theoretical maximum number of
    -- octets which are available to carry a single data type,
    -- without requiring segmentation to cope with the network layer
    -- service. However, the actual maximum size available for a data
    -- type may be lower, especially when other information elements
    -- have to be included in the same component.

ProtocolId ::= ENUMERATED {
    gsm-0408  (1),
    gsm-0806  (2),
    gsm-BSSMAP  (3),
    -- Value 3 is reserved and must not be used
    ets-300102-1  (4)}

Ext-ExternalSignalInfo ::= SEQUENCE {
    ext-ProtocolId                  Ext-ProtocolId,
    signalInfo                      SignalInfo,
    -- Information about the internal structure is given in
    -- subclause 7.6.9.10
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

```
Ext-ProtocolId ::= ENUMERATED {
     ets-300356  (1),
     ...,
     gsm-0471 (2),
     -- Value 2 refers to the smlc-lmu messages defined in GSM 04.71
     gsm-0871  (3)
     -- Value 3 refers to the SMLC-BSC messages defined in GSM 08.71
      }
-- exception handling:
-- For Ext-ExternalSignalInfo sequences containing this parameter with any
-- other value than the ones listed the receiver shall ignore the whole
-- Ext-ExternalSignalInfo sequence.
```

```
AlertingPattern ::= OCTET STRING (SIZE (1) )
     -- This type is used to represent Alerting Pattern

     --   bits 8765 : 0000 (unused)

     --   bits 43 : type of Pattern
     --        00 level
     --        01 category
     --        10 category
     --        all other values are reserved.

     --   bits 21 : type of alerting

alertingLevel-0   AlertingPattern ::= '00000000'B
alertingLevel-1   AlertingPattern ::= '00000001'B
alertingLevel-2   AlertingPattern ::= '00000010'B
     -- all other values of Alerting level are reserved
     -- Alerting Levels are defined in GSM 02.07

alertingCategory-1   AlertingPattern ::= '00000100'B
alertingCategory-2   AlertingPattern ::= '00000101'B
alertingCategory-3   AlertingPattern ::= '00000110'B
alertingCategory-4   AlertingPattern ::= '00000111'B
alertingCategory-5   AlertingPattern ::= '00001000'B
     -- all other values of Alerting Category are reserved
     -- Alerting categories are defined in GSM 02.07
```

```
-- data types for numbering and identification
```

```
IMSI ::= TBCD-STRING (SIZE (3..8))
     -- digits of MCC, MNC, MSIN are concatenated in this order.
```

```
Identity ::= CHOICE {
     imsi                                IMSI,
     imsi-WithLMSI                       IMSI-WithLMSI}
```

```
IMSI-WithLMSI ::= SEQUENCE {
     imsi                                IMSI,
     lmsi                                LMSI,
     -- a special value 00000000 indicates that the LMSI is not in use
     ...}
```

```
ASCI-CallReference ::= TBCD-STRING (SIZE (1..8))
     -- digits of VGCS/VBC-area,Group-ID are concatenated in this order.
```

```
TMSI ::= OCTET STRING (SIZE (1..4))
```

```
SubscriberId ::= CHOICE {
     imsi                                [0] IMSI,
     tmsi                                [1] TMSI}
```

```
IMEI ::= TBCD-STRING (SIZE (8))
     --   Refers to International Mobile Station Equipment Identity
     --   and Software Version Number (SVN) defined in TS GSM 03.03.
     --   If the SVN is not present the last octet shall contain the
     --   digit 0 and a filler.
     --   If present the SVN shall be included in the last octet.
```

```
HLR-Id ::= IMSI
     -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
     -- MSIN) forming HLR Id defined in TS GSM 03.03.
```

```
HLR-List ::= SEQUENCE SIZE (1..maxNumOfHLR-Id) OF
                                        HLR-Id

maxNumOfHLR-Id  INTEGER ::= 50

LMSI ::= OCTET STRING (SIZE (4))

GlobalCellId ::= OCTET STRING (SIZE (5..7))
     -- Refers to Cell Global Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS GSM 04.08
     -- octets 6 and 7                   Cell Identity (CI) according to TS GSM 04.08

NetworkResource ::= ENUMERATED {
     plmn  (0),
     hlr  (1),
     vlr  (2),
     pvlr  (3),
     controllingMSC  (4),
     vmsc  (5),
     eir  (6),
     rss  (7)}

NAEA-PreferredCI ::= SEQUENCE {
     naea-PreferredCIC                  [0] NAEA-CIC,
     extensionContainer                 [1] ExtensionContainer          OPTIONAL,
     ...}

NAEA-CIC ::= OCTET STRING (SIZE (3))
     -- The internal structure is defined by the Carrier Identification
     -- parameter in ANSI T1.113.3. Carrier codes between “000” and “999” may
     -- be encoded as 3 digits using “000” to “999” or as 4 digits using
     -- “0000” to “0999”. Carrier codes between “1000” and “9999” are encoded
     -- using 4 digits.

SubscriberIdentity ::= CHOICE {
     imsi                               [0] IMSI,
     msisdn                             [1] ISDN-AddressString
     }

LCSClientExternalID ::= SEQUENCE {
     externalAddress                    [0] AddressString               OPTIONAL,
     extensionContainer                 [1] ExtensionContainer          OPTIONAL,
     ... }

LCSClientInternalID ::= ENUMERATED {
     broadcastService                   (0),
     o-andM-HPLMN                       (1),
     o-andM-VPLMN                       (2),
     anonymousLocation                  (3),
     targetMSsubscribedService          (4),
     ... }


-- data types for CAMEL

CellIdOrLAI ::= CHOICE {
     cellIdFixedLength                  [0] CellIdFixedLength,
     laiFixedLength                     [1] LAIFixedLength}
```

```
CellIdFixedLength ::= OCTET STRING (SIZE (7))
     -- Refers to Cell Global Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS GSM 04.08
     -- octets 6 and 7                   Cell Identity (CI) according to TS GSM 04.08

LAIFixedLength ::= OCTET STRING (SIZE (5))
     -- Refers to Location Area Identification defined in TS GSM 03.03.
     -- The internal structure is defined as follows:
     -- octet 1 bits 4321                Mobile Country Code 1st digit
     --         bits 8765                Mobile Country Code 2nd digit
     -- octet 2 bits 4321                Mobile Country Code 3rd digit
     --         bits 8765                Mobile Network Code 3rd digit
     --                                  or filler (1111) for 2 digit MNCs
     -- octet 3 bits 4321                Mobile Network Code 1st digit
     --         bits 8765                Mobile Network Code 2nd digit
     -- octets 4 and 5                   Location Area Code according to TS GSM 04.08


-- data types for subscriber management

BasicServiceCode ::= CHOICE {
     bearerService                      [2] BearerServiceCode,
     teleservice                        [3] TeleserviceCode}

Ext-BasicServiceCode ::= CHOICE {
     ext-BearerService                  [2] Ext-BearerServiceCode,
     ext-Teleservice                    [3] Ext-TeleserviceCode}

EMLPP-Info ::= SEQUENCE {
     maximumentitledPriority            EMLPP-Priority,
     defaultPriority                    EMLPP-Priority,
     extensionContainer                 ExtensionContainer              OPTIONAL,
     ...}

EMLPP-Priority ::= INTEGER (0..15)
     -- The mapping from the values A,B,0,1,2,3,4 to the integer-value is
     -- specified as follows where A is the highest and 4 is the lowest
     -- priority level
     -- the integer values 7-15 are spare and shall be mapped to value 4

priorityLevelA                          EMLPP-Priority ::= 6
priorityLevelB                          EMLPP-Priority ::= 5
priorityLevel0                          EMLPP-Priority ::= 0
priorityLevel1                          EMLPP-Priority ::= 1
priorityLevel2                          EMLPP-Priority ::= 2
priorityLevel3                          EMLPP-Priority ::= 3
priorityLevel4                          EMLPP-Priority ::= 4


   -- data types for geographic location

AgeOfLocationInformation ::= INTEGER (0..32767)
-- the value represents the elapsed time in minutes since the last
-- network contact of the mobile station (i.e. the actuality of the
-- location information).
-- value “0” indicates that the MS is currently in contact with the
--           network
-- value “32767” indicates that the location information is at least
--               32767 minutes old

END
```

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

17.7.13 Location service data types

```
MAP-LCS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-LCS-DataTypes (25) version6 (6)}

DEFINITIONS
IMPLICIT TAGS
::=
BEGIN

EXPORTS
   RoutingInfoForLCS-Arg,
   RoutingInfoForLCS-Res,
   ProvideSubscriberLocation-Arg,
   ProvideSubscriberLocation-Res,
   SubscriberLocationReport-Arg,
   SubscriberLocationReport-Res,
   LocationType,
   LCSClientName,
   LCS-QoS,
   Horizontal-Accuracy,
   ResponseTime,
   Ext-GeographicalInformation
   PerformLocation-Arg,
   PerformLocation-Res,
   LCSRegistration-Arg,
   LCSRegistration-Res,
   LCSInformationRequest-Arg,
   LCSInformationReport-Arg,
   LCSReset-Arg,
   LCSAssignTrafficChannel-Arg,
   LCSAssignTrafficChannel-Res
;

IMPORTS
   AddressString,
   ISDN-AddressString,
   IMEI,
   IMSI,
   LMSI,
   Identity,
   SubscriberIdentity,
   GlobalCellId,
   Ext-ExternalSignalInfo,
   AgeOfLocationInformation,
   LCSClientExternalID,
   LCSClientInternalID
FROM MAP-CommonDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-CommonDataTypes (18) version6 (6)}

   ExtensionContainer
FROM MAP-ExtensionDataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0)
   gsm-Network (1) modules (3) map-ExtensionDataTypes (21) version6 (6)}

   USSD-DataCodingScheme,
   USSD-String
FROM MAP-SS-DataTypes {
   ccitt identified-organization (4) etsi (0) mobileDomain (0) gsm-Network (1) modules (3)
   map-SS-DataTypes (14) version6 (6)}
;
```

```
RoutingInfoForLCS-Arg ::= SEQUENCE {
    mlcNumber                       [0] ISDN-AddressString,
    targetMS                        [1] SubscriberIdentity,
    extensionContainer              [2] ExtensionContainer          OPTIONAL,
    ...}
```

```
RoutingInfoForLCS-Res ::= SEQUENCE {
    targetMS                        [0] SubscriberIdentity,
    lcsLocationInfo                 [1] LCSLocationInfo,
    extensionContainer              [2] ExtensionContainer          OPTIONAL,
    ...}
```

```
LCSLocationInfo ::= SEQUENCE {
     msc-Number                          ISDN-AddressString,
     lmsi                                [0] LMSI                          OPTIONAL,
     extensionContainer                  [1] ExtensionContainer            OPTIONAL,
     ...}
```

```
ProvideSubscriberLocation-Arg ::= SEQUENCE {
     locationType                        LocationType,
     mlc-Number                          ISDN-AddressString,
     lcs-ClientID                        [0] LCS-ClientID                  OPTIONAL,
     privacyOverride                     [1] NULL                          OPTIONAL,
     imsi                                [2] IMSI                          OPTIONAL,
     msisdn                              [3] ISDN-AddressString            OPTIONAL,
     lmsi                                [4] LMSI                          OPTIONAL,
     imei                                [5] IMEI                          OPTIONAL,
     na-ESRK                             [6] ISDN-AddressString            OPTIONAL,
     lcs-Priority                        [67] LCS-Priority                 OPTIONAL,
     lcs-QoS                             [78] LCS-QoS                      OPTIONAL,
     extensionContainer                  [89] ExtensionContainer           OPTIONAL,
     ...}

-- one of imsi, or msisdn or na-ESRK is mandatory
-- na-ESRK is applicable only to North American PLMNs
```

EDITORIAL NOTE: the ASN.1 TAG for the above extensionContainer for Release 98 09.02 should be 8

```
LocationType ::= SEQUENCE {
     locationEstimateType                [0] LocationEstimateType,
     ... }
```

```
LocationEstimateType ::= ENUMERATED {
     currentLocation                     (0),
     currentOrLastKnownLocation          (1),
     initialLocation                     (2),
     ... }
--   exception handling:
--   a ProvideSubscriberLocation-Arg containing an unrecognized LocationEstimateType
--   shall be rejected by the receiver with a return error cause of unexpected data value
```

```
LCS-ClientID ::= SEQUENCE {
     lcsClientType                       [0] LCSClientType,
     lcsClientExternalID                 [1] LCSClientExternalID           OPTIONAL,
     lcsClientDialedByMS                 [2] AddressString                 OPTIONAL,
     lcsClientInternalID                 [3] LCSClientInternalID           OPTIONAL,
     lcsClientName                       [4] LCSClentName                  OPTIONAL,
     ... }
```

```
LCSClientType ::= ENUMERATED {
     emergencyServices                   (0),
     valueAddedServices                  (1),
     plmnOperatorServices                (2),
     lawfulInterceptServices             (3),
     ... }
--   exception handling:
--   unrecognized values may be ignored if the LCS client uses the privacy override
--   otherwise, an unrecognized value shall be treated as unexpected data by a receiver
--   a return error shall then be returned if received in a MAP invoke
```

```
LCSClientName ::= SEQUENCE {
     dataCodingScheme                    [0] USSD-DataCodingScheme,
     nameString                          [2] NameString,
     ...}

-- The USSD-DataCodingScheme shall indicate use of the default alphabet through the
-- following encoding
--   bit  7 6 5 4 3 2 1 0
--        0 0 0 0 1 1 1 1
```

```
NameString ::= USSD-String (SIZE (1..maxNameStringLength))
```

```
maxNameStringLength  INTEGER ::= 63
```

```
LCS-Priority ::= OCTET STRING (SIZE (1))
     -- 0 = highest priority
     -- 1 = normal priority
     -- all other values treated as 1
```

```
LCS-QoS ::= SEQUENCE {
     horizontal-accuracy                [0] Horizontal-Accuracy          OPTIONAL,
     verticalCoordinateRequest          [1] NULL                         OPTIONAL,
     vertical-accuracy                  [2] Vertical-Accuracy            OPTIONAL,
     responseTime                       [31] ResponseTime                OPTIONAL,
     extensionContainer                 [42] ExtensionContainer          OPTIONAL,
     ...}
```

```
Horizontal-Accuracy ::= OCTET STRING (SIZE (1))
     -- bit 8 = 0
     -- bits 7-1 = 7 bit Uncertainty Code defined in GSM 03.32
```

```
Vertical-Accuracy ::= OCTET STRING (SIZE (1))
     -- bit 8 = 0
     -- bits 7-1 = 7 bit Vertical Uncertainty Code defined in GSM 03.32
```

```
ResponseTime ::= SEQUENCE {
     responseTimeCategory               ResponseTimeCategory,
     ...}
--   note: an expandable SEQUENCE simplifies later addition of a numeric response time.
```

```
ResponseTimeCategory ::= ENUMERATED {
     nodelay  (0),
     lowdelay  (01),
     delaytolerant  (12),
     ... }
--   exception handling:
--   an unrecognized value shall be treated the same as value 12 (delaytolerant)
```

```
ProvideSubscriberLocation-Res ::= SEQUENCE {
     locationEstimate                   Ext-GeographicalInformation,
     ageOfLocationEstimate              [0] AgeOfLocationInformation     OPTIONAL,
     extensionContainer                 [1] ExtensionContainer           OPTIONAL,
     ...}
```

```
Ext-GeographicalInformation ::= OCTET STRING (SIZE (1..maxExt-GeographicalInformation))
-- Refers to geographical Information defined in GSM 03.32.
-- This is composed of 1 or more octets with an internal structure according to GSM 03.32
-- Octet 1: Type of shape, only the following shapes in GSM 03.32 are allowed:
--        (a) Ellipsoid point with uncertainty circle
--        (b) Ellipsoid point with uncertainty ellipse
--        (c) Ellipsoid point with altitude and uncertainty ellipsoid
          (d) Ellipsoid Arc
-- Any other value in octet 1 shall be treated as invalid
-- Octets 2 to 8 for case (a) – Ellipsoid point with uncertainty circle
--        Degrees of Latitude                                          3 octets
--        Degrees of Longitude                                         3 octets
--        Uncertainty code                                             1 octet
-- Octets 2 to 1110 for case (b) – Ellipsoid point with uncertainty ellipse:
--        Degrees of Latitude                                          3 octets
--        Degrees of Longitude                                         3 octets
--        Uncertainty semi-major axis                                  1 octet
--        Uncertainty semi-minor axis                                  1 octet
--        Angle of major axis                                          1 octet
--        Confidence                                                   1 octet
-- Octets 2 to 14 for case (c) – Ellipsoid point with altitude and uncertainty ellipsoid
--        Degrees of Latitude                                          3 octets
--        Degrees of Longitude                                         3 octets
--        Altitude                                                     2 octets
--        Uncertainty semi-major axis                                  1 octet
--        Uncertainty semi-minor axis                                  1 octet
--        Angle of major axis                                          1 octet
--        Uncertainty altitude                                         1 octet
--        Confidence                                                   1 octet
-- Octets 2 to 13 for case (d) – Ellipsoid Arc
--        Degrees of Latitude                                          3 octets
--        Degrees of Longitude                                         3 octets
--        Inner radius                                                 2 octets
--        Uncertainty radius                                           1 octet
--        Offset angle                                                 1 octet
--        Included angle                                               1 octet
--        Confidence                                                   1 octet
--
-- An Ext-GeogrpahicalInformation parameter containing any other shape or an incorrect number
-- of octets or coding according to GSM 03.32 shall be treated as invalid data by a receiver
```

```
maxExt-GeographicalInformation  INTEGER ::= 20
-- the maximum length allows for further shapes in GSM 03.32 to be included in later versions
-- of GSM 09.02
```

```
SubscriberLocationReport-Arg ::= SEQUENCE {
     lcs-Event                          LCS-Event,
     lcs-ClientID                       LCS-ClientID,
     lcsLocationInfo                    LCSLocationInfo,
     msisdn                             [0] ISDN-AddressString           OPTIONAL,
     imsi                               [1] IMSI                         OPTIONAL,
     imei                               [2] IMEI                         OPTIONAL,
     na-ESRD                            [3] ISDN-AddressString           OPTIONAL,
     na-ESRK                            [4] ISDN-AddressString           OPTIONAL,
     locationEstimate                   [5] Ext-GeographicalInformation  OPTIONAL,
     ageOfLocationEstimate              [6] AgeOfLocationInformation     OPTIONAL,
     extensionContainer                 [7] ExtensionContainer           OPTIONAL,
     ...}

-- one of msisdn, or imsi, or na-ESRK is mandatory
-- in North America, the na-ESRD is mandatory
```

```
LCS-Event ::= ENUMERATED {
     emergencyCallOrigination  (0),
     emergencyCallRelease  (1),
     mo-lr  (2),
     ... }
--   exception handling:
--   a SubscriberLocationReport-Arg containing an unrecognized LCS-Event
--   shall be rejected by a receiver with a return error cause of unexpected data value
```

```
SubscriberLocationReport-Res ::= SEQUENCE {
     extensionContainer                 ExtensionContainer               OPTIONAL,
     ...}
```

```
PerformLocation-Arg ::= SEQUENCE {
     globalCellId                       GlobalCellId,
     radioChannelType                   [0] RadioChannelType             OPTIONAL,
     lcs-Priority                       [1] LCS-Priority                 OPTIONAL,
     lcs-QoS                            [2] LCS-QoS                      OPTIONAL,
     lcs-APDU                           [3] Ext-ExternalSignalInfo       OPTIONAL,
     extensionContainer                 [4] ExtensionContainer           OPTIONAL,
     ...}
```

```
RadioChannelType ::= ENUMERATED {
     sdcch  (0),
     tch-fr (1),
     tch-hr (2),
     ... }
--   exception handling
--   an unrecognized value shall be treated as unexpected data
--   a return error shall be returned if received in a MAP invoke
```

```
PerformLocation-Res ::= SEQUENCE {
     locationEstimate                   Ext-GeographicalInformation,
     positioningData                    [0] PositioningDataList          OPTIONAL,
     extensionContainer                 [1] ExtensionContainer           OPTIONAL,
     ... }
```

```
PositioningDataList ::= SEQUENCE SIZE (1..maxNumOfPositionAttempts) OF
                                        PositioningData
     -- list of positioning data for each positioning attempt
     -- first in list = first attempt, last in list = last attempt
```

```
maxNumOfPositionAttempts  INTEGER ::= 5
```

```
PositioningData ::= SEQUENCE {
     positionMethod                     PositionMethod,
     positionResult                     PositionResult,
     duration                           [0] Duration                     OPTIONAL,
     toa-LMU-data                       [1] TOA-LMU-Data                 OPTIONAL,
     extensionContainer                 [2] ExtensionContainer           OPTIONAL,
     ...}

-- Positioning data need not be provided to an LCS client but may be useful to the PLMN
-- for billing, accounting and statistical purposes
```

```
PositionMethod ::= ENUMERATED {
    timingAdvance  (0),
    toa (1),
    ... }
--  exception handling:
--  an unrecognized value may be stored in billing or accounting records
--  an unrecognized value shall not cause rejection of any associated location estimate
```

```
PositionResult ::= ENUMERATED {
    failure (0),
    success-NoDeliveryToClient (1),
    success-DeliveryToClient  (2) }
```

```
Duration  ::= INTEGER (0..250)
    -- duration of location attempt in units of 100ms
    -- 250 : duration >= 25 seconds
```

```
TOA-LMU-Data ::= SEQUENCE {
    numberOfAssignedLMUs                INTEGER (0..12),
    numberOfLMUsWithValidMeasurements   INTEGER (0..12),
    extensionContainer                  [0] ExtensionContainer          OPTIONAL,
    ... }
```

```
LCSRegistration-Arg ::= SEQUENCE {
    lmuIdentity                         Identity,
    registrationType                    RegistrationType,
    mscNumber                           [0] ISDN-AddressString          OPTIONAL,
    extensionContainer                  [1] ExtensionContainer          OPTIONAL,
    ...}
```

```
RegistrationType ::= ENUMERATED {
    registration                            (0),
    deRegistration                          (1)}
```

```
LCSRegistration-Res ::= SEQUENCE {
    extensionContainer                  ExtensionContainer              OPTIONAL,
    ...}
```

```
LCSInformationRequest-Arg ::= SEQUENCE {
    lcs-Entity                          LCS-Entity,
    mlcNumber                           [0] ISDN-AddressString          OPTIONAL,
    release-forbidden                   [1] NULL                        OPTIONAL,
    reportError-request                 [2] NULL                        OPTIONAL,
    lcs-apdu                            [3] Ext-ExternalSignalInfo      OPTIONAL,
    -- lcs-apdu carries either the Facility Information Element defined in GSM 04.71
    -- or the Location Information parameter defined in GSM 08.71
    extensionContainer                  [4] ExtensionContainer          OPTIONAL,
    ...}
```

```
LCS-Entity ::= SEQUENCE {
    entityType                          EntityType,
    entityIdentity                      [0] EntityIdentity              OPTIONAL,
    ...}
```

```
EntityType ::= ENUMERATED {
    lmu (0),
    serving-BSC (1),
    ... }
--  Exception handling:
--  an unrecognized value for the Entity Type shall cause any associated LCS APDU to be
--  discarded; the Report Error procedure in GSM 03.71 may also be invoked if requested in
--  an LCSInformationRequest-Arg.
```

```
EntityIdentity ::= SEQUENCE {
    lmuIdentity                         Identity                        OPTIONAL,
    ...}
```

```
LCSInformationReport-Arg ::= SEQUENCE {
    lcs-Entity                      LCS-Entity,
    lcsCause                        [0] LCSCause                    OPTIONAL,
    -- lcsCause is included if and only if the MSC is returning an lcs-apdu to the SMLC
    -- that could not be successfully transferred to its destination LCS entity.
    lcs-apdu                        [1] Ext-ExternalSignalInfo      OPTIONAL,
    -- lcs-apdu carries either the Facility Information Element defined in GSM 04.71
    -- or the Location Information parameter defined in GSM 08.71
    extensionContainer              [2] ExtensionContainer          OPTIONAL,
    ...}
```

```
LCSCause ::= ENUMERATED {
    undefined                       (0),
    unknownLCSEntity                (1),
    noPagingResponse                (2),
    errorInAuthentication           (3),
    errorInServingMSC               (4),
    ... }
--  exception handling:
--  an unrecognized value shall be treated the same as value 0 (undefined)
```

```
LCSReset-Arg ::= SEQUENCE {
    mlcNumber                       ISDN-AddressString,
    lmu-List                        [0] LMU-List                    OPTIONAL,
    extensionContainer              [1] ExtensionContainer          OPTIONAL,
    ...}
```

```
LMU-Id ::= IMSI
    -- leading digits of IMSI, i.e. (MCC, MNC, leading digits of
    -- MSIN) defining a set of LMUs sharing the same SMLC
```

```
LMU-List ::= SEQUENCE SIZE (1..maxNumOfLMU-Id) OF
                                    LMU-Id
```

```
maxNumOfLMU-Id  INTEGER ::= 10
```

```
LCSAssignTrafficChannel-Arg ::= SEQUENCE {
    radioChannelType                RadioChannelType,
    extensionContainer              [0] ExtensionContainer          OPTIONAL,
    ...}
```

```
LCSAssignTrafficChannel-Res ::= SEQUENCE {
    extensionContainer              ExtensionContainer              OPTIONAL,
    ...}
```

END