

ETSI TS 101 530 V7.0.0 (2000-01)

Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Location Services (LCS);
Base Station System Application Part
LCS Extension (BSSAP-LE)
(GSM 09.31 version 7.0.0 Release 1998)**

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Reference

DTS/SMG-030931Q7

Keywords

Digital cellular telecommunications system,
Global System for Mobile communications (GSM)
GSM, LCS

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Foreword

This Technical Specification (TS) has been produced by the Special Mobile Group (SMG).

The present document defines the coding of information in an extension of the Base Station System Application Part (BSSAP) that is needed to support location services on interfaces based on use of BSSAP.

The contents of the present document are subject to continuing work within SMG and T1P1 and may change following formal SMG and T1P1 approval. Should SMG or T1P1 modify the contents of the present document it will then be re-issued with an identifying change of release date and an increase in version number as follows:

Version 7.x.y

where:

- 7 GSM Phase 2+ Release 1998;
- x the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.;
- y the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

The present document specifies procedures and information coding that are needed to define and support the BSSAP LCS Extension (BSSAP-LE). The BSSAP-LE message set is applicable to the following GSM interfaces defined in GSM 03.71:

Lb interface (BSC-SMLC)

Ls interface (MSC-SMLC)

Lp interface (SMLC-SMLC)

The present document defines message formats and encoding for BSSAP-LE and the particular subsets of it that are applicable to each of the above interfaces. The present document also defines the support for BSSAP-LE message transfer on each of these interfaces using CCITT and ANSI versions of SS7 MTP and SCCP. Additional requirements for the above interfaces that are applicable to BSSAP-LE are also defined – e.g. usage of BSSAP (as defined in GSM 04.08 and 08.08) on the Lb interface.

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 03.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); (Functional description) - Stage 2"
- [3] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".
- [4] GSM 04.31: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Mobile Station (MS) – Serving Mobile Location Center (SMLC); Radio Resource LCS Protocol (RRLP)."
- [5] GSM 04.71: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 Location Services (LCS) specification".
- [6] GSM 08.06: " Digital cellular telecommunications system (Phase 2+); Signaling transport specification mechanism for the Base Station Subsystem – Mobile-services Switching Centre (BSS - MSC) interface".
- [7] GSM 08.08: " Digital cellular telecommunications system (Phase 2+); Mobile-services Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification"
- [8] 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)."

- [9] GSM 08.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Serving Mobile Location Center – Base Station Subsystem (SMLC-BSS) interface Layer 3 specification."
- [10] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".
- [11] CCITT Recommendation Q.702: "Specifications of Signalling System No. 7 - Signalling data link".
- [12] CCITT Recommendation Q.703: "Signalling link".
- [13] CCITT Recommendation Q.704: "Signalling network functions and messages".
- [14] CCITT Recommendation Q.707: "Specifications of Signalling System No. 7 - Testing and maintenance".
- [15] CCITT Recommendation Q.711: "Functional description of the signalling connection control part".
- [16] CCITT Recommendation Q.712: "Definition and function of SCCP messages".
- [17] CCITT Recommendation Q.713: "SCCP formats and codes".
- [18] CCITT Recommendation Q.714: "Signalling connection control part procedures".
- [19] ANSI T1.111-1996 - Signalling System Number 7 (SS7) – Message Transfer Part (MTP)
- [20] ANSI T1.112-1996 - Signalling System Number 7 (SS7) - Signalling Connection Control Part (SCCP).

3 Definitions, symbols and abbreviations

Unless listed below, all definitions, symbols and abbreviations used in the present document are listed in GSM 01.04 and GSM 03.71.

4 Definition of BSSAP-LE

BSSAP-LE is an extension to BSSAP that contains messages and parameters specific to the support of LCS. The following subsets of BSSAP-LE are defined: DTAP-LE, BSSMAP-LE.

4.1 DTAP-LE Messages

DTAP-LE messages are transferred between an SMLC and a Type A LMU and comprise the following individual messages:

REGISTER

FACILITY

RELEASE COMPLETE

The content, encoding and certain procedures associated with DTAP-LE messages are defined in GSM 04.71.

4.2 BSSMAP-LE Messages

BSSMAP-LE messages are transferred between a BSC, MSC and SMLC and comprise the following individual messages:

BSSMAP-LE Positioning Messages

Perform Location Request

Perform Location Response

Perform Location Abort

BSSMAP-LE LMU Control Messages

LMU Connection Request

LMU Connection Accept

LMU Connection Reject

LMU Connection Release

BSSMAP-LE Information Messages

Connection Oriented Information

Connectionless Information

The content and encoding of BSSMAP-LE messages are defined in this specification.

5 Procedures applicable to use of BSSAP-LE

5.1 Location Request

The Location Request procedure is applicable to the Lb and Ls interfaces. Its purpose is to obtain a location estimate for a target MS that is already in dedicated mode. It is also used to provide an MS with LCS assistance data or with a deciphering key for LCS broadcast assistance data. The initiator of a location request may be either the serving BSC or the visited MSC for the MS. The procedure makes use of SCCP connection oriented signaling on the Lb and Ls interfaces.

5.1.1 Successful Operation

The initiator of the location request (VMSC or serving BSC) sends a BSSMAP-LE Perform Location Request to the SMLC associated with the current serving cell for the target MS. The message contains the following mandatory (M), conditional (C) and optional (O) information, where conditional parameters are required if available.

Location Type (M)

Cell Identifier (M)

Classmark Information Type 3 (C)

LCS Client Type (O)

Chosen Channel (C)

LCS Priority (C)

LCS QoS (C)

Requested GPS Assistance Data (C)

BSSLAP APDU (C)

If requested, the SMLC performs positioning of the target MS using a particular position method or a combination of more than one positioning method. Alternatively, if requested otherwise, the SMLC may provide positioning assistance data to the MS. The SMLC may invoke the following other BSSAP-LE procedures to perform these procedures:

connection oriented information transfer

connectionless information transfer

LMU connection establishment

LMU connection release

DTAP-LE information transfer

For an SMLC accessed over the Lb interface by a BSC initiator, additional procedures defined in GSM 04.08 and GSM 08.08 may also be performed. If a location estimate was requested and was subsequently obtained satisfying the required LCS QoS, the SMLC shall return a BSSMAP-LE Perform Location Response to the initiator of the location request (serving BSC or VMSC). This message contains the following mandatory, conditional and optional parameters.

Location Estimate (M)

Positioning Data (C)

If assistance data was instead requested for an MS and the SMLC was able successfully to transfer this to the MS, the SMLC shall return a BSSMAP-LE Perform Location Response to the initiator of the location request (serving BSC or VMSC). This message shall contain no parameters. The absence of an LCS Cause parameter in this case implies that the transfer was successful.

Otherwise, if a deciphering key was requested for LCS broadcast assistance data and the SMLC has access to the appropriate keys, the SMLC shall return a BSSMAP-LE Perform Location Response to the initiator of the location request (serving BSC or VMSC). This message contains the following mandatory parameters.

Deciphering Keys (M)

5.1.2 Unsuccessful Operation

If the SMLC is unable to obtain any of the location information requested or none of the information obtained satisfies the requested LCS QoS or if requested LCS assistance data could not be transferred or requested deciphering keys for broadcast assistance data could not be returned, the SMLC shall return a BSSMAP-LE Perform Location Response to the initiator of the Location Request carrying the following parameters:

LCS Cause (M)

Positioning Data (O)

5.1.3 Abnormal Conditions

If an ongoing location request is preempted at the initiator by an inter-BSC handover or if the main signaling link to the target MS is lost or released or if there is a timeout waiting for the positioning response, the initiator shall send a BSSMAP-LE Perform Location Abort to the SMLC containing the following parameters.

LCS Cause (M)

On receipt of this message, the SMLC shall stop positioning of the target MS and may release any resources (e.g. LMUs) previously allocated. If the SMLC has not yet returned a BSSMAP-LE Perform Location Response to the initiator, it shall return this message containing an LCS Cause indicating an abort and, optionally, positioning data. The initiator shall then release the SCCP connection. If the SMLC cannot proceed with positioning due to some protocol violation or error condition (e.g. inter-BSC handover indication received from the serving BSC), it shall return a BSSMAP-LE Perform Location Response to the initiator containing an LCS cause and, optionally, positioning data. The initiator need not reply at the BSSAP-LE level to this message. However, the initiator may return a BSSMAP-LE perform Location Abort which shall not be treated as an error by the SMLC.

5.2 Connection Oriented Information Transfer

The Connection Oriented Information transfer procedure is applicable to the Lb and Ls interfaces. It enables both way transfer of BSSLAP messages between an SMLC and the BSC serving a target MS. The initiator of the procedure can be either the BSC serving the target MS, the visited MSC for the target MS or the SMLC. The procedure is only valid while a location request procedure for the target MS is ongoing. The procedure makes use of SCCP connection oriented signaling on the Lb and Ls interfaces and uses the same SCCP connection as the location request procedure for the particular target MS.

5.2.1 Successful Operation

An SMLC, MSC or BSC with a BSSLAP message or message segment to transfer concerning a particular target MS sends a BSSMAP-LE Connection Oriented Information message to a recipient carrying the following parameters:

BSSLAP APDU (M)

If the sender is an NSS based SMLC, the message is transferred to the VMSC for the target MS. The recipient MSC shall then transfer the message to the serving BSC using procedures defined in GSM 08.08.

If the sender is a BSS based SMLC, the message is transferred to the serving BSC for the target MS. The BSC shall then perform the positioning operation requested by the BSSLAP APDU (refer to GSM 08.71). If the BSSLAP APDU contains an RRLP APDU, the BSC shall transfer this to the target MS.

If the sender is a BSC or MSC and the intended recipient is the SMLC for a target MS, the message is transferred to the SMLC. The SMLC shall then perform interpretation of the BSSLAP APDU.

5.2.2 Abnormal Conditions

At an intermediate entity, if a received BSSMAP-LE Connection Oriented Information message contains unrecognized information or if the message cannot be sent on, the message shall be discarded.

At the recipient entity, if a received BSSMAP-LE Connection Oriented Information message contains invalid or unrecognized information as defined for BSSAP-LE, any ongoing positioning procedure shall be terminated and associated resources may be released. If the recipient is a BSC, the SMLC shall be notified – e.g. using a BSSLAP Reject or Abort. If the recipient is an SMLC, a new positioning attempt (e.g. using a different position method) may be started.

5.3 Connectionless Information Transfer

The Connectionless Information transfer procedure is applicable to the Lb, Ls and Lp interfaces. It enables both way transfer of LLP messages between an SMLC and a Type B LMU. The procedure also enables both way transfer of SMLCPP messages between two SMLCs. The initiator of the procedure can be a BSC, MSC or SMLC. The procedure makes use of SCCP connectionless signaling.

5.3.1 Successful Operation

An SMLC, MSC or BSC needing to transfer an LLP message concerning a Type B LMU or an SMLCPP message sends a BSSMAP-LE Connectionless Information message to a recipient carrying the following parameters:

Source Entity (M)

Destination Entity (M)

Return Error Request (O)

APDU (M)

The source entity identifies the sender. The recipient entity identifies the final destination. The Return Error Request may be included to request notification in the event of unsuccessful transfer. If the recipient entity is not the final destination, the recipient shall transfer the BSSMAP-LE Connectionless Information message to either the final destination or an intermediate MSC or BSC capable of onward transfer to the final destination.

5.3.2 Unsuccessful Operation

If the message cannot be transferred by an intermediate entity and the Return Error Request is not included, the message shall be discarded. If the Return Error Request is included, the intermediate entity shall send a BSSMAP-LE Connectionless Information message to, or towards, the original source containing the following parameters:

Source Entity (M)

Destination Entity (M)

Return Error Cause (M)

APDU (C)

The Source entity shall indicate the Destination Entity in the original received message. The Destination Entity shall indicate the Source Entity in the original message. The Return Error cause shall indicate the reason for unsuccessful transfer. The APDU shall contain any originally received APDU.

If a received BSSMAP-LE Connectionless Information message containing a Return Error Cause cannot be transferred by an intermediate entity, it shall be discarded with no return error message.

5.3.3 Abnormal Conditions

At an intermediate entity, if a received BSSMAP-LE Connectionless Information message contains unrecognized or invalid information, the message shall be discarded.

At the recipient entity, if a received BSSMAP-LE Connectionless Information message contains invalid or unrecognized information as defined for BSSAP-LE, the message shall be discarded.

5.4 LMU Connection Establishment

The LMU Connection Establishment procedure is applicable to the Ls interface. Its purpose is to establish a signaling connection between an SMLC and Type A LMU via the visited MSC for the LMU. The procedure can be initiated by either the SMLC or MSC. The procedure makes use of SCCP connection oriented signaling on the Ls interface.

5.4.1 LMU Connection Establishment initiated by the SMLC

5.4.1.1 Successful Operation

The SMLC sends a BSSMAP-LE LMU Connection Request message to the VMSC for the LMU. This message contains the following parameters.

IMSI (M)

Sender Address (O)

Security (C)

The IMSI identifies the LMU. The sender address, if included, identifies the SMLC. The Security parameter shall be included if authentication or ciphering of the LMU are required. On receipt of this message, the MSC shall attempt to establish a signalling link to the LMU (refer to GSM 03.71). Authentication and ciphering shall be invoked if requested by the SMLC. Once the signaling link has been established, the MSC shall return a BSSMAP-LE LMU Connection Accept to the SMLC with the following parameters.

Call Number (O)

The call number shall be included if the MSC has the capability to support signaling to an LMU using a traffic channel (refer to GSM 03.71).

5.4.1.2 Unsuccessful Operation

If the LMU is not recognized in the MSC (e.g. no VLR record) or a signaling link cannot be setup to the LMU (e.g. paging of the LMU fails) or authentication or ciphering cannot be performed when requested by the SMLC, any signaling link to the LMU shall be released, if not required for other MM or CM procedures and a BSSMAP-LE LMU Connection Reject shall be returned to the SMLC with the following parameters.

Reject Cause (M)

5.4.1.3 Abnormal Conditions

If the SMLC or MSC detects release of the SCCP connection on the Ls interface for an LMU, the connection establishment procedure shall be considered to have failed and any associated resources may be released.

5.4.2 LMU Connection Establishment initiated by the MSC

5.4.2.1 Successful Operation

The MSC shall initiate the LMU connection establishment procedure when no LMU connection to the SMLC currently exists and the MSC receives a CM Service Request from the LMU specifying the LCS service. The MSC shall then send a BSSMAP-LE LMU Connection Request message to the SMLC associated with either the IMSI or current cell location of the LMU. This message shall contain the following parameters.

IMSI (M)

Sender Address (M)

Call Number (C)

The IMSI identifies the LMU. The sender address identifies the MSC. The call number shall be included if the MSC has the capability to support signaling to an LMU using a traffic channel (refer to GSM 03.71). On receipt of this message, the SMLC shall return a BSSMAP-LE LMU Connection Accept to the MSC with the following parameters.

Security (C)

The Security parameter shall be included if authentication or ciphering of the LMU are required. On receipt of this message, the MSC shall perform authentication and/or ciphering if requested by the SMLC and shall complete the establishment of an MM connection to the LMU to support LCS.

5.4.2.2 Unsuccessful Operation

If the LMU is not recognized in the SMLC or a signaling connection cannot be supported (e.g. due to congestion), a BSSMAP-LE LMU Connection Reject shall be returned to the MSC with the following parameters.

Reject Cause (M)

The MSC shall then reject the CM service request from the LMU.

5.4.2.3 Abnormal Conditions

If the SMLC or MSC detects release of the SCCP connection on the Ls interface for an LMU, the connection establishment procedure shall be considered to have failed and any associated resources may be released.

5.5 LMU Connection Release

The LMU Connection Release procedure is applicable to the Ls interface. Its purpose is to release a signaling connection between an SMLC and Type A LMU. The procedure can be initiated by either the SMLC or MSC. The procedure makes use of SCCP connection oriented signaling on the Ls interface.

5.5.1 LMU Connection Release initiated by the SMLC

5.5.1.1 Successful Operation

The SMLC sends a BSSMAP-LE LMU Connection Release message to the VMSC for the LMU. This message contains the following parameters.

Release Cause (M)

On receipt of this message, the MSC shall release the main signaling link to the LMU unless required for other ongoing MM and CM procedures in the MSC. The MSC shall also initiate release of the SCCP connection to the SMLC for the LMU.

5.5.1.2 Abnormal Conditions

The SMLC may initiate release of the signaling connection to an LMU by initiating release of the SCCP connection for the LMU to the MSC. The MSC shall then release the main signaling link to the LMU unless required for other ongoing MM or CM procedures.

5.5.2 LMU Connection Release initiated by the MSC

5.5.2.1 Successful Operation

The MSC shall initiate release of an LMU connection to an SMLC if the main signaling link to the LMU is released. The MSC sends a BSSMAP-LE LMU Connection Release message to the SMLC for the LMU. This message contains the following parameters.

Release Cause (M)

On receipt of this message, the SMLC should initiate release of the SCCP connection to the MSC for the LMU.

5.5.2.2 Abnormal Conditions

The MSC may initiate release of the signaling connection between an SMLC and LMU by initiating release of the SCCP connection for the LMU to the SMLC.

5.6 DTAP-LE Information Transfer

The DTAP-LE Information transfer procedure is applicable to the Ls interface. It supports bothway LLP message transfer between an NSS based SMLC and Type A LMU. The procedure is only valid when a signaling connection between an SMLC and Type A LMU has been established. The procedure uses SCCP connection oriented signaling using the SCCP connection previously established between the SMLC and MSC when the signaling connection between the SMLC and LMU was established.

5.6.1 DTAP-LE Information Transfer Initiated by the SMLC

The SMLC initiates the procedure when it has an LLP message to transfer to a type A LMU. The message may first be segmented. The SMLC shall then transfer each LLP segment to the MSC inside a DTAP-LE REGISTER, FACILITY or RELEASE COMPLETE message. The usage of these messages is as defined in GSM 04.71. The MSC relays each DTAP-LE message to the LMU.

5.6.2 DTAP-LE Information Transfer Initiated by the MSC

The MSC initiates the procedure when a DTAP message is received from an LMU containing the LCS protocol discriminator. The MSC then relays the DTAP message to the SMLC

6 Usage of BSSAP-LE and BSSAP on the Lb Interface

6.1 Applicable Message Sets

The following BSSAP-LE message sets are applicable to the Lb interface between an SMLC and BSC:

- All DTAP-LE messages
- All BSSMAP-LE positioning messages
- All BSSMAP-LE information messages

The following BSSMAP messages defined in GSM 08.08 are applicable to the Lb interface to support signaling to a Type A LMU using an SDCCH:

- Cipher Mode Command (SMLC to BSC)
- Cipher Mode Complete (BSC to SMLC)
- Cipher Mode Reject (BSC to SMLC)
- Clear Command (BSC to SMLC)
- Clear Complete (BSC to SMLC)
- Clear Request (SMLC to BSC)
- Complete Layer 3 Information (BSC to SMLC)
- Paging (SMLC to BSC)

The following additional BSSMAP messages defined in GSM 08.08 are applicable to the Lb interface to support signaling to a Type A LMU using a TCH:

- Assignment Request (SMLC to BSC)
- Assignment Complete (BSC to SMLC)
- Assignment Failure (BSC to SMLC)
- Block (bothway)
- Blocking Acknowledge (bothway)
- Reset (bothway)
- Reset Ack. (bothway)
- Unblock (bothway)
- Unblocking Ack. (bothway)
- Unequipped circuit (bothway)

The following DTAP messages defined in GSM 04.08 are applicable to the Lb interface to support signaling to a Type A LMU using an SDCCH:

- RR Paging Response
- All MM Messages

The following additional CM level DTAP messages defined in GSM 04.08 are applicable to the Lb interface to support signaling to a Type A LMU using a TCH.

- Call Confirmed (LMU to SMLC)
- Connect (LMU to SMLC)
- Connect Acknowledge (SMLC to LMU)
- Setup (SMLC to LMU)
- Disconnect (bothway)
- Release (bothway)
- Release Complete (bothway)

6.2 MTP Functions

Except where defined otherwise in this specification, MTP requirements on the Lb interface for the BSC are the same as those defined for the A interface in GSM 08.06 for the BSC. MTP requirements on the Lb interface for the SMLC are the same as those defined for the A interface in GSM 08.06 for the MSC. STP functions are not required in the SMLC and a single signaling link set may be used between the BSC and SMLC. The BSC shall be homed to a single SMLC and shall only use the Lb signaling interface for signaling communication with the SMLC.

6.3 SCCP Functions

6.3.1 General

Except where defined otherwise in this specification, SCCP requirements on the Lb interface for the BSC are the same as those defined for the A interface in GSM 08.06 for the BSC. SCCP requirements on the Lb interface for the SMLC are the same as those defined for the A interface in GSM 08.06 for the MSC. Requirements concerning support of a type A LMU are the same as those in GSM 08.06 regarding support of a normal MS. In particular, usage of SCCP to transfer DTAP-LE messages between a type A LMU and SMLC are the same as those regarding transfer of other DTAP messages.

6.3.2 Modifications for Connectionless SCCP

Connectionless SCCP messages and procedures are used to transfer BSSMAP-LE Connectionless Information messages and those BSSMAP messages applicable to the Lb interface for which connectionless SCCP transfer is defined in GSM 08.08. Refer to GSM 03.71 for a description of the procedures in the SMLC and BSC. SCCP protocol class 1 shall be used when multiple BSSMAP-LE messages are transferred containing segments of a single fragmented LLP or SMLCPP message.

6.3.3 Modifications for Connection Oriented SCCP

Use of connection oriented SCCP messages and procedures on the Lb interfaces to support signaling access to a type A LMU using DTAP-LE, DTAP and BSSMAP messages is the same as that defined in GSM 08.06 on the A interface to support access to a normal MS.

To support positioning of a target MS, connection oriented SCCP messages and procedures using protocol class 2 shall be used to transfer BSSMAP-LE positioning messages and BSSMAP-LE Connection Oriented Information messages over the Lb interface. A separate dedicated SCCP connection shall be used to support positioning for each target MS. Connection establishment shall be instigated by the BSC when the positioning attempt commences. Connection release shall be instigated by either the BSC or SMLC when the positioning attempt has been completed or has failed.

Transfer of BSSMAP-LE messages using an SCCP connection to support positioning of a particular target MS is shown in the following figure. In particular, a BSSMAP-LE message shall be included in the data field of the SCCP CR and a BSSMAP-LE message may be included in the data field of an SCCP CC, CREF or RLSD message.

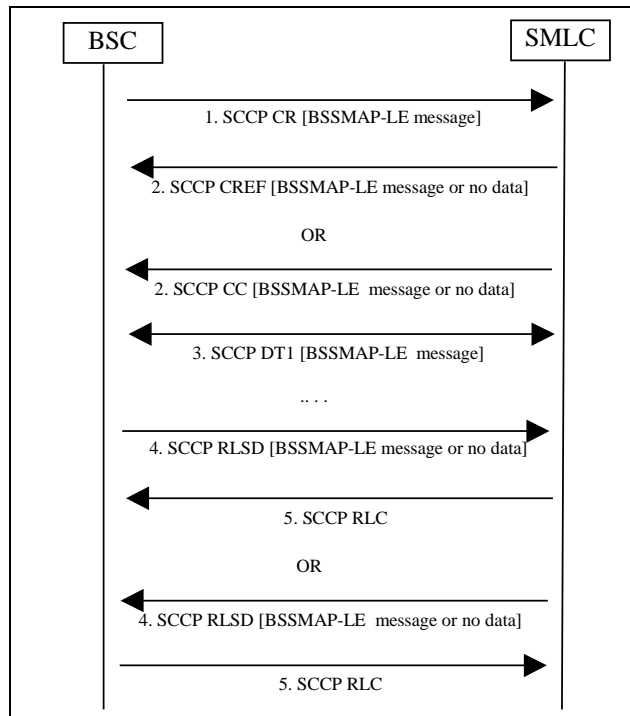


Figure 6.3.3/09.31: SCCP Connection Oriented Signaling on Lb Interface for Positioning

6.3.4 Contents of the SCCP Data Field

The contents of the SCCP data field are the same as that defined for the A interface in GSM 08.06 for MSC-BSC signaling. In particular, the same conventions are used to transfer and discriminate between any BSSAP and DTAP message contained within the SCCP data field. Since all BSSAP-LE messages applicable to the Lb interface use the same encoding as for the A interface, the conventions used to discriminate a BSSMAP message are applicable to any BSSMAP-LE message on the Lb interface, while the conventions for a DTAP message apply to any DTAP-LE message.

7 Use of BSSAP-LE on the Ls Interface

7.1 Applicable Message Sets

The following BSSAP-LE messages are applicable to the Ls interface between an MSC and SMLC:

- All DTAP-LE messages
- All BSSMAP-LE positioning messages
- All BSSMAP-LE LMU control messages
- All BSSMAP-LE information messages

7.2 MTP Functions

SS7 signaling on the Ls interface may be supported using 56 kbps or 64 kbps digital signaling channels. These may be supported within either E1 or T1 physical links.

For E1 links or where CCITT/ITU SS7 signaling is applicable, the MTP functions as specified in CCITT Recommendations Q.702, Q.703, Q.704 and Q.707 are applicable. For T1 links or where ANSI SS7 signaling is applicable, the MTP functions as specified in ANSI T1.111 are applicable. For the SMLC, the requirements in these recommendations for a signaling end point are applicable. For the MSC, the requirements in these recommendations for both a signaling end point and signaling transfer point (STP) are applicable. MSC support of STP functions is only required for situations in which the SMLC has no signaling links to an STP and needs to access other network entities to which there are no direct point-to-point signaling links.

Where an SMLC supports direct signaling links to one or more MSCs only and has no signaling links to an STP, certain exceptions and modifications to normal CCITT and ANSI requirements may be applied within a PLMN administration.

7.3 SCCP functions

7.3.1 General

For E1 links or where CCITT/ITU SS7 signaling is applicable, the SCCP functions as specified in either CCITT Blue Book Recommendations Q.711, Q.712, Q.713 and Q.714 or ITU White Book Recommendations Q.711, Q.712, Q.713 and Q.714 are applicable, as amended by the exceptions and modifications defined here. For T1 links or where ANSI SS7 signaling is applicable, the SCCP functions as specified in ANSI T1.112 are applicable, as amended by the exceptions and modifications defined here.

Several functions of the SCCP are not used on the Ls interface: error detection, receipt confirmation, flow control.

The segmenting/reassembling function may be used if the total message length exceeds the maximum allowed message length that can be carried by the MTP.

7.3.2 Allowed Exceptions to CCITT Recommendations Q.711-714

Only the following SCCP messages are applicable to the Ls interface:

- Connection Confirm (CC)
- Connection Request (CR)
- Connection Refused (CREF)
- Data Form 1 (DT1)
- Inactivity Test (IT)
- Released (RLSD)
- Release Complete (RLC)
- Subsystem Allowed (SSA)
- Subsystem Prohibited (SSP)
- Subsystem Status Test (SST)
- Unitdata (UDT)
- Unitdata Service (UDTS)

Support of only SCCP protocol classes 0, 1 and 2 is required. For protocol class 2, the "credit" parameter field and the "sequencing/segmenting" parameter fields are not used, but the parameters must still be included in the Inactivity Test (IT) message for syntax reasons. Negotiation of protocol class and flow control is not required for protocol class 2.

The SCCP called party address in a CR or UDT may contain only the subsystem number (SSN) or a signaling point code (SPC) plus SSN or a global title. Use of a global title is not required for SMLC to MSC signaling within the same PLMN. SSN values applicable to the Ls interface are defined in GSM 03.03.

For protocol class 2, support of only a single connection section is required. Use of multiple connection sections is a national concern.

7.3.3 Allowed Exceptions to ANSI T1.112

Only the following SCCP messages are applicable to the Ls interface:

- Connection Confirm (CC)
- Connection Request (CR)
- Connection Refused (CREF)
- Data Form 1 (DT1)
- Inactivity Test (IT)
- Released (RLSD)
- Release Complete (RLC)
- Subsystem Allowed (SSA)
- Subsystem Prohibited (SSP)
- Subsystem Status Test (SST)
- Unitdata (UDT)
- Unitdata Service (UDTS)

Support of only SCCP protocol classes 0, 1 and 2 is required. For protocol class 2, the "credit" parameter field and the "sequencing/segmenting" parameter fields are not used, but the parameters must still be included in the Inactivity Test (IT) message for syntax reasons. Negotiation of protocol class and flow control is not required for protocol class 2.

The SCCP called party address in a CR or UDT may contain only the subsystem number (SSN) or a signaling point code (SPC) plus SSN or a global title. Use of a global title is not required for SMLC to MSC signaling within the same PLMN. SSN values applicable to the Ls interface are defined in GSM 03.03.

For protocol class 2, support of only a single connection section is required. Use of multiple connection sections is a national concern.

7.3.4 Usage of Connectionless SCCP

Connectionless SCCP messages and procedures are used to transfer BSSMAP-LE Connectionless Information messages. Refer to GSM 03.71 for a description of the procedures in the SMLC and MSC. SCCP protocol class 1 shall be used when multiple BSSMAP-LE messages are transferred containing segments of a single fragmented LLP or SMLCPP message.

7.3.5 Usage of Connection Oriented SCCP

Connection oriented SCCP messages and procedures for SCCP protocol class 2 shall be used to transfer BSSMAP-LE positioning messages, BSSMAP-LE LMU control messages, BSSMAP-LE Connection Oriented Information messages and DTAP-LE messages. A separate dedicated SCCP connection shall be used to support either positioning for each target MS or signaling to each type A LMU. Connection establishment shall be instigated when the positioning attempt commences or when a signaling link to a type A LMU needs to be established. Connection release shall be instigated when the positioning attempt has been completed or has failed or when a signaling link to a type A LMU needs to be released. The MSC is normally expected to release the SCCP connection to the SMLC.

Transfer of BSSAP-LE messages within an SCCP connection is shown in the following figure. In particular, a BSSMAP-LE message shall be included in the data field of any SCCP CR and a BSSMAP-LE message may be included in the data fields of an SCCP CC, CREF or RLSD message.

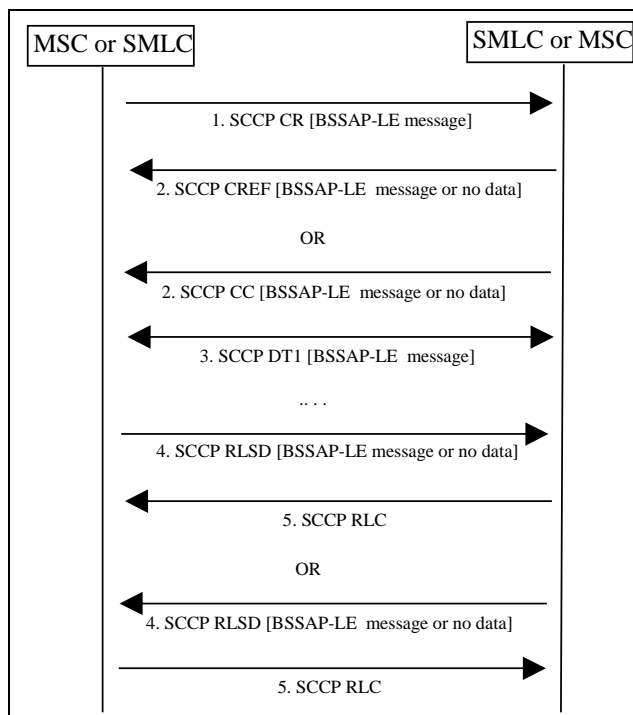


Figure 7.3.5-1/09.31: SCCP Connection Oriented Signaling on Ls Interface

7.3.6 Contents of the SCCP Data Field

The contents of the SCCP data field for BSSMAP-LE and DTAP-LE messages are shown in the following figures.

	8	7	6	5	4	3	2	1
Octet 1	0	0	0	0	0	0	0	D=0
Octet 2	Length indicator = n							
Octet 3 yo Octet n+2	BSSMAP-LE Message Contents							

Figure 7.3.6-1/GSM 09.31: SCCP Data Field for a BSSMAP-LE Message

	8	7	6	5	4	3	2	1
Octet 1	0	0	0	0	0	0	0	D=1
Octet 2	DLCI							
Octet 3	Length indicator = n							
Octet 4 yo Octet n+3	DTAP-LE Message Contents							

Figure 7.3.6-2/GSM 09.31: SCCP Data Field for a DTAP-LE Message

The Discrimination Indicator is coded in bit 1 of octet one and indicates the type of the BSSAP-LE message.

Discrimination Indicator	BSSAP-LE Message Type
0	BSSMAP-LE
1	DTAP-LE

The DLCI in octet 2 is applicable only to DTAP-LE messages and is coded as defined for the A interface in GSM 08.06 for DTAP. For signaling to a type A LMU using an SDCCH and SAPI=0, the value of the DLCI is 10000000.

The length indicator is coded in one octet, and is the binary representation of the number of octets of the subsequent BSSMAP-LE or DTAP-LE message parameter.

7.3.7 Content of DTAP-LE Messages

DTAP-LE messages transferred on the Ls interface are encoded as defined in GSM 04.71. In particular, in octet 1 of any DTAP-LE message, the Protocol discriminator shall indicate LCS and the transaction identifier (TI) shall indicate the transaction between the SMLC and type A LMU. The TI shall be assigned by the SMLC if the transaction is originated from the SMLC and by the LMU if the originator is the LMU. The MSC shall not change the value of the TI when transferring any DTAP-LE message from the SMLC to the LMU or from the LMU to the SMLC.

8 Use of BSSAP-LE on the Lp Interface

8.1 Applicable Message Sets

The following BSSAP-LE messages are applicable to the Lp interface between an SMLC and a peer SMLC.

BSSMAP-LE Connectionless Information message

8.2 MTP Functions

SS7 signaling on the Lp interface may be supported using 56 kbps or 64 kbps digital signaling channels. These may be supported within either E1 or T1 physical links.

Two SMLCs may be connected by direct point-to-point SS7 signaling links or links may be employed via intermediate STPs. Alternatively, signaling transfer between two SMLCs may be supported via intermediate BSCs and/or MSCs using the Lb and/or Ls interfaces. Signaling requirements to support message transfer on the Lp interface via an intermediate Lb or Ls interface are the same as those defined elsewhere in this specification for these interfaces. This section defines the requirements applicable to direct SMLC-SMLC SS7 links and SS7 links from an SMLC to an STP.

For E1 links or where CCITT/ITU SS7 signaling is applicable, the MTP functions as specified in CCITT Recommendations Q.702, Q.703, Q.704 and Q.707 are applicable. For T1 links or where ANSI SS7 signaling is applicable, the MTP functions as specified in ANSI T1.111 are applicable. Only the requirements in these recommendations for a signaling end point are applicable.

Where an SMLC has no signaling links to an STP, certain exceptions and modifications to normal CCITT and ANSI requirements may be applied within a PLMN administration.

8.3 SCCP functions

8.3.1 General

For E1 links or where CCITT/ITU SS7 signaling is applicable, the SCCP functions as specified in either CCITT Blue Book Recommendations Q.711, Q.712, Q.713 and Q.714 or ITU White Book Recommendations Q.711, Q.712, Q.713 and Q.714 are applicable, as amended by the exceptions and modifications defined here. For T1 links or where ANSI SS7 signaling is applicable, the MTP functions as specified in ANSI T1.112 are applicable, as amended by the exceptions and modifications defined here.

8.3.2 Allowed Exceptions to CCITT Recommendations Q.711-714

Only the following SCCP messages are applicable to the Lp interface:

Inactivity Test (IT)

Subsystem Allowed (SSA)

Subsystem Prohibited (SSP)

Subsystem Status Test (SST)

Unitdata (UDT)

Unitdata Service (UDTS)

Support of only SCCP protocol classes 0 and 1 is required.

The SCCP called party address in a UDT may contain only the subsystem number (SSN) or a signaling point code (SPC) plus SSN or a global title. Use of a global title is not required for SMLC to SMLC signaling within the same PLMN. SSN values applicable to the Lp interface are defined in GSM 03.03.

8.3.3 Allowed Exceptions to ANSI T1.112

Only the following SCCP messages are applicable to the Lp interface:

Inactivity Test (IT)

Subsystem Allowed (SSA)

Subsystem Prohibited (SSP)

Subsystem Status Test (SST)

Unitdata (UDT)

Unitdata Service (UDTS)

Support of only SCCP protocol classes 0 and 1 is required.

The SCCP called party address in a UDT may contain only the subsystem number (SSN) or a signaling point code (SPC) plus SSN or a global title. Use of a global title is not required for SMLC to SMLC signaling within the same PLMN. SSN values applicable to the Lp interface are defined in GSM 03.03.

8.3.4 Usage of Connectionless SCCP

Connectionless SCCP messages and procedures shall be used to transfer BSSMAP-LE Connectionless Information messages. Refer to GSM 03.71 for a description of the procedures in the SMLC. SCCP protocol class 1 shall be used when multiple BSSMAP-LE messages are sent containing segments of a single fragmented SMLCPP message.

8.3.5 Usage of Connection Oriented SCCP

Connection oriented SCCP messages and procedures are not applicable to the Lp interface.

8.3.6 Contents of the SCCP Data Field

The contents of the SCCP data field is shown in the following figure.

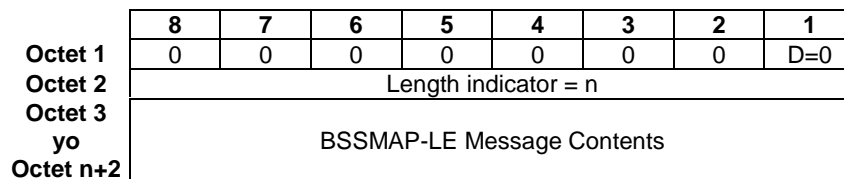


Figure 8.3.6-1/GSM 09.31: SCCP Data Field for a BSSMAP-LE Message

The Discrimination Indicator is coded in bit 1 of octet one and indicates the type of the BSSAP-LE message.

Discrimination Indicator	BSSAP-LE Message Type
0	BSSMAP-LE

The length indicator is coded in one octet, and is the binary representation of the number of octets of the subsequent BSSMAP-LE message parameter.

9 Message Functional Definitions and Contents

9.1 BSSMAP-LE PERFORM LOCATION REQUEST message

This message is sent to request a location estimate for a target MS and contains sufficient information to enable location according to the required QoS using any positioning method supported by the PLMN and, where necessary, MS. The message is also used to request LCS assistance data transfer to an MS or request a deciphering key for LCS broadcast assistance data. The message can be sent from the BSC to the SMLC and from the MSC to the SMLC.

Table 9.1: BSSMAP-LE PERFORM LOCATION REQUEST message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type 17.1.1.1	M	V	1
Location Type	Location Type	M	TLV	4
Cell Identifier	Cell Identifier	M	TLV	3-10
Classmark Information Type 3	Classmark Information Type 3	O	TLV	2-n
LCS Client Type	LCS Client Type	O	TLV	3
Chosen Channel	Chosen Channel	O	TLV	n
LCS Priority	LCS Priority	O	TLV	3
LCS QoS	LCS QoS	O	TLV	6
GPS Assistance Data	GPS Assistance Data	O	TLV	3-n
BSSLAP APDU	APDU	O	TLV	2-n

9.1.1 Location Type

This parameter defines the type of location information being requested.

9.1.2 Cell Identifier

This parameter gives the current cell location of the target MS. The format shall either be the cell global identification or the LAC plus CI form.

9.1.3 Classmark Information Type 3

This parameter indicates the positioning methods supported by the MS as obtained from the MS Classmark 3 received earlier from the target MS.

9.1.4 LCS Client Type

This parameter defines the type of the originating LCS Client. It may be included to assist an SMLC to appropriately prioritize a location request

9.1.5 Chosen Channel

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

9.1.6 LCS Priority

This parameter defines the priority of the location request.

9.1.6a LCS QoS

This parameter provides the required Quality of Service for the LCS Request. Quality of Service may include horizontal accuracy, vertical accuracy and allowed response time.

9.1.7 GPS Assistance Data

This parameter identifies the specific GPS assistance data that may be requested.

9.1.8 BSSLAP APDU

This parameter provides additional measurements (e.g. timing advance) for the target MS from the BSC. The measurements are contained inside a BSSLAP APDU.

9.2 BSSMAP-LE PERFORM LOCATION RESPONSE message

This message is sent in response to a BSSMAP-LE Perform Location Request to return a successful location estimate for a target MS or to indicate some failure in obtaining this. The message is also sent in response to a BSSMAP-LE Perform Location Request to return deciphering keys or an indication that LCS assistance data has been successfully delivered to an MS. The message can be sent from the SMLC to the BSC and from the SMLC to the MSC.

Table 9.2: BSSMAP-LE PERFORM LOCATION RESPONSE message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Location Estimate	Geographic Location	C	TLV	2-22
Positioning Data	Positioning Data	O	TLV	2-n
Deciphering Key	Deciphering Key	O	TLV	10-n
LCS Cause	LCS Cause	O	TLV	3

9.2.1 Location Estimate

This parameter provides a location estimate for the target MS in the case of a successful location attempt.

9.2.2 Positioning Data

This parameter provides additional information for the positioning attempt from the SMLC.

9.2.3 Deciphering Key

This parameter provides one or more deciphering keys that can be used to decode LCS broadcast assistance data by the MS. The SMLC shall provide the current deciphering key for the MS's present location. The SMLC may also provide additional deciphering keys applicable either after the current deciphering key or to data broadcast by other SMLCs.

9.2.4 LCS Cause

The LCS Cause is included if and only if a requested location estimate was not successfully obtained (e.g. location estimate not available or does not meet the required QoS), requested deciphering keys were not successfully returned or requested LCS assistance data was not successfully transferred to the MS. The parameter provides the reason for the failure. If the LCS Cause is included, the Location Estimate, Current Deciphering Key and Next Deciphering Key shall not be included.

9.3 BSSMAP-LE PERFORM LOCATION ABORT message

This message is sent by the instigator of a location request to abort the positioning attempt or the request for assistance data or deciphering keys. This message can be sent from the MSC to the SMLC and from the BSC to the SMLC.

Table 9.3: BSSMAP-LE PERFORM LOCATION ABORT message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
LCS Cause	LCS Cause	M	TLV	3

9.3.1 LCS Cause

The LCS Cause provides the reason for the aborting the location attempt.

9.4 BSSMAP-LE LMU CONNECTION REQUEST message

This message is sent to request the establishment of a signaling connection between an LMU and an SMLC. The message can be sent from an SMLC to an MSC and from an MSC to an SMLC.

Table 9.4: BSSMAP-LE LMU CONNECTION REQUEST message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
IMSI	IMSI	M	TLV	3-10
Sender Address	Signaling Point Code	O	TLV	2-n
Security	Security	O	TLV	2-n
Call Number	ISDN Address	O	TLV	3-n

9.4.1 IMSI

This parameter identifies the LMU using its E.212 IMSI.

9.4.2 Sender Address

This parameter provides the SS7 signaling point code for the sender of the message. The parameter is mandatory for message transfer between an MSC and SMLC on the Ls interface.

9.4.3 Security

This parameter indicates if authentication or ciphering are required for the LMU. This parameter may be included for message transfer from an SMLC. If the parameter is absent, authentication and ciphering shall be assumed not to be required.

9.4.4 Call Number

This parameter may be included in an LMU connection request sent by an MSC to enable the SMLC to subsequently establish a TCH to the LMU.

9.5 BSSMAP-LE LMU CONNECTION ACCEPT message

This message is sent in response to a BSSMAP-LE LMU Connection Request message to accept the establishment of a signaling connection between an LMU and an SMLC. The message can be sent from an SMLC to an MSC and from an MSC to an SMLC.

Table 9.5: BSSMAP-LE LMU CONNECTION ACCEPT message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Security	Security	O	TLV	3
Call Number	ISDN Address	O	TLV	3-n

9.5.1 Security

This parameter indicates if authentication or ciphering are required for the LMU. This parameter may be included for message transfer from an SMLC. If the parameter is absent, authentication and ciphering shall be assumed not to be required.

9.5.2 Call Number

This parameter may be included in an LMU connection accept sent by an MSC to enable the SMLC to subsequently establish a TCH to the LMU.

9.6 BSSMAP-LE LMU CONNECTION REJECT message

This message is sent in response to a BSSMAP-LE LMU Connection Request message to reject the establishment of a signaling connection between an LMU and an SMLC. The message can be sent from an SMLC to an MSC and from an MSC to an SMLC.

Table 9.6: BSSMAP-LE LMU CONNECTION REQUEST message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Reject Cause	LMU Cause	M	TLV	3-10

9.6.1 Reject Cause

This parameter provides the reason for the rejection of an LMU connection.

9.7 BSSMAP-LE LMU CONNECTION RELEASE message

This message is sent to release a signaling connection between an LMU and an SMLC. The message can be sent from an SMLC to an MSC and from an MSC to an SMLC.

Table 9.7: BSSMAP-LE LMU CONNECTION RELEASE message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Release Cause	LMU Cause	M	TLV	3-10

9.7.1 Release Cause

This parameter provides the reason for the release of an LMU connection.

9.8 BSSMAP-LE CONNECTION ORIENTED INFORMATION message

This message is sent in association with an existing signaling connection between an SMLC and another entity to transfer information between the SMLC and other entity belonging to a higher level protocol. The message can be sent from an SMLC to an MSC, from an MSC to an SMLC, from a BSC to an SMLC and from an SMLC to a BSC.

Table 9.8: BSSMAP-LE CONNECTION ORIENTED INFORMATION message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
BSSLAP APDU	APDU	M	TLV	3-n

9.8.1 BSSLAP APDU

This parameter contains a BSSLAP message.

9.9 BSSMAP-LE CONNECTIONLESS INFORMATION message

This message conveys signaling information associated with a higher protocol level between an SMLC and another entity when there is no existing signaling connection association. The message can be sent from an SMLC to an MSC, from an MSC to an SMLC, from a BSC to an SMLC, from an SMLC to a BSC and from an SMLC to another SMLC..

Table 9.9: BSSMAP-LE CONNECTIONLESS INFORMATION message content

Information element	Type / Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Source Identity	Network Element Identity	M	TLV	3-n
Destination Identity	Network Element Identity	M	TLV	3-n
APDU	APDU	O	TLV	3-n
Return Error Request	Return Error Request	O	TLV	2
Return Error Cause	Return Error Cause	O	TLV	3

9.9.1 Source Identity

This parameter identifies the original source of the message. The original source can either be an SMLC or a Type B LMU. The source is identified by association with either a location area or a cell site.

9.9.2 Destination Identity

This parameter identifies the final destination of the message. The final destination can either be an SMLC or a Type B LMU. The destination is identified by association with either a location area or a cell site.

9.9.3 APDU

This parameter contains an embedded APDU. For information transfer between an SMLC and Type B LMU this shall be an LLP APDU. For information transfer between two peer SMLCs, this shall be an SMLCPP APDU.

9.9.4 Return Error Request

This parameter may be included to request an error response if BSSMAP-LE message cannot be delivered successfully to its final destination. This parameter shall not be included if the Return Error cause is present.

9.9.5 Return Error Cause

This parameter indicates an error response for a BSSMAP-LE connectionless information message that could not be delivered to its final destination. The APDU should be present and the same as the APDU in the original undelivered message. The source and destination identities shall be included and the same as the destination and source identities, respectively, in the original undelivered message.

10 Message format and information element coding

This clause specifies the coding of the Information Elements used by the BSSAP-LE protocol. The spare bits in the coding of an IE shall be set to zero by the sender and shall be ignored by the receiver.

All unassigned codes (whether omitted or explicitly *Unassigned* in the text) shall be treated as unknown (see clause 'Error Handling and Future Compatibility').

The following conventions are assumed for the sequence of transmission of bits and bytes:

- Each bit position is marked as 1 to 8. Bit 1 is the least significant bit and is transmitted first.
- In an element octets are identified by number, octet 1 is transmitted first, then octet 2 etc.

When a field extends over more than one octet, the order of bit values progressively decreases as the octet number increases. The least significant bit of the field is represented by the lowest numbered bit of the highest numbered octet of the field.

- For variable length elements a length indicator is included, this indicates the number of octets following in the element.
- All fields within Information Elements are mandatory unless otherwise specified. The Information Element Identifier shall always be included.

All spare bits are set to 0.

For any information element of format TLV, the length indicator octet, as in GSM 08.08, defines the number of octets in the information element that follow the length indicator octet.

10.1 Message type

Message type uniquely identifies the message being sent. It is a single octet element, mandatory in all messages.

Table 10.1/GSM 09.31: Message type information element

Category	8 7 6 5 4 3 2 1	Message Type
POSITIONING MESSAGES	0 0 0 0 0 0 0 0	Reserved.
	0 0 1 0 1 0 1 1	BSSMAP-LE PERFORM LOCATION REQUEST
	0 0 1 0 1 1 0 1	BSSMAP-LE PERFORM LOCATION RESPONSE
	0 0 1 0 1 1 1 0	BSSMAP-LE PERFORM LOCATION ABORT
LMU CONTROL MESSAGES	0 0 0 0 0 0 0 0	BSSMAP-LE LMU CONNECTION REQUEST
	0 0 0 0 0 0 0 1	BSSMAP-LE LMU CONNECTION ACCEPT
	0 0 0 0 0 0 1 0	BSSMAP-LE LMU CONNECTION REJECT
	0 0 0 0 0 0 1 1	BSSMAP-LE LMU CONNECTION RELEASE
INFORMATION MESSAGES	0 0 1 0 1 0 1 0	BSSMAP-LE CONNECTION ORIENTED INFORMATION
	0 0 1 1 1 0 1 0	BSSMAP-LE CONNECTIONLESS INFORMATION

10.2 Information Element Identifiers

The next list shows the coding of the Information Element Identifiers used in the present document.

Table 10.2/GSM 09.31: Information Element Identifier coding

8 7 6 5 4 3 2 1	Information element	Reference
0 0 1 1 1 1 1 0	LCS QoS	10.15
0 0 1 1 1 1 1 1	LCS Priority	10.14
0 1 0 0 0 0 1 1	Location Type	10.16
0 1 0 0 0 1 0 0	Geographic Location	10.8
0 1 0 0 0 1 0 1	Positioning Data	10.18
0 1 0 0 0 1 1 0	LCS Cause	10.12
0 1 0 0 0 1 1 1	LCS Client Type	10.13
0 1 0 0 1 0 0 0	APDU	10.3
0 1 0 0 1 0 0 1	Network Element Identity	10.17
0 1 0 0 1 0 1 0	GPS Assistance Data	10.9
0 1 0 0 1 0 1 1	Deciphering Key	10.7
0 1 0 0 1 1 0 0	Return Error Request	10.19
0 1 0 0 1 1 0 1	Return Error Cause	10.20
0 0 0 1 0 0 1 1	Classmark Information Type 3	10.6
0 0 0 0 0 1 0 1	Cell Identifier	10.4
0 0 1 0 0 0 0 1	Chosen Channel	10.5
0 0 0 0 0 0 0 0	IMSI	10.10
0 0 0 0 0 0 0 1	ISDN Address	10.11
0 0 0 0 0 0 1 0	Security	10.21
0 0 0 0 0 0 1 1	Signaling Point Code	10.22

10.3 APDU

This is a variable length information element that conveys an embedded message or message segment associated with a higher level protocol.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	S	Protocol ID						
Octet 4 to Octet n	The rest of the information element contains a message whose content and encoding are defined according to the protocol ID.							

Figure 10.3.1/GSM 09.31: APDU IE

Protocol ID (bits 7-1 of octet 3)

- 0000000 reserved
- 0000001 BSSLAP
- 0000010 LLP
- 0000011 SMLCPP

S (Segmentation Bit, bit 8 of octet 3)

- 0 final segment in a segmented message or a non-segmented message or segmenting not indicated
- 1 non-final segment in a segmented message

Embedded Message (octets 4-n)

- BSSLAP the embedded message is as defined in GSM 08.71
- LLP the embedded message contains a Facility Information Element as defined in GSM 04.71 excluding the Facility IEI and length of Facility IEI octets defined in GSM 04.71.
- SMLCPP the embedded message is as defined in GSM 08.31

10.4 Cell Identifier

This is a variable length information element identifying a particular cell.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	The rest of the information element is coded as the value part of the Cell Identifier IE defined in GSM 08.08.							

Figure 10.4.1/GSM 09.31: Cell Identifier IE

10.5 Chosen Channel

This information element identifies a type of radio interface channel.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	The rest of the information element is coded as the value part of the Chosen Channel IE defined in GSM 08.08.							

Figure 10.5.1/GSM 09.31: Chosen Channel IE

10.6 Classmark Information Type 3

This information element contains classmark information for a target MS obtained from the MS Classmark 3 defined in GSM 04.08.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	The rest of the information element is coded as the value part of the Classmark Information Type 3 IE defined in GSM 08.08.							

Figure 10.6.1/GSM 09.31: Classmark Information Type 3 IE

10.7 Deciphering Keys

This information element defines the deciphering keys which should be used by the MS to decode LCS broadcast assistance data. The parameter includes the following data fields:

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	spare							Ciphering Key Flag
Octet 4	Current Deciphering Key Value							
...								
Octet 10								
Octet 11	Next Deciphering Key Value							
...								
Octet 17								

Figure 10.7.1/GSM 09.31: Deciphering Keys IE

Ciphering Key Flag (octet 3)

This flag indicates the current Ciphering Key Flag used in the LCS assistance data broadcast messages in the location area.

Current Deciphering Key Value (octet 4 – 10)

Current Deciphering Key contains the 56 bit deciphering key that is currently in use in location area for deciphering the LCS assistance data broadcast messages.

Next Deciphering Key (octet 11 – 17)

Next Deciphering Key contains the 56 bit deciphering key that will be used next in location area for deciphering the LCS assistance data broadcast messages..

10.8 Geographic Location

This is a variable length information element providing an estimate of a geographic location.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	The rest of the information element contains an octet sequence identical to that for the Ext-GeographicalInformation data type in GSM 09.02.							
to								
Octet n								

Figure 10.8.1/GSM 09.31: Geographic Location IE

10.9 GPS Assistance Data

This is a variable length information element identifying the GPS assistance data requested for an MS.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	spare				Eph	ACQ	SAT	
Octet 4	Satellite related data							
to								
Octet 8+2n								

Figure 10.9.1/GSM 09.31: GPS Assistance Data IE

SAT – Satellite related data (bit 1 of octet 3)

0 : Satellite related data is not requested – octets 4 to 8+2n are not present

1 : Satellite related data is requested – octets 4 to 8+2n are present

ACQ – Acquisition Assistance (bit 2 of octet 3)

0 : Acquisition Assistance is not requested

1 : Acquisition Assistance is requested

Eph – Ephemeris Compression (bit 3 of octet 3)

This field indicates the compression method for ephemeris update.

0: Ephemeris compression can be incorporated into requested Navigation Model information.

1: Ephemeris compression cannot be incorporated in requested Navigation Model information.

	8	7	6	5	4	3	2	1
Octet 4	H	G	F	E	D	C	B	A
Octet 5	GPS Week		spare					
Octet 6	GPS Week							
Octet 7	GPS_Toe							
Octet 8	Spare	NSAT				T-Toe limit		
Octet 9	spare		SatID 1					
Octet 10	IODE 1							
...								
Octet 7+2n	spare		SatID n					
Octet 8+2n	IODE n							

Figure 10.9.2/GSM 09.31: Coding of Satellite Related Data

Octets 4 and 5

bit A Almanac

0 : Almanac is not requested

1 : Almanac is requested

bit B UTC Model

0 : UTC Model is not requested

1 : UTC Model is requested

bit C Ionospheric Model

0 : Ionospheric Model is not requested

1 : Ionospheric Model is requested

bit D Navigation Model

0 : Navigation Model is not requested

1 : Navigation Model is requested

bit E DGPS Corrections

0 : DGPS Corrections are not requested

1 : DGPS Corrections are requested

bit F Reference Location

0 : Reference Location is not requested

1 : Reference Location is requested

bit G Reference Time

0 : Reference Time is not requested

1 : Reference Time is requested

bit H spare

At least one of bits A, B, C, D, E, F, or G shall be set to the value "1".

GPS Week (bits 7-8 octet 5 and octet 6)

This field contains a 10 bit binary representation of the GPS Week of the assistance currently held by the MS. The most significant bit of the GPS Week is bit 8 in octet 5 and the least significant bit is bit 1 in octet 6.

GPS_Toe (octet 7)

This field contains a binary representation of the GPS time of ephemeris in hours of the latest ephemeris set contained in handset memory (range 0-167).

NSAT (octet 8, bits 4-7)

This field contains a binary representation of the number of satellites to be considered for the current GPS assistance request.

T-Toe limit (octet 8, bits 1-3)

This field contains a binary representation of the ephemeris age tolerance of the MS to the network in hours.

SatID x (x = 1,2, ... n) (octet 7 + 2x, bits 1-6)

This field contains a binary representation of the identity of a satellite for which the assistance request is applicable. The number of satellite fields is indicated in the field NSAT.

IODE x (x = 1,2, ... n) (octet 8 + 2x)

This field contains a binary representation of the Issue of Data Ephemeris, which identifies the sequence number for the satellite x (x = 1, 2, ..., n).

10.10 IMSI

The IMSI is of variable length and is coded as a sequence of BCD digits, compressed two into each octet. This is a variable length element, and includes a length indicator. The IMSI is defined in GSM 03.03. It shall not exceed 15 digits (see GSM 03.03).

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	IMSI digit 1				odd/ even	0	0	0
Octet 4	IMSI digit 3				IMSI digit 2			
Octet 4+x	IMSI digit i+1				IMSI digit i			

Figure 10.10.1/GSM 09.31: IMSI IE

Where $x = (i-2)/2$ and i is always even

* The value of the odd/even bit (bit 4 in octet 3) indicates:

- 0 Even number of IMSI digits
- 1 Odd number of IMSI digits

If the number of IMSI digits is even then bits 5 to 8 of the last octet shall be filled with an end mark coded as 1111.

10.11 ISDN Address

This information element contains an ISDN address.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	The rest of the information element contains an octet string coded the same as the ISDN-AddressString common data type defined in GSM 09.02							

Figure 10.11.1/GSM 09.31: ISDN Address IE

10.12 LCS Cause

The LCS Cause parameter is of variable length IE and provides the reason for an unsuccessful location request.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	Cause value							
Octet 4	Diagnostic value (note 1)							

NOTE 1: The inclusion of this octet depends on the cause value

Figure 10.12.1/GSM 09.31: LCS Cause IE

Table 10.12.1/GSM 09.31: Cause value

LCS Cause value (octet 2)	
Bits	
8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	Unspecified
0 0 0 0 0 0 0 1	System Failure
0 0 0 0 0 0 1 0	Protocol Error
0 0 0 0 0 0 1 1	Data missing in position request
0 0 0 0 0 1 0 0	Unexpected data value in position request
0 0 0 0 0 1 0 1	Position method failure
0 0 0 0 0 1 1 0	Target MS Unreachable
0 0 0 0 0 1 1 1	Location request aborted
0 0 0 0 1 0 0 0	
	to <i>unspecified</i> in this version of the protocol
1 1 1 1 1 1 1 1	

Diagnostic value (octet 4):

this octet may be included if the cause value indicates "position method failure", the binary encoding of this octet shall encode the same set of values as defined for the PositionMethodFailure-Diagnostic in GSM 09.02. Values outside those defined in GSM 09.02 shall be ignored by a receiver.

10.13 LCS Client Type

This information element identifies the type of LCS Client.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	Client Category				Client Subtype			

Figure 10.13.1/GSM 09.31: LCS Client Type IE

The client category (bits 8-5 of octet 2) and the client subtype (bits 4-1 of octet 2) are coded as follows.

Client Category	Client Subtype	Explanation
0000	0000 all values	Value Added Client unspecified reserved
0010	0000 0001 0010 0011 0100 other values	PLMN operator unspecified broadcast service O&M anonymous statistics Target MS service support reserved
0011	0000 other values	Emergency services unspecified reserved
0100	0000 other values	Lawful Intercept services unspecified reserved
0101 – 1111	all values	reserved

10.14 LCS Priority

This information element defines the priority level of a location request.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	This octet is coded as the LCS-Priority octet in GSM 09.02.							

Figure 10.14.1/GSM 09.31: LCS Priority IE

10.15 LCS QoS

This information element defines the Quality of Service for a location request.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	spare							VERT
Octet 4	HA	Horizontal Accuracy						
Octet 5	VA	Vertical Accuracy						
Octet 6	RT		spare					

Figure 10.15.1/GSM 09.31: Cell Identifier IE

Octet 3

VERT = vertical coordinate indicator
0 : vertical coordinate not requested
1 : vertical coordinate is requested

Octet 4

bit 8 HA = horizontal accuracy indicator
0 : Horizontal Accuracy is not specified
1 : Horizontal Accuracy is specified

bits 7-1 Horizontal Accuracy :
spare (set all zeroes) if HA=0
set to 7 bit uncertainty code in GSM 03.32 if HA=1

Octet 5 – applicable only if VERT = 1

bit 8 VA = vertical accuracy indicator
0 : Vertical Accuracy is not specified
1 : Vertical Accuracy is specified

bits 7-1 Vertical Accuracy :
spare (set all zeroes) if VA=0
set to 7 bit uncertainty altitude code in GSM 03.32 if VA=1

Octet 6

bits 8-7 RT = response time category
00 : Response Time is not specified
01 : Low Delay
10 : Delay Tolerant
11 : reserved

bits 6-1 spare

10.16 Location Type

This is a variable length information element defining the type of location information being requested.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	Location Information							
Octet 4	Positioning Method							

Figure 10.16.1/GSM 09.31: Location Type IE

Coding of location information (octet 3):

00000000 current geographic location
00000001 location assistance information for the target MS
00000010 deciphering key for broadcast assistance data for the target MS
all other values are reserved

Positioning Method (octet 4)

This octet shall be included if the location information in octet 3 indicates "location assistance information for the target MS" and shall be omitted otherwise.

- 00000000 reserved
- 00000001 Mobile Assisted E-OTD
- 00000010 Mobile Based E-OTD
- 00000011 GPS
- all other values are reserved

10.17 Network Element Identity

This is a variable length information element identifying a network element, by association with either a designated cell site or a designated location area.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	spare				Identity Discriminator			
Octet 4 to Octet n	Network Element Identification							

Figure 10.17.1/GSM 09.31: Network Element Identity IE

Identity Discriminator (bits 4-1 of octet 3)

- 0000 Identification using the LAC as defined in GSM 03.03
- 0001 Identification using LAC + CI as defined in GSM 03.03

	8	7	6	5	4	3	2	1
Octet 4	LAC							
Octet 5	LAC - continued							

Figure 10.17.2/GSM 09.31: Coding of Network Element Identification using the LAC

	8	7	6	5	4	3	2	1
Octet 4	LAC							
Octet 5	LAC - continued							
Octet 6	CI value							
Octet 7	CI value - continued							

Figure 10.17.3/GSM 09.31: Coding of Network Element Identification using the LAC + CI

10.18 Positioning Data

This is a variable length information element providing positioning data associated with a successful or unsuccessful location attempt for a target MS.

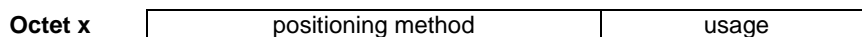
	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	spare				Positioning Data Discriminator			
Octets 4-4+m	Positioning Method 1							
Octets ..-4+nm	Positioning Method n							

Figure 10.18.1/GSM 09.31: Positioning Data IE

The positioning data discriminator (bits 4-1 of octet 3) defines the type of data provided for each positioning method:

- 0000 indicate usage of each positioning method that was attempted either successfully or unsuccessfully
- all other values are reserved

Coding of the positioning method octets for positioning data discriminator = 0:



Coding of positioning method (bits 8-4):

- 00000 Timing Advance
- 00001 TOA
- 00010 AOA
- 00011 Mobile Assisted E-OTD
- 00100 Mobile Based E-OTD
- 00101 Mobile Assisted GPS
- 00110 Mobile Based GPS
- 00111 Conventional GPS
- 01000
- to reserved for GSM
- 01111
- 10000
- to reserved for network specific positioning methods
- 11111

Coding of usage (bits 3-1)

- 000 Attempted unsuccessfully due to failure or interruption
- 001 Attempted successfully: results not used to generate location
- 010 Attempted successfully: results used to verify but not generate location
- 011 Attempted successfully: results used to generate location
- 100 Attempted successfully: case where MS supports multiple mobile based positioning methods and the actual method or methods used by the MS cannot be determined

10.19 Return Error Request

The Return Error Request parameter indicates a request from the source of a BSSMAP-LE connectionless information message for an error response if the message cannot be delivered to its final destination.

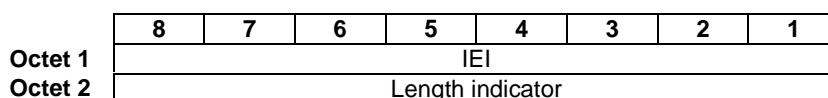


Figure 10.19.1/GSM 09.31: Return Error Request IE

10.20 Return Error Cause

The Return Error Cause parameter provides the reason for unsuccessful delivery of a BSSMAP-LE Connectionless Information message to its final destination.

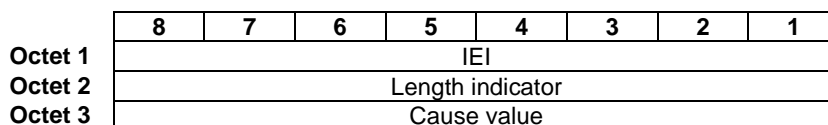


Figure 10.20.1/GSM 09.31: Return Error Cause IE

Table 10.20.1/GSM 09.31: Cause value

Cause value (octet 2)	
Bits	
8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	Unspecified
0 0 0 0 0 0 0 1	System Failure
0 0 0 0 0 0 1 0	Protocol Error
0 0 0 0 0 0 1 1	Destination unknown
0 0 0 0 0 1 0 0	Destination unreachable
0 0 0 0 0 1 0 1	Congestion
0 0 0 0 0 1 1 0	
	to <i>unspecified</i> in this version of the protocol
1 1 1 1 1 1 1 1	

10.21 Security

This information element defines what security measures are needed for signaling to an LMU.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	spare						CIPH	AUTH

Figure 10.21.1/GSM 09.31: Security IE

Coding of octet 3:

- bit 1 AUTH = authentication indicator
 - 0 : authentication of LMU not required
 - 1 : authentication of LMU required
- bit 2 CIPH = ciphering indicator
 - 0 : ciphering of LMU signaling data not required
 - 1 : ciphering of LMU signaling data required

10.22 Signaling Point Code

This is a variable length information element providing that provides the signaling point code of a network element.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octets 3-n	Signaling Point Code value							

Figure 10.22.1/GSM 09.31: Signaling Point Code IE

There are three options for the coding of Signaling Point Code value; 2 octets containing a 14 bit ITU code, 3 octets containing a 24 bit unstructured code and 3 octets containing a 24 bit ANSI structured code.

Encoding of 14 bit ITU signaling point code:

Octet 3	0	0	signaling point code (high order bits)					
Octets 4	signaling point code (low order bits)							

Encoding of a 24 bit unstructured signaling point code:

Octet 3	signaling point code (high order octet)
Octet 4	signaling point (second octet)
Octets 5	signaling point code (low order octet)

Encoding of a 24 bit ANSI structured signaling point code:

Octet 3	Network Identifier
Octet 4	Network Cluster
Octets 5	Network Cluster Member

Annex A (informative): Change History

Change history						
Meeting#	Spec	Version	CR	<Phase>	New Version	Subject/Comment
SMG#30bis	09.31		-	R98	7.0.0	Approved at SMG#30bis as Release 98

History

Document history		
V7.0.0	January 2000	Publication