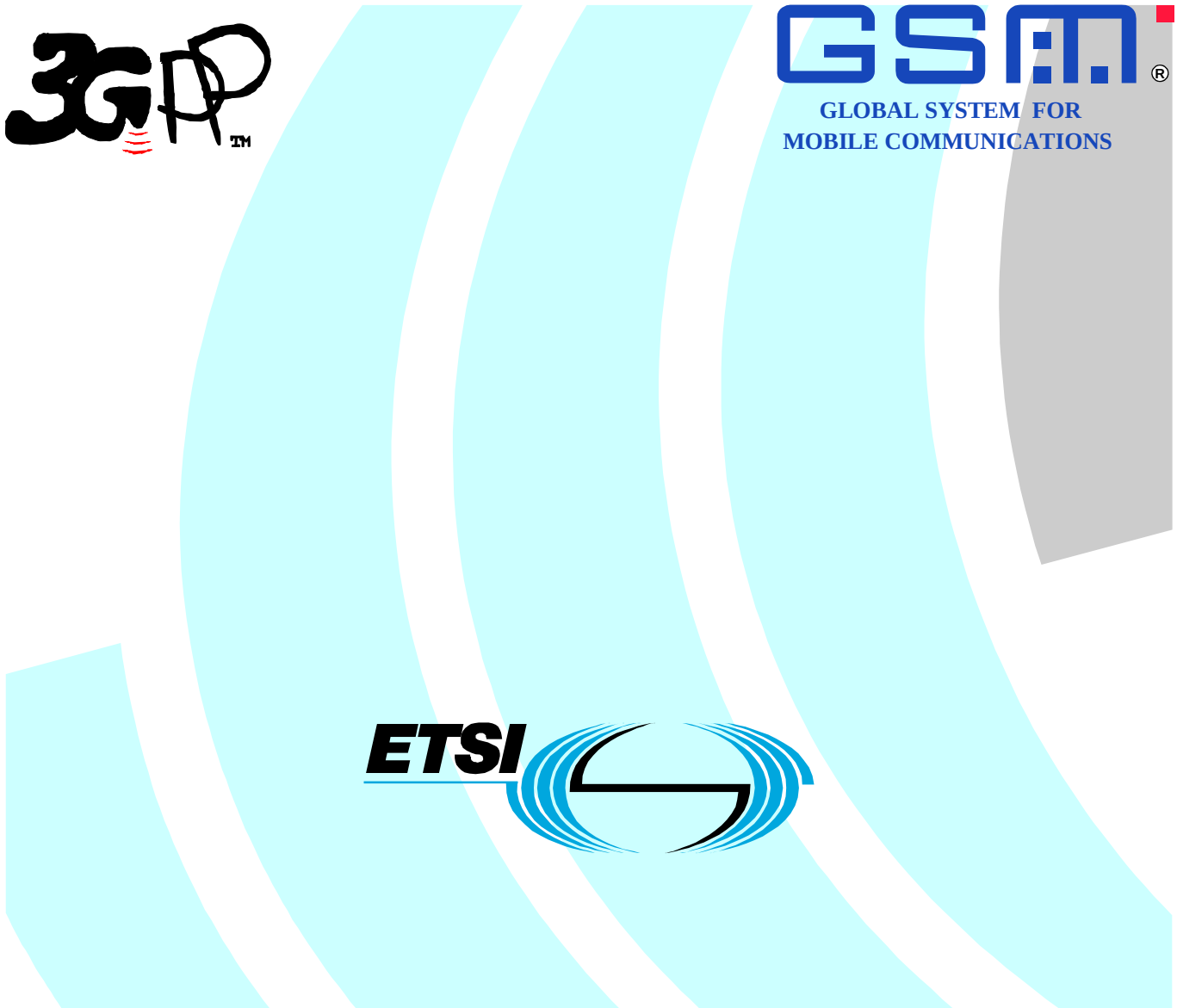
ETSI TS 149 031 V5.2.0 (2002-02)

Technical Specification

Digital cellular telecommunications system (Phase 2+);
Location Services (LCS);
Base Station System Application Part
LCS Extension (BSSAP-LE)
(3GPP TS 49.031 version 5.2.0 Release 5)



Reference
RTS/TSGG-0249031v520

Keywords
GSM

ETSI

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Foreword

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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 the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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- x the first digit:
  - 1 presented to TSG for information;
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- z the third digit is incremented when editorial only changes have been incorporated in the document.

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 3GPP TS 43.059:

- Lb interface (BSC-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 ITU-T 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 3GPP TS 24.008 and 48.008) 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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[1a] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[2] 3GPP TS 43.059: "Functional Stage 2 Description of Location Services in GERAN".

[3] 3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control Protocol".

[3a] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core Network Protocols; Stage 3".

[4] 3GPP TS 44.031: "Location Services (LCS); Mobile Station (MS) – Serving Mobile Location Center (SMLC); Radio Resource LCS Protocol (RRLP)".

[5] 3GPP TS 44.071: "Location Services (LCS); Mobile radio interface layer 3 Location Services (LCS) specification".

[6] 3GPP TS 48.006: "Signaling transport mechanism specification for the Base Station Subsystem – Mobile-services Switching Centre (BSS - MSC) interface".

[7] 3GPP TS 48.008: "Mobile-services Switching Centre – Base Station System (MSC-BSS) interface; Layer 3 specification".

[8] 3GPP TS 48.031: "Location Services (LCS); Serving Mobile Location Center – Serving Mobile Location Center (SMLC - SMLC); SMLCPP specification".

[9] 3GPP TS 48.071: "Serving Mobile Location Center – Base Station Subsystem (SMLC-BSS) interface Layer 3 specification".

[10] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[10a] 3GPP TS 23.003: "Numbering, addressing and identification".

[11] ITU-T Recommendation Q.702: "Signalling data link".

[12] ITU-T Recommendation Q.703: "Signalling link".

[13] ITU-T Recommendation Q.704: "Signalling network functions and messages".

[14] ITU-T Recommendation Q.707: "Testing and maintenance".

[15] ITU-T Recommendation Q.711: "Functional description of the signalling connection control part".

[16] ITU-T Recommendation Q.712: "Definition and function of signalling connection control part messages".

[17] ITU-T Recommendation Q.713: "Signalling connection control part formats and codes".

[18] ITU-T Recommendation Q.714: "Signalling connection control part procedures".

[19] ANSI T1.111 (1996): "Signalling System Number 7 – Message Transfer Part".

[20] ANSI T1.112 (1996): "Signalling System Number 7 (SS7) - Signalling Connection Control Part Functional Description".

[21] TIA/EIA/IS-J-STD-036 (2000): "Wireless Enhanced Emergency Services".

[22] 3GPP TS 48.018: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP)".

3 Definitions, abbreviations and symbols

For the purposes of the present document, the definitions, symbols and abbreviations listed in 3GPP TS 21.905 and 3GPP TS 43.059 apply.

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 transfered between an SMLC and a Type A LMU and comprise the following individual messages:

- REGISTER;
- FACILITY;
- RELEASE COMPLETE.

The content, encoding and certain procedures asssociated with DTAP-LE messages are defined in 3GPP TS 44.071.

4.2 BSSMAP-LE Messages

BSSMAP-LE messages are transferred between a BSS and SMLC and comprise the following individual messages:

BSSMAP-LE Positioning Messages:

- Perform Location Request;
- Perform Location Response;

- Perform Location Abort;
- Perform Location Information.

BSSMAP-LE Information Messages:

- Connection Oriented Information;
- Connectionless Information.

BSSMAP-LE General Messages:

- Reset;
- Reset Acknowledge.

The content and encoding of BSSMAP-LE messages are defined in the present document.

5 Procedures applicable to use of BSSAP-LE

5.1 Location Request

The Location Request procedure is applicable to the Lb interface. Its purpose is to obtain a location estimate for a target MS that is already in dedicated mode, in packet transfer mode, in packet idle mode, or in dual transfer 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 is the BSS. The procedure makes use of SCCP connection oriented signaling on the Lb interface.

5.1.1 Successful Operation

The initiator of the location request 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 (C).
- Chosen Channel (C).
- LCS Priority (C).
- LCS QoS (C).
- Requested GPS Assistance Data (C).
- BSSLAP APDU (C).
- LCS Capability (O).
- Packet Measurement Report (O).
- Measured Cell Identity List (O).

If requested, the SMLC performs positioning of the target MS using a particular position method or a combination of more than one positioning method. If neither the Classmark Information Type 3 IE nor the LCS Capability IE is present, the SMLC shall instigate only network based positioning methods (e.g. TA but not GPS or E-OTD).

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.

Additional procedures defined in 3GPP TS 24.008 and 3GPP TS 48.008 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. This message contains the following mandatory, conditional and optional parameters.

- Location Estimate (M).
- Positioning Data (C).

Restrictions on the geographic shape encoded within the Location Estimate parameter may exist for certain LCS client types. The SMLC shall comply with any restrictions defined in 3GPP specifications and, in a particular country, with any restrictions defined for a specific LCS client type in relevant national standards. For example, in the US, national interim standard TIA/EIA/IS-J-STD-036 [21] restricts the geographic shape for an emergency services LCS client to minimally either an "ellipsoid point" or an "ellipsoid point with uncertainty circle and confidence" as defined in 3GPP TS 23.032.

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). 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. 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).

If assistance data or deciphering keys for a specific positioning method is not supported in the network or in the location area, the SMLC shall indicate this with LCS Cause value "Position method failure" accompanied with diagnostic value "Position Method Not Available in Network" or "Position Method Not Available in Location Area".

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, or if there is an Inter NSE cell change in the PS Domain (e.g. detected by the BSS at receipt of BSSGP FLUSH-LL PDU) for which the BSS is unable to maintain the positioning procedure, 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.

5.1.4 Overload

If the SMLC is in an overload condition, it may reject a BSSMAP-LE Perform Location request by returning a BSSMAP-LE Perform Location response containing an LCS Cause parameter indicating congestion. The initiator of the location service request (BSC) may reduce the frequency of future location service requests until rejection due to overload has ceased. In reducing the frequency of location service requests, a BSC shall reduce lower priority requests, to zero if necessary, before reducing the frequency of higher priority requests. An SMLC shall similarly reject location service requests of a lower priority, to zero if necessary, due to overload before rejecting location service requests of a higher priority. An SMLC in an overload condition may optionally employ the following procedures to alleviate overload:

a) Allow higher priority location service requests to preempt lower priority requests for which location service procedures are already in progress.

b) Abort lower priority location service requests already in progress.

c) Reduce the supported QoS for lower priority requests for a location estimate – e.g. by reducing accuracy or increasing response time.

d) Employ MS based positioning methods, where supported by the target MS and SMLC, rather than MS assisted or network based methods (except TA).

The priority of a location service request shall be defined according to the value in the LCS Priority parameter. If this parameter is absent in a BSSMAP-LE Perform Location request, the lowest priority shall be assumed.

5.2 Connection Oriented Information Transfer

The Connection Oriented Information transfer procedure is applicable to the Lb interface. It enables two way transfer of BSSLAP messages between an SMLC and the BSS serving a target MS. The initiator of the procedure can be either the BSS serving 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 interface and uses the same SCCP connection as the location request procedure for the particular target MS.

5.2.1 Successful Operation

An SMLC or BSS with a BSSLAP message 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);
- (Segmentation (C)).

If the sender is an SMLC, the message is transferred to the BSS. The BSS shall then perform the positioning operation requested by the BSSLAP APDU (refer to 3GPP TS 48.071). If the BSSLAP APDU contains an RRLP APDU, the BSS shall transfer this to the target MS.

If the sender is a BSS 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 BSS, 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.

If a BSS receives an error from SGSN after having attempted to transfer the information via SGSN to an MS for PS domain positioning, the BSS shall notify the SMLC with a BSSLAP Abort message.

5.2.3 Segmentation

Segmentation is only included for support of interoperability with Legacy (3GPP R4 and older) equipment when a segmented message is received from a Legacy node. 3GPP R5 and later equipment shall not initiate the use of segmentation.

The Segmentation parameter shall not be included if the BSSLAP message is not segmented.

If the size of an embedded BSSLAP message is too large to fit into one BSSMAP-LE message, the sending entity divides the BSSLAP message to a necessary number of BSSMAP-LE messages each containing a BSSLAP APDU IE and a Segmentation IE. In the BSSLAP APDU IE it includes as many octets as possible.

The segmentation IE contains a segment number field and an indication of the final segment. Message identification shall not be used. The order number of a segment in the Segment Number field in the Segmentation IE is incremented by one starting from zero, i.e. the value is 0 for the first segment, 1 for the next and so on. The receiving entity may use the segment number in order to recognize the start of a new BSSLAP message and verify that all segments were reliably transferred.

In case of handover interrupting the information transfer procedure, the exception procedures described in 3GPP TS 43.059 shall be used.

5.3 Connectionless Information Transfer

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

5.3.1 Successful Operation

An SMLC or BSS 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);
- APDU (M);
- Segmentation (C);
- Return Error Request (O).

The source entity identifies the sender. The recipient entity identifies the final destination. The Segmentation IE provides segmentation and message identification for a segmented APDU. The Return Error Request may be included to request notification in the event of unsuccessful transfer and indicate the type of notification needed. 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 entity capable of onward transfer to the final destination.

5.3.2 Unsuccessful Operation

If the message cannot be transferred by an intermediate entity or destination entity (e.g. reassembly of a segmented message fails) and the Return Error Request is not included, the message shall be discarded. If the Return Error Request is included, the intermediate or destination entity shall, depending on the Return Error Request type, send a BSSMAP-LE Connectionless Information message to, or towards, the original source containing the following parameters:

- Source Entity (M);
- Destination Entity (M);
- APDU (C);
- Segmentation (C);
- Return Error Cause (M).

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 and Segmentation IEs shall, depending on the Return Error Request type, contain any originally received APDU and Segmentation IEs, respectively.

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.

5.3.4 Segmentation

The Segmentation parameter shall not be included if the APDU is not segmented.

If the size of an APDU containing an embedded SMLCPP message is too large to fit into one BSSMAP-LE message, the sending entity divides the SMLCPP message to a necessary number of BSSMAP-LE messages each containing an APDU IE and a Segmentation IE. In the APDU IE it includes as many octets as possible.

The segmentation IE contains a segment number, an indication of the final segment and the message ID. The order number of a segment in the Segment Number field in the APDU IE is incremented by one starting from zero, i.e. the value is 0 for the first segment, 1 for the next and so on. The receiving entity recognizes that a segment is missing or duplicated, when:

- There is more than one segment with the same segment number and same Message ID.
- The segment number does not increase by steps of one starting from zero.

If the recipient recognizes a missing or duplicated element, it shall discard the entire message (i.e. all received segment with the message ID).

The message identity in the Message ID field in the APDU IE is used to recognize a particular message to which that segment belongs. The sending entity can select any of the available values (0-65535) that is not currently used between it and the receiving entity.

If an APDU segment is received with Return Error cause IE (due to invocation of the return error option), reassembly does not apply and the APDU segment and error cause maybe returned to the original source application.

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 visted 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 3GPP TS 43.071). 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 3GPP TS 43.071).

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 3GPP TS 43.071). 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 Void

5.6 DTAP-LE Information Transfer

The DTAP-LE Information transfer procedure is applicable to the Lb interface. It supports two way LLP message transfer between an 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 BSC 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 BSC inside a DTAP-LE REGISTER, FACILITY or RELEASE COMPLETE message. The usage of these messages is as defined in 3GPP TS 44.071. The BSC relays each DTAP-LE message to the LMU.

5.6.2 DTAP-LE Information Transfer Initiated by the BSC

The BSC initiates the procedure when a DTAP message is received from an LMU. The BSC then relays the DTAP message to the SMLC.

5.7 Reset

The reset procedure is an optional procedure within a PLMN applicable to the Lb interface. It enables an SMLC or BSS that has undergone a failure with loss of memory of LMU signalling connections and location service transactions to indicate this to a partner entity (SMLC or BSS). The recipient entity can then release its own connection and transaction resources. The reset procedure may not be applicable when only a limited part of an SMLC or BSS has suffered a failure, since error recovery procedures specific to individual connections and transactions may then be used.

5.7.1 Normal Operation

In the event of a failure at an SMLC or BSS that results in the loss of LMU connection information and location service information, a Reset message may be sent to the partner SMLC or BSS across the Lb interface. The message carries no parameters and is sent using connectionless SCCP procedures. The sending entity shall ensure that all information on LMU connections and location service transactions to the other entity is reinitialized to indicate no existing connections and transactions.

On receiving a Reset message, the recipient SMLC or BSS shall clear all references and state information for LMU connections and location service transactions to the sending entity and shall release any associated resources including, in the case of a recipient BSS, any signaling connections or circuit connections to LMUs controlled by a sending SMLC. The recipient entity shall then return a Reset Acknowledge message.

For a reset on the Lb interface where the SMLC and BSS support circuit connections to LMUs (in addition to signaling connections), the entity that does not control assignment of circuits shall initiate blocking procedures (Block or Circuit Group Block procedure as defined in 3GPP TS 48.008) for all circuits that are locally blocked on its own side. The initiation of blocking may occur before sending or receipt, whichever applies, of the Reset Acknowledge.

5.7.2 Abnormal Conditions

If an initiating SMLC or BSS receives no response to a Reset message following an O&M administered time period, it shall resend the Reset message. For successive no response conditions, sending shall occur a maximum of "n" times, where "n" is an O&M administered parameter. Following "n" unsuccessful, reset attempts, the procedure shall be terminated and maintenance shall be informed.

5.8 Perform Location Information

The Perform Location Information procedure is applicable to the Lb interface. It enables an SMLC to be informed by the BSS when a target MS in the PS domain (A/Gb-mode) has changed serving cell. 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 interface and uses the same SCCP connection as the location request procedure for the particular target MS.

The BSS initiates the procedure when a location request procedure for the target MS is ongoing in the PS domain and the BSS has determined that the target MS has changed cell (e.g. by reception of a BSSGP FLUSH-LL PDU). The BSS sends a Perform Location Information message to the SMLC. This procedure may also optionally be initiated by the BSS for Intra-BSC handover during positioning of a target MS in the CS domain when no BSSLAP procedure is ongoing. The message contains the following mandatory (M) and conditional (C) information.

- Cell Identifier (M).
- BSSLAP APDU (C).

The BSSLAP APDU shall be included and include the Timing Advance value, if that value is available for the target MS in the new cell.

On receiving the Perform Location Information message, the SMLC shall store the new Cell Identifier value and the Timing Advance value, if provided.

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 BSS:

- All DTAP-LE messages;
- All BSSMAP-LE positioning messages;

- All BSSMAP-LE information messages;
- All BSSMAP-LE general messages.

The following BSSMAP messages defined in 3GPP TS 48.008 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);
- Classmark Update (BSC to SMLC);
- Clear Command (SMLC to BSC);
- Clear Complete (BSC to SMLC);
- Clear Request (BSC to SMLC);
- Complete Layer 3 Information (BSC to SMLC);
- Confusion (BSC to SMLC);
- Handover Required (BSC to SMLC);
- Handover Required Reject (SMLC to BSC);
- Handover Performed (BSC to SMLC);
- Paging (SMLC to BSC).

The following additional BSSMAP messages defined in 3GPP TS 48.008 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 (two way);
- Blocking Acknowledge (two way);
- Unblock (two way);
- Unblocking Ack. (two way);
- Unequipped circuit (two way).

The following DTAP messages defined in 3GPP TS 24.008 and 3GPP TS 44.018 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 3GPP TS 24.008 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 (two way).
- Release (two way).
- Release Complete (two way).

6.2 MTP Functions

Except where defined otherwise in the present document, MTP requirements on the Lb interface for the BSS are the same as those defined for the A interface in 3GPP TS 48.006 for the BSC. MTP requirements on the Lb interface for the SMLC are the same as those defined for the A interface in 3GPP TS 48.006 for the MSC. STP functions are not required in the SMLC and a single signaling link set may be used between the BSS and SMLC. The BSS 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 the present document, SCCP requirements on the Lb interface for the BSS are the same as those defined for the A interface in 3GPP TS 48.006 for the BSC. SCCP requirements on the Lb interface for the SMLC are the same as those defined for the A interface in 3GPP TS 48.006 for the MSC. Requirements concerning support of a type A LMU are the same as those in 3GPP TS 48.006 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 3GPP TS 48.008. Refer to 3GPP TS 43.059 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 3GPP TS 48.006 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 BSS when the positioning attempt commences. Connection release shall be instigated by either the BSS 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.

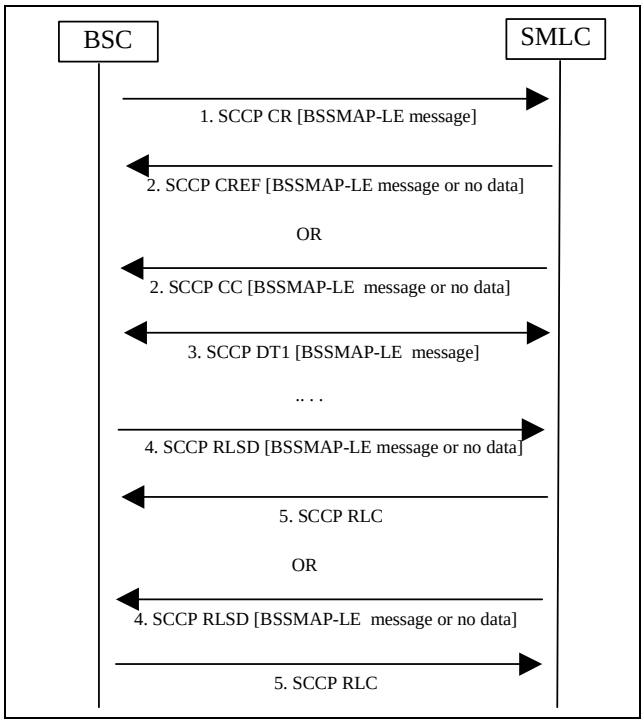

Figure 6.3.3/49.031: SCCP Connection Oriented Signaling on Lb Interface for Positioning

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 3GPP TS 48.006 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.

6.3.5 Abnormal Conditions

If a user-out-of-service information or signalling-point-inaccessible information is received by a BSS or SMLC, no new attempt to establish SCCP connections towards the affected point code shall be started until the corresponding user-in-service information or signalling-point-accessible information is received.

When a user-out-of-service information or signalling-point-inaccessible is received, an optional timer may be started. If the timer expires all the SCCP connections towards the affected point code shall be released. When the user-in-service or signalling-point-accessible is received, the timer is stopped.

If an SCCP connection is released, the optional timer expires or a connection refusal is received, any dependent BSSAP-LE procedure between the SMLC and BSS shall be terminated and, at a BSS, any associated SCCP connection or location service transaction to an MSC, or any associated signaling or circuit connection to an LMU, shall be released using appropriate signalling procedures.

7 Void

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 BSSs and/or MSCs using the Lb and/or Ls interfaces. Signaling requirements to support message transfer on the Lp interface via an intermediate Lb interface are the same as those defined elsewhere in the present document for these interfaces. This clause defines the requirements applicable to direct SMLC-SMLC SS7 links and SS7 links from an SMLC to an STP.

For E1 links or where ITU-T/ITU SS7 signaling is applicable, the MTP functions as specified in ITU-T 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 ITU-T and ANSI requirements may be applied within a PLMN administration.

8.3 SCCP functions

8.3.1 General

For E1 links or where ITU-T/ITU SS7 signaling is applicable, the SCCP functions as specified in either ITU-T 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 ITU-T 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 3GPP TS 23.003.

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 3GPP TS 23.003.

8.3.4 Usage of Connectionless SCCP

Connectionless SCCP messages and procedures shall be used to transfer BSSMAP-LE Connectionless Information messages. Refer to 3GPP TS 43.059 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.

	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 to Octet n+2	BSSMAP-LE Message Contents							

Figure 8.3.6-1/3GPP TS 49.031: SCCP Data Field for a BSSMAP-LE Message

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

Discrmination 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

For each message there is, in this clause, a table listing the signalling elements in their order of appearance in the transmitted message.

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 keys for LCS broadcast assistance data The message can be sent from the BSS 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	M	V	1
Location Type	Location Type	M	TLV	3-4
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	C	TLV	3
Chosen Channel	Chosen Channel	O	TLV	2-n
LCS Priority	LCS Priority	O	TLV	3
LCS QoS	LCS QoS	O	TLV	6
Requested GPS Assistance Data	Requested GPS Assistance Data	O	TLV	3-n
BSSLAP APDU	APDU	O	TLV	2-n
LCS Capability	LCS Capability	O	TLV	3-n
Packet Measurement Report	Packet Measurement Report	O	TLV	2-n
Measured Cell Identity List	Cell Identity List	O	TLV	6-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 shall be included if the Location Type indicates a request for a location estimate and may be included in other cases 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 Requested 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 and measurement report) in a BSSLAP TA Layer3 message for the target MS from the BSS. The measurements are contained inside a BSSLAP APDU. This parameter shall be included for location requests for the PS Domain in A/Gb-mode when the timing advance value is available in the BSS.

9.1.9 LCS Capability

This parameter provides information about the LCS capabilities of the target MS. This IE and the Classmark Information Type 3 IE are mutually exclusive.

9.1.10 Packet Measurement Report

This parameter provides information about the neighbour measurements that the target MS has performed for a positioning request in the PS domain.

9.1.11 Measured Cell Identity List

This parameter provides information about the cell identities relative to the packet measurement report IE.

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 BSS.

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 Keys	Deciphering Keys	O	TLV	17
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 Keys

This parameter provides two deciphering keys that can be used to decode LCS broadcast assitance data by the MS. The SMLC shall provide the current deciphering key for the MS's present location. The SMLC shall also provide the next deciphering key applicable after the current deciphering key .

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 and 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 BSS 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 Void

9.5 Void

9.6 Void

9.7 Void

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 a BSS to an SMLC and from an SMLC to a BSS.

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
Segmentation	Segmentation	C	TLV	3

9.8.1 BSSLAP APDU

This parameter contains a BSSLAP message.

9.8.2 Segmentation

This parameter contains segmentation information for a segmented APDU. The parameter shall not include message information. The parameter shall be included if and only if the BSSLAP APDU is segmented.

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 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
Segmentation	Segmentation	C	TLV	5
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 Segmentation

This parameter contains segmentation and message information for a segmented APDU. The parameter shall be included if and only if a segmented APDU is present.

9.9.5 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.

9.9.6 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.

9.10 BSSMAP-LE RESET message

This message is sent to indicate a failure in the sending entity with loss of memory of LMU connections and location service transactions that were established or were being established. The message may be sent from an SMLC to a BSS and from a BSS to an SMLC.

This message is sent as a connectionless SCCP message.

Table 9.10: BSSMAP-LE RESET message content

Information element	Type/Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Cause	Cause	M	TLV	3-4

9.11 BSSMAP-LE RESET ACKNOWLEDGE message

This message is sent in response to a Reset message to indicate that references and resources associated with LMU connections and location service transactions towards the entity sending the Reset have been released. The message may be sent from an SMLC to a BSS and from a BSS to an SMLC.

This message is sent as a connectionless SCCP message.

Table 9.11: BSSMAP-LE RESET ACKNOWLEDGE message content

Information element	Type/Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1

9.12 BSSMAP-LE PERFORM LOCATION INFORMATION message

This message is sent from the BSS to the SMLC to notify the SMLC that the target MS is now located in a new cell.

Table 9.12: BSSMAP-LE PERFORM LOCATION INFORMATION message content

Information element	Type/Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Cell Identifier	Cell Identifier	M	TLV	3-10
BSSLAP APDU	APDU	O	TLV	2-n

9.12.1 Cell Identifier

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

9.12.2 BSSLAP APDU

This parameter provides additional measurements (timing advance) in a BSSLAP TA Layer3 message for the target MS from the BSS. The measurements are contained inside a BSSLAP APDU.

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 explicitely *Unassigned* in the text) shall be treated as unknown.

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 3GPP TS 48.008, 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 10.1/3GPP TS 49.031: Message type information element

Category	8 7 6 5 4 3 2 1	Message Type
	0 0 0 0 0 0 0 0	Reserved.
POSITIONING MESSAGES		
	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
	0 0 1 0 1 1 1 1	BSSMAP-LE PERFORM LOCATION INFORMATION
Reserved (NOTE)		
	0 0 0 0 0 0 0 1	Reserved (note)
	0 0 0 0 0 0 1 0	Reserved (note)
	0 0 0 0 0 0 1 1	Reserved (note)
	0 0 0 0 0 1 0 0	Reserved (note)
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
GENERAL MESSAGES		
	0 0 1 1 0 0 0 0	RESET
	0 0 1 1 0 0 0 1	RESET ACKNOWLEDGE

NOTE: These values of the codepoints shall not be used as they were used in an earlier version of the protocol.

10.2 Information Element Identifiers

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

Table 10.2/3GPP TS 49.031: 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	10.16
0 1 0 0 0 0 1 1	LCS Priority	10.15
0 1 0 0 0 1 0 0	Location Type	10.18
0 1 0 0 0 1 0 1	Geographic Location	10.9
0 1 0 0 0 1 1 0	Positioning Data	10.20
0 1 0 0 0 1 1 1	LCS Cause	10.13
0 1 0 0 1 0 0 0	LCS Client Type	10.14
0 1 0 0 1 0 0 1	APDU	10.3
0 1 0 0 1 0 1 0	Network Element Identity	10.19
0 1 0 0 1 0 1 1	Requested GPS Assistance Data	10.10
0 1 0 0 1 1 0 0	Deciphering Keys	10.8
0 1 0 0 1 1 0 1	Return Error Request	10.21
0 1 0 0 1 1 1 0	Return Error Cause	10.22
0 1 0 0 1 1 1 1	Segmentation	10.24
0 0 0 1 0 0 1 1	Classmark Information Type 3	10.7
0 0 0 0 0 1 0 0	Cause	10.4
0 0 0 0 0 1 0 1	Cell Identifier	10.5
0 0 1 0 0 0 0 1	Chosen Channel	10.6
0 0 0 0 0 0 0 0	Reserved (note)	
0 0 0 0 0 0 0 1	Reserved (note)	
0 0 0 0 0 0 1 0	Reserved (note)	
0 0 0 0 0 0 1 1	Reserved (note)	
0 0 0 0 0 1 0 0	Reserved (note)	
0 1 0 1 0 0 0 0	LCS Capability	10.26
0 1 0 1 0 0 0 1	Packet Measurement Report	10.27
0 1 0 1 0 0 1 0	Cell Identity List	10.X
NOTE: These values of the codepoints shall not be used as they were used in an earlier version of the protocol.		

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 2-3	Length indicator							
Octet 4	Spare	Protocol ID						
Octet 5 to Octet n	The rest of the information element contains a message or message segment whose content and encoding are defined according to the protocol ID.							

Figure 10.3.1/3GPP TS 49.031: APDU IE

Length Indicator (octets 2-3).

The most significant bit is bit 8 of Octet 2, and the least significant bit is bit 1 in Octet 3. The length indicator defines the total number of octets after length indicator.

Protocol ID (bits 7-1 of octet 4).

0000000 reserved

0000001 BSSLAP

0000010 LLP

0000011 SMLCPP

Embedded Message (octets 5-n)

BSSLAP	the embedded message is as defined in 3GPP TS 48.071
LLP	the embedded message contains a Facility Information Element as defined in 3GPP TS 44.071 excluding the Facility IEI and length of Facility IEI octets defined in 3GPP TS 44.071.
SMLCPP	the embedded message is as defined in 3GPP TS 48.031

10.4 Cause

This is a variable length information element indicating the reason for sending a Reset message.

	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 Cause IE defined in 3GPP TS 48.008.							

Figure 10.4.1/3GPP TS 49.031: Cause IE

10.5 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 3GPP TS 48.008.							

Figure 10.5.1/3GPP TS 49.031: Cell Identifier IE

10.6 Chosen Channel

This information element identifiers 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 3GPP TS 48.008.							

Figure 10.6.1/3GPP TS 49.031: Chosen Channel IE

10.7 Classmark Information Type 3

This information element contains classmark information for a target MS obtained from the MS Classmark 3 defined in 3GPP TS 24.008.

	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 3GPP TS 48.008.							

Figure 10.7.1/3GPP TS 49.031: Classmark Information Type 3 IE

10.8 Deciphering Keys

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

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

Figure 10.8.1/3GPP TS 49.031: 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.

10.9 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 to Octet n	The rest of the information element contains an octet sequence identical to that for the Ext-GeographicalInformation data type in 3GPP TS 29.002.							

Figure 10.9.1/3GPP TS 49.031: Geographic Location IE

10.10 Requested 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	H	G	F	E	D	C	B	A
Octet 4	P	O	N	M	L	K	J	I
Octet 5 to Octet 8+2n	Satellite related data							

Figure 10.10.1/3GPP TS 49.031: Requested GPS Assistance Data IE

Octet 3
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 – octets 5 to 8+2n are not present
1: Navigation Model is requested – octets 5 to 8+2n are present

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 Acquisition Assistance
0: Acquisition Assistance is not requested
1: Acquisition Assistance is requested

bit I Real-Time Integrity
0: Real-Time Integrity is not requested
1: Real-Time Integrity is requested

bits J through P are Spare bits

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

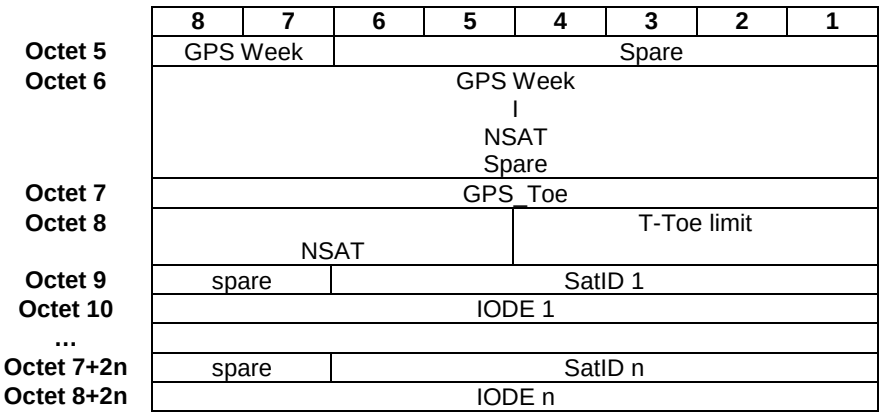

Figure 10.10.2/3GPP TS 49.031: Coding of Satellite Related Data

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 5-8)

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

T-Toe limit (octet 8, bits 1-4)

This field contains a binary representation of the ephemeris age tolerance of the MS to the network in hours (range 0-10).

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).

10.11 Void

10.12 Void

10.13 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)							

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

Figure 10.13.1/3GPP TS 49.031: LCS Cause IE

Table 10.13.1/3GPP TS 49.031: Cause value

LCS Cause value (octet 3) 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	Facility not supported
0 0 0 0 1 0 0 1	Inter-BSC Handover Ongoing
0 0 0 0 1 0 1 0	Intra-BSC Handover Complete
0 0 0 0 1 0 1 1	Congestion
0 0 0 0 1 1 0 0	Inter NSE cell change
0 0 0 0 1 1 0 1	Routing Area Update
0 0 0 0 1 1 1 0	PTMSI reallocation
0 0 0 0 1 1 1 1	Suspension of GPRS services
0 0 0 1 0 0 0 0 to *unspecified* 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 3GPP TS 29.002. Values outside those defined in 3GPP TS 29.002 shall be ignored by a receiver.

10.14 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 10.14.1/3GPP TS 49.031: LCS Client Type IE

The client category (bits 8-5 of octet 3) and the client subtype (bits 4-1 of octet 3) are coded as follows.

Client Category	Client Subtype	Explanation
0000		Value Added Client
	0000	unspecified
	all values	reserved
0010		PLMN operator
	0000	unspecified
	0001	broadcast service
	0010	O&M
	0011	anonymous statistics
	0100	Target MS service support (note 1)
	other values	reserved
		note 1: includes a CAMEL phase 3 LCS client
0011		Emergency services
	0000	unspecified
	other values	reserved
0100		Lawful Intercept services
	0000	unspecified
	other values	reserved
0101 – 1111	all values	reserved

10.15 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 3GPP TS 29.002.							

Figure 10.15.1/3GPP TS 49.031: LCS Priority IE

10.16 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 10.16.1/3GPP TS 49.031: LCS QoS 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 3GPP TS 23.032 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 3GPP TS 23.032 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

10.17 Void

10.18 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 10.18.1/3GPP TS 49.031: Location Type IE

Coding of location information (octet 3):

00000000 current geographic location
00000001 location assistance information for the target MS
00000010 deciphering keys 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" or "deciphering keys for broadcast assistance data for the target MS" and shall be omitted otherwise.

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

10.19 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 Discrminator			
Octet 4 to Octet n	Network Element Identification							

Figure 10.19.1/3GPP TS 49.031: Network Element Identity IE

Identity Discriminator (bits 4-1 of octet 3)

0000 Identification using the MCC + MNC +LAC + CI as defined in 3GPP TS 23.003

0001 Identification using LAC + CI as defined in 3GPP TS 23.003

0100 Identification using the MCC + MNC + LAC as defined in 3GPP TS 23.003

0101 Identification using the LAC as defined in 3GPP TS 23.003

0110 Identification using LMU ID as defined below

All other values are reserved.

	8	7	6	5	4	3	2	1
Octet 4 to Octet 10	MCC+MNC+LAC+CI							

Figure 10.19.2/3GPP TS 49.031: Coding of Network Element Identification using the MCC+MNC+LAC+CI

Octets 4 to 10 are coded as the Cell Identification of the Cell Identifier IE for Cell identification discriminator = 0000 defined in 3GPP TS 48.008.

	8	7	6	5	4	3	2	1
Octet 4 to Octet 7	LAC + CI							

Figure 10.19.3/3GPP TS 49.031: Coding of Network Element Identification using the LAC + CI

Octets 4 to 7 are coded as the Cell Identification of the Cell Identifier IE for Cell identification discriminator = 0001 defined in 3GPP TS 48.008.

	8	7	6	5	4	3	2	1
Octet 4 to Octet 6	MCC+ MNC							
Octet 7 to Octet 8	LAC							

Figure 10.19.4/3GPP TS 49.031: Coding of Network Element Identification using the MCC + MNC + LAC

Octets 4 to 8 are coded as the corresponding octets in the Cell Identification of the Cell Identifier List IE for Cell identification discriminator = 0100 defined in 3GPP TS 48.008.

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

Figure 10.19.5/3GPP TS 49.031: Coding of Network Element Identification using the LAC

Octets 4 to 5 are coded as the corresponding octets in the Cell Identification of the Cell Identifier List IE for Cell identification discriminator = 0101 defined in 3GPP TS 48.008.

	8	7	6	5	4	3	2	1
Octet 4	LMU ID							
…	LMU ID - continued							
Octet n	LMU ID - continued							

Figure 10.19.6/3GPP TS 49.031: Coding of Network Element Identification using the LMU ID

Octets 4 and possible additional octets are coded as one to six octets of unformatted data. The maximum allowed length for the LMU ID is 6 (in this case octet 4-9 carry the LMU ID). This type of Network Element Identity is a BSS allocated address for an LMU. It shall not be used for addressing an SMLC and shall not be used when the Network Element Identity is sent to the core network (i.e. one of the other choices above shall be used in such a case).

10.20 Positioning Data

This is a variable length information element providing positioning data associated with a successful or unsuccessful locatiomn 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 10.20.1/3GPP TS 49.031: Positioning Data IE

The positioning data discrminator (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 postioning method octets for positioning data discrminator = 0:

Octet x	positioning method	usage

Coding of positioning method (bits 8-4):

00000 Timing Advance
00001 Reserved (Note)
00010 Reserved (Note)
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

NOTE: These values of the codepoints shall not be used as they were used in an earlier version of the protocol.

10.21 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.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	Return Error Type							

Figure 10.21.1/3GPP TS 49.031: Return Error Request IE

Coding of Return Error Type (octet 3):

00000000 Return an unsegmented APDU or the first segment of a segmented APDU; no Return Error shall be sent if no APDU was received or if a subsequent segment of a segmented APDU was received

00000001
to
11111111 Reserved for future use

10.22 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.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	Cause value							

Figure 10.22.1/3GPP TS 49.031: Return Error Cause IE

Table 10.22.1/3GPP TS 49.031: Cause value

Cause value (octet 3) 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 1 1 1 1 1 1 1 1	*unspecified* in this version of the protocol

10.23 Void

10.24 Segmentation

This is a variable length information element that carries information for a segmented APDU.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octets 3-n	Segmentation and Message Information							

Figure 10.24.1/3GPP TS 49.031: Segmentation IE

There are two options for the coding of the Segmentation and Message Information portion; 1 octet containing segmentation information only and 3 octets containing segmentation and message information.

Encoding of Segmentation Information:

	8	7	6	5	4	3	2	1
Octet 3	Spare			S	Segment Number			

Figure 10.24.2/3GPP TS 49.031: Segmentation Information

Encoding of Segmentation and Message Information:

	8	7	6	5	4	3	2	1
Octet 3	Spare			S	Segment Number			
Octet 4-5	Message ID							

Figure 10.24.3/3GPP TS 49.031: Segmentation and Message Information

S (Segmentation Bit, bit 5 of octet 3)

0 final segment of a segmented message

1 non-final segment of a segmented message

Segment Number (bits 4-1 of octet 3)

This field contains a 4 bit binary representation of the segment number. The first segment has the value '0000', the next '0001', and so on.

Message ID (octets 4 and 5)

This field contains a 16 bit binary representation of the message identity, i.e. values 0-65535 are possible.

This field is used to identify to which messages different segments belong to.

10.25 Void

10.26 LCS Capability

This is a variable length information element that carries the LCS capabilities for the target MS.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3-n	Rest of element coded as the value part of the LCS Capability information element in 3GPP TS 48.018, not including 3GPP TS 48.018 IEI and length indicator.							

Figure 10.26.1/3GPP TS 49.031: LCS Capability IE

10.27 Packet Measurement Report

This is a variable length information element that carries the packet measurement report for the target MS.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3-n	Rest of element coded as the Packet Measurement Report message or the Packet Enhanced Measurement Report message starting with the 6-bit MESSAGE_TYPE (see clause 11 in 3GPP TS 44.060) and ending with the Non-distribution contents (i.e. the RLC/MAC padding bits are not included). The end of the message is padded with 0-bits to the nearest octet boundary.							

Figure 10.27.1/3GPP TS 49.031: Packet Measurement Report IE

10.28 Cell Identity List

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 Identity List IE defined in 3GPP TS 48.071.							

Figure 10.5.1/3GPP TS 49.031: Cell Identifier IE

Annex A (informative): Change history

Change history				
Meeting#	**CR**	**Rev**	**Subject/Comment**	**New Version**
SMG#31			Version for Release 1999	8.0.0
SMG#31bis	A013		Addition of Integrity Monitor Status	8.1.0
SMG#31bis	A009		Addition of missing "LMU Cause" IE	8.1.0
SMG#31bis	A011	1	Correction of Message Type Encoding and GPS Assistance Data IE	8.1.0
SMG#31bis	A012		Addition of Global reset and SCCP error procedures	8.1.0
SMG#32	A016		Error handling in case requested position method is not supported	8.2.0
GP-01	A018	1	Geographic Shape restriction in LCS	8.3.0
GP-01	-	-	References to GSM xx.xx changed to 3GPP TS xx.xx	8.3.0
GP-04	A019	2	New issue to support LCS (Rel 4)	49.031 v4.0.0
GP-06	004		Correction of Location Type IE length in BSSMAP-LE PERFORM LOCATION REQUEST message (Rel-4)	4.1.0
GP-06	003	2	Introduction of LCS for GPRS to BSSAP-LE (Rel-5)	5.0.0
-	-	-	Editorial corrections	5.0.1
GP-07	014		Editorial corrections	5.1.0
GP-07	011	3	Inter NSE Cell Change for LCS for GPRS	5.1.0
GP-07	008		Define IE's order of appearance in BSSAP-LE message	5.1.0
GP-07	016	1	Define number of keys in Deciphering Keys IE	5.1.0
GP-07	010		Removal of invalid crossreference.	5.1.0
GP-07	013		Addition of Cell Identifier List related to Packet Measurement report information	5.1.0
GP-08	017	2	Transparent Address in Network Element Identity	5.2.0

History

Document history		
V5.2.0	February 2002	Publication