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Digital cellular telecommunications system (Phase 2+) (GSM); Location Services (LCS); Base Station System Application Part LCS Extension (BSSAP-LE) (3GPP TS 49.031 version 14.0.0 Release 14)

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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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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 either ITU-T and ANSI versions of SS7 MTP or IETF M3UA/SCTP 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)".

[23]   IETF STD 51, RFC 1661(07/1994): "The Point-To-Point Protocol (PPP)".

[24]   IETF STD 51, RFC 1662(07/1994): "PPP in HDLC-like Framing".

[25]   IETF RFC 2507(02/1999): "IP header compression".

[26]   IETF RFC 1990(07/1994): "The PPP Multilink Protocol (MP)".

[27]   IETF RFC 2686(09/1999): "The Multi-Class Extension to Multi-Link PPP".

[28]   IETF RFC 2509(02/1999): "IP Header Compression over PPP".

[29]   3GPP TS 29.202: "SS7 Signalling Transport in Core Network; Stage 3".

[30]   Galileo OS SIS ICD/D.0 "Galileo Open Service, Signal In Space Interface Control Document/Draft 0".

[31]   Global Navigation Satellite System GLONASS Interface Control Document, Version 5, 2002.

[32]   BDS-SIS-ICD-B1I-1.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal B1I (Version 1.0)", December 2012.

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).

- GANSS Location Type (C)

- 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).

- IMSI of target MS (O).

- IMEI of target MS (O).

- Requested GANSS Assistance Data (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. 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 and U-TDOA 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, 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).

- GANSS 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 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).

- GANSS 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, GANSS 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, GANSS 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 and M3UA/SCTP 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 and M3UA/SCTP 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. The SMLC is primarily responsible for ensuring release – e.g. in the event that the BSS waits for the SMLC to instigate release.

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: 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 sub-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.

It is recommended that when IP transport (via M3UA/SCTP) is used, the data link layer is implemented using Ethernet. A node using IP transport having interfaces connected via low bandwidth PPP links like E1/T1 shall also support IP Header Compression [25] and the PPP extensions ML/MC-PPP [26], [27]. In this case, the negotiation of header compression [25] over PPP shall be performed according to [28].

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. For M3UA/SCTP signalling, functions as specified in 3GPP TS 29.202 [29] 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 are 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: 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.

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 content.

NOTE: The contained BSSMAP-LE message may itself contains an APDU containing either a complete LLP or SMLCPP message or a part of segmented SMLCPP message.

9 Message Functional Definitions and Contents

For each message there is, in this sub-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 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
IMSI	IMSI	O (Note 1)	TLV	5-10
IMEI	IMEI	O (Note 1)	TLV	10
GANSS Location Type	GANSS Location Type	C	TLV	3
Requested GANSS Assistance Data	Requested GANSS Assistance Data	O	TLV	3-n
NOTE 1: The IMSI should be sent preferably if known. The IMEI could be sent if the IMSI is not known, or in addition to the IMSI for the purpose of allowing correlation between the two identities.				

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.

9.1.12 IMSI

This parameter identifies the IMSI of the target Mobile Station.

9.1.13 IMEI

This parameter identifies the IMEI of the target Mobile Station.

9.1.14 GANSS Location Type

This parameter identifies the GANSS Location type.

9.1.15 Requested GANSS Assistance Data

This parameter identifies the specific GNSS (e.g. Galileo) assistance data that may be requested.

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	3-4
Velocity Data	Velocity Data	O	TLV	6-9
GANSS Positioning Data	GANSS Positioning Data	O	TLV	3-n

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), 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.

9.2.5 Velocity Data

This parameter gives an estimate of the velocity of an MS and for certain encodings the uncertainty of the estimate. The estimate is expressed in terms of any of the velocity descriptions defined by 3GPP TS 23.032 and is composed of the velocity type plus the encoding of that type.

9.2.6 GANSS Positioning Data

This parameter provides additional information for the positioning attempt in case where GANSS has been used. It describes the nature of GANSS used.

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	3-4

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 sub-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.

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: 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: 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
1 0 0 0 0 0 1 0	GANSS Location Type	10.33
0 1 0 0 0 1 0 1	Geographic Location	10.9
0 1 0 0 0 1 1 0	Positioning Data	10.20
1 0 0 0 0 0 1 1	GANSS Positioning Data	10.32

0 1 0 1 0 1 0 1	Velocity Data	10.30
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 0 0 0 1	Requested GANSS Assistance Data	10.31
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	IMSI	10.11
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	10.28
1 0 0 0 0 0 0 0	IMEI	10.29
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: 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: 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: 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: 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: 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: 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 Geographical Information defined in 3GPP TS 23.032..							

Figure 10.9.1: Geographic Location IE

Geographical Information (octet 3 to n)

This parameter gives an estimate of the location of an MS in universal coordinates and for certain shapes the accuracy of the estimate. The estimate is expressed in terms of the geographical shapes defined by 3GPP TS 23.032. and is composed of the type of shape plus the encoding of the shape itself. Any type of shape defined in 3GPP TS 23.032 can be filled in in the Location Estimate parameter.

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: 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

   bit J   Ephemeris Extension
   0:           Ephemeris Extension is not requested
   1:           Ephemeris Extension is requested

   bit K   Ephemeris Extension Check
   0:           Ephemeris Extension Check is not requested
   1:           Ephemeris Extension Check is requested

bits L through P are Spare bits

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

Bits D, J and K are mutually exclusive, only one of these can be set to one at the same time.

	8	7	6	5	4	3	2	1
Octet 5	GPS Week		Spare					
Octet 6	GPS Week I NSAT Spare							
Octet 7	GPS_Toe							
Octet 8	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 10.10.2: 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 newest ephemeris set contained in handset memory (range 0-167).

NSAT (octet 8, bits 5-8)

This field contains a binary representation of the number of satellites to be considered for the current GPS assistance request. If the MS has no ephemeris data, this field shall be set to zero. If the MS has ephemeris data whose age exceeds the T-Toe limit, this field may be set to zero. If the SMLC receives a zero value for this field, it shall ignore the GPS Week and GPS_Toe fields and assume that the MS has no ephemeris data.

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 is present only if NSAT exceeds zero and 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 is present only if NSAT exceeds zero and contains a binary representation of the Issue of Data Ephemeris held in the MS, which identifies the sequence number for the satellite x (x = 1, 2, …, n). The SMLC shall derive the issue date and time for the IODE of each satellite x from the GPS Week and GPS_Toe fields (e.g. when a particular IODE value for a satellite x was issued more than once within the period of T-Toe limit).

GPS Extended Ephemeris

This octet shall be present when the GPS Ephemeris Extension bit is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Octet 5	Validity Hours							

Figure 10.10.2a: Coding of Information Extension for Ephemeris Extension (conditional)

Validity Hours indicate the validity time for which the Ephemeris Extension should be valid in multiples of four hours.

GPS Ephemeris Extension Check

These octets shall be present when the GPS Ephemeris Extension Check bit is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Octet 5	GPS Ephemeris Extension Begin Week				GPS Ephemeris Extension End Week			
Octet 6	GPS Ephemeris Extension Begin TOW							
Octet 7	GPS Ephemeris Extension End TOW							

Figure 10.10.2b: Coding of Information Extension for Ephemeris Extension Check (conditional)

These octets define the time duration of the Ephemeris Extension held by the MS.

The GPS Ephemeris extension Week (Begin and End) is the defined as the GPS Week modulo 4.

The GPS Ephemeris extension TOW (Begin and End) is represented in hours into the GPS week.

10.11 IMSI

This information element identifies the International Mobile Subscriber Identity of the target MS (see 3GPP TS 23.003 [10a]).

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octets 3-n	IMSI coded as the value part of the *Mobile Identity* IE defined in 3GPP TS 24.008 (NOTE 1)							
	NOTE 1: The *Type of identity* field in the *Mobile Identity* IE shall be ignored by the receiver.							

Figure 10.11.1: IMSI IE

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: LCS Cause IE

Table 10.13.1: 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: 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: 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						VEL	VERT
Octet 4	HA	Horizontal Accuracy						
Octet 5	VA	Vertical Accuracy						
Octet 6	RT		spare					

Figure 10.16.1: LCS QoS IE

Octet 3

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

  bit 2   VEL = Velocity Requested

        0: do not report velocity

        1: report velocity if available

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: 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
00000100	Assisted GANSS
00000101	Assisted GPS and Assisted GANSS

all other values are reserved

if Positionning Method (octet 4) is equal to 00000100 or 00000101 then, the GANSS definition is provided in the GANSS Location Type. If the GANSS Location Type is missing it means that all the satellite systems included in GANSS are refered.

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: 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: 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: 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: 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: 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: 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 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 to 4+m-1	Positioning Method 1							
Octets 4+nm-m to 4+nm-1	Positioning Method n							

Figure 10.20.1: Positioning Data IE

The positioning data discrminator (bits 4-1 of octet 3) defines the type of data and number of octets m provided for each positioning method:

0000   indicate usage of each positioning method that was attempted either successfully or unsuccessfully; 1 octet of data is provided for each positioning method included

all other values are reserved.

Coding of the positioning method octets for positioning data discriminator = 0000:

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	U-TDOA
01001	Reserved for UTRAN use only
01010	Reserved for UTRAN use only
01011	Reserved for UTRAN use only
01100	Cell ID
01101 to 01111	reserved for GSM
10000 to 11111	reserved for network specific positioning methods

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: 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: Return Error Cause IE

Table 10.22.1: 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           unspecified in this version of the protocol
1 1 1 1 1 1 1 1
```

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: 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: 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: 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: 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: 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 10.28.1: Cell Identifier IE

10.29   IMEI

This information element identifies the International Mobile Station Equipment Identity of the target MS (see 3GPP TS 23.003).

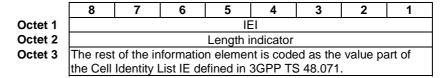|	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octets 3-10	IMEI coded as the value part of the *Mobile Identity* IE defined in 3GPP TS 24.008 (NOTE 1)							
	NOTE 1: The *Type of identity* field in the *Mobile Identity* IE shall be ignored by the receiver.							

Figure 10.29.1: IMEI IE

10.30 Velocity Data

This is a variable length information element providing an estimate of a velocity data.

	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 Description of Velocity defined in 3GPP TS 23.032.							

Figure 10.30.1: Velocity Data IE

Description of Velocity (octet 3 to n)

This parameter gives an estimate of the velocity of an MS in speed and bearing and for certain descriptions, the accuracy of the estimate. The estimate is expressed in terms of the velocity description defined by 3GPP TS 23.032.

10.31 Requested GANSS Assistance Data

This is a variable length information element identifying the GANSS 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 m1 to Octet p1	Generic assistance data for GNSS1, coding according to Figure 10.31.2							
…								
Octet pz-1+1 to Octet pz	Generic assistance data for GNSSz, coding according to Figure 10.31.2							

Octet p_n denote the last octet for $GNSS_n$

Figure 10.31.1: Requested GANSS Assistance Data IE, general structure

Octet m	L	K	J	I	GANSS ID			
Octet m+1	T	S	R	Q	P	O	N	M
Octet m+2	W	V	U	Information extension length indicator				
Octet m+3 to Octet m+2+a	Information extensions for assistance data (Conditional) Coding according to Figure 10.31.3							
Octet m+3+a to Octet m+5+a+2n	Satellite related data (Conditional) Coding according to Figure 10.31.4							

a = length of "Information extensions for assistance data" as indicated in "Information extension length indicator", range 0..31

Figure 10.31.2: Requested GANSS Assistance Data for one GNSS

For each of the following bits, a "1" indicates that the GANSS assistance data is requested for that particular parameter and a "0" indicates that the data is not requested. For each bit, or GANSS ID indicating "SBAS", there may be one or more extension octets. These octets are defined in Figure 10.31.3 and they shall occur in "Information extensions for assistance data " field in the same order as they are introduced in Figure 10.31.3. For each bit set to "1", or GANSS ID indicating "SBAS", the respective octet or octets shall be present. The total amount of octets in "Information extensions for assistance data" field is indicated in "Information extension length indicator".

Octet 3 in figure 10.31.1 defines the common assistance elements:

bit A	GANSS Reference Time
bit B	Reference Location
bit C	GANSS Ionospheric Model
bit D	GANSS Additional Ionospheric Model for Data ID = '00'
bit E	GANSS Additional Ionospheric Model for Data ID = '11'
bit F	GANSS Earth Orientation Parameters
bit G	GANSS Additional Ionospheric Model for Data ID = '01'

bit H are Spare bits

Octet m in figure 10.31.2 defines the generic assistance elements:

GANSS ID (bits 1-4)
This field indicates the GNSS for which the following assistance data is requested. (Range: 0 – 8).

0000:	Galileo
0001:	Satellite Based Augmentation Systems (SBAS)
0010:	Modernized GPS
0011:	Quasi Zenith Satellite System (QZSS)
0100:	GLONASS
0101:	BDS

If GANSS ID is set to '0001' (SBAS), the Extension Octet 5+n+3 (Figure 10.31.3f) shall be included.

bit I   GANSS Real-Time Integrity

bit J   GANSS Differential Corrections

bit K   GANSS Almanac
0:      GANSS Almanac is not requested
1:      GANSS Almanac is requested. If GANSS ID indicates modernized GPS or QZSS and bit S is set to "0", this bit shall be interpreted as Model-4 for modernized GPS and as Model-2 for QZSS, defined in Table A.54 of TS44.031[4]

bit L   GANSS Reference Measurement Information

Octet m+1 in figure 10.31.2 defines the generic assistance elements:

bit M   GANSS Navigation Model

0:	GANSS Navigation Model is not requested – Satellite Related Data in figure 10.31.2 is not present for this GNSS.)
1:	GANSS Navigation Model is requested – Satellite Related Data in figure 10.31.2 is present for this GNSS.)

bit N	GANSS Ephemeris Extension
0:	GANSS Ephemeris Extension is not requested
1:	GANSS Ephemeris Extension is requested

bit O	GANSS Time Model GNSS-UTC
0:	GANSS Time Model GNSS-UTC is not requested
1:	GANSS Time Model GNSS-UTC is requested. If GANSS ID indicates QZSS and bit S is set to "0", this bit shall be interpreted as Model-1, defined in Table A.55 of TS44.031[4]

bit P   GANSS Time Model GNSS-GNSS

bit Q   GANSS Data Bit Assistance

bit R	GANSS Ephemeris Extension Check
0:	GANSS Ephemeris Extension Check is not requested
1:	GANSS Ephemeris Extension Check is requested

bit S	GANSS Additional Assistance Data Choices
0:	GANSS Additional Assistance Data Choices octets are not included
1:	GANSS Additional Assistance Data Choices octets are included

bit T	Last Requested GANSS Assistance Data indicator
0:	More Requested GANSS Assistance Data is included in the IE
1:	This Requested GANSS Assistance Data is the last one in the IE

The T bit indicates whether the current Requested GANSS Assistance Data for a GNSS as defined in figure 10.31.2 is the last one. If bit T is set to "0", another structure of Figure 10.31.2 shall follow the current one.

bit U   GANSS Auxiliary Information

bit V   DBDS Corrections

bit W	Bit Field Extension indicator
0:	Bit Field Extension octet is not included
1:	Bit Field Extension octet is included

At least one of bits A to F, or I to R, or U, or W shall be set to the value "1".

Bits M, N and R are mutually exclusive for the additional assistance requests from the MS. In such case only one of these can be set to one at the same time.

GANSS Differential Corrections Extension

This octet shall be present when the GANSS Differential Corrections bit is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Extension Octet 1	S8	S7	S6	S5	S4	S3	S2	S1

Figure 10.31.3a: Coding of Information Extension for GANSS Differential Corrections (conditional)

Differential corrections are requested for each of the bits S1 to S8 set to "1".

If GANSS ID indicates Galileo, the bits shall be interpreted as follows:

bit S1	L1
bit S2	E5a
bit S3	E5b
bit S4	E6
bit S5	spare

bit S6   spare
bit S7   spare
bit S8   spare

If GANSS ID indicates SBAS, Modernized GPS, QZSS, GLONASS or BDS, the bits shall be interpreted as in Table A.59 of 3GPP TS 44.031 [4], where bits S1 to S8 in Figure 10.31.3a correspond to Signal 1 to Signal 8 in Table A.59 of 3GPP TS 44.031, respectively.

GANSS Time Model GNSS-GNSS Extension

This octet shall be present when the GANSS Time Model GNSS-GNSS bit is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Extension Octet 2	spare	spare	spare	BDS	GLON ASS	QZSS	Galileo	GPS

Figure 10.31.3b: Coding of Information Extension for GANSS Time Model GNSS-GNSS (conditional)

The reference system for requested GANSS time models is as indicated in GANSS ID. The models are requested for each system with respective bit set to "1".

GANSS Data Bit Assistance Extension

These octets shall be present when the GANSS Data Bit Assistance bit (bit Q) is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Extension Octet 3	GANSS TOD (range 0 – 59)						spare	
Extension Octet 4	signal8	signal7	signal6	signal5	signal4	signal3	signal2	signal1
Extension Octet 5	GANSS Data Bit Interval				Num Sat			
Extension Octet 6	GANSS Sat ID 1						Spare	
…	…						...	
Extension Octet 5+n	GANSS Sat ID N						Spare	

Figure 10.31.3c: Coding of Information Extension for Data Bit Assistance (conditional)

GANSS TOD

This field contains the reference time of the first bit of the requested data in integer seconds in GANSS system time. The time is given as modulo 60 s from GANSS TOD.

GANSS Signals: signal1 – signal8 (Extension Octet 4)

Each bit in Extension Octet 4 specifies the GANSS signal type of the GANSS Data Bit Assistance requested. The GANSS Signals value shall be interpreted as in Table A.59 of 3GPP TS 44.031 [4].

GANSS Data Bit Interval

This field represents the time length for which the Data Bit Assistance is requested. The Data Bit Assistance shall be relative to the time interval (GANSS TOD, GANSS TOD + Data Bit Interval).

The Data Bit Interval r, expressed in seconds, is mapped to a binary number K with the following formula:

$$r = 0.1 * 2^K$$

Value K=15 means that the time interval is not specified.

The number of bits sent by the SMLC shall be estimated exploiting information about Data Bit Interval (sec) and Symbol Rate (sps). This number of bits shall be rounded up to the next higher multiple of 8. The total number of bits for each signal shall not exceed 1024 as defined in A.4.2.6.2 of 3GPP TS 44.031 [4].

Num Sat

This field contains a binary representation of the number of GANSS satellites for which the Data Bit Assistance is requested.

Range 0-15:

0	no GANSS satellite ID is specified, octets 6 to 5+n are not present. In this case, Data Bit Assistance is requested for all the satellites supposed in visibility;
1-15	number of satellites for which the Data Bit Assistance is requested.

GANSS Sat ID

This field is present only if Num Sat is not equal to 0; it contains a binary representation of the identity of a GANSS satellite for which the Data Bit Assistance request is applicable.

GANSS Ephemeris Extension

This octet shall be present when the GANSS Ephemeris Extension bit is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Extension Octet 5+n+1				Validity Time				

Figure 10.31.3d: Coding of Information for Ephemeris Extension (conditional)

Validity Time indicates the validity time for which the Ephemeris Extension should be valid in multiples of four hours.

GANSS Ephemeris Extension Check

These octets shall be present when the GANSS Ephemeris Extension Check bit is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Extension Octet 5+n+1	GANSS Ephemeris Extension Begin Day					GANSS Ephemeris Extension Begin TOD (MSB)		
Extension Octet 5+n+2	GANSS Ephemeris Extension Begin TOD (LSB)		GANSS Ephemeris Extension End Day					Spare

Figure 10.31.3e: Coding of Information Extension for Ephemeris Extension Check (conditional)

These octets define the time duration of the Ephemeris Extension held by the MS.

The GANSS Ephemeris extension Day (Begin and End) is the defined as the GANSS Day modulo 32.

The GANSS Ephemeris extension TOD (Begin and End) is represented in hours into the GANSS day.

SBAS ID

This octet shall be present when GANSS ID in octet m is set to value '0001' (SBAS) and absent otherwise.

	8	7	6	5	4	3	2	1
Extension Octet 5+n+3	spare	spare	spare	spare	spare	SBAS ID		

Figure 10.31.3f: Coding of Information Extension for GANSS ID indicating "SBAS" (conditional)

SBAS ID (bits 1-3)

This field indicates the SBAS for which the assistance data request is applicable.

000:	WAAS

001: EGNOS
010: MSAS
011: GAGAN

GANSS Additional Assistance Data Choices

These octets shall be present when the GANSS Additional Assistance Data Choices bit is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Extension Octet 5+n+4	Orbit model ID			Clock model ID			Spare	
Extension Octet 5+n+5	UTC Model ID			Almanac model ID			Spare	

Figure 10.31.3g: Coding of Information Extension for GANSS Additional Assistance Data Choices (conditional)

These parameters specify the model type when non-native models are requested or when several native models exist. If SMLC supports the requested GANSS but can not provide the requested model, the native model shall be provided.

These parameters shall be considered only if the respective request bit ('K' for Almanac, 'M' for Clock and Orbit model, 'O' for UTC model) is set to "1" and ignored otherwise.

The values of each parameter shall be interpreted as follows:

Range 0-7:

0   Native model
1-7   The model number as defined in Tables A.49.1, A.49.2, A.54, and A.55/A.55.17 of TS44.031[4] for Clock model, Orbit model, Almanac model, and UTC model, respectively.

 (Note: Future extensions shall be added here)

Bit Field Extension

This octet shall be present when the Bit Field Extension bit is set to "1" and absent otherwise.

	8	7	6	5	4	3	2	1
Octet m+2+a (As defined in Figure 10.31.2)	spare	spare	spare	spare	spare	spare	spare	BDS Grid Model

Figure 10.31.3h: Coding of Information Extension for Bit Field Extension (conditional)

This octet extends the bit field of octects m...m+2.

bit 1   BDS Grid Model
0:             indicates that the BDS Grid Model is not requested.
1:             indicates that the BDS Grid Model is requested

Satellite Related Data

Satellite Related Data for Navigation Models (Figure 10.31.4) is present only when the GANSS Navigation Model bit is set to the value "1".

	8	7	6	5	4	3	2	1
Octet m+3+a	GANSS Week/Day				Spare			
Octet m+4+a	GANSS Week/Day							
Octet m+5+a	GANSS_Toe							
Octet m+6+a	NSAT				T-Toe limit			
Octet m+7+a	IOD 1		GANSSSatID 1					
Octet m+8+a	IOD 1							
…								
Octet m+5+2n+a	IOD n		GANSSSatID n					
Octet m+6+2n+a	IOD n							

Figure 10.31.4: Coding of Satellite Related Data for Navigation Models (conditional)

GANSS Week (bits 5-8 octet m+3+a and octet m+4+a)

If GANSS ID does not indicate 'GLONASS', this field contains a 12 bit binary representation of the GANSS Week of the assistance currently held by the MS. The most significant bit of the GANSS Week is bit 8 in octet m+3+a and the least significant bit is bit 1 in octet m+4+a.

If GANSS ID is set to 'GLONASS', this field contains a 11 bit binary representation of the calendar number of day within the four-year interval starting from 1st of January in a leap year, as defined by the parameter N_T in [31] of the assistance currently held by the MS. The most significant bit of N_T is bit 7 in octet m+3+a and the least significant bit is bit 1 in octet m+4+a. Bit 8 in octet m+3+a shall be set to zero.

GANSS_Toe (octet m+5+a)

If GANSS ID does not indicate 'GLONASS', this field contains a binary representation of the GANSS time of ephemeris in hours of the newest ephemeris set contained in handset memory (range 0-167 hours).

If GANSS ID is set to 'GLONASS', this field contains a binary representation of the time of ephemeris in units of 15 minutes of the newest ephemeris set contained in handset memory (binary range 0 to 95 representing time values between 0 and 1425 minutes).

NSAT (octet m+6+a, bits 5-8)

This field contains a binary representation of the number of satellites to be considered for the current GANSS assistance request. If the MS has no GANSS ephemeris data, this field shall be set to zero. If the MS has GANSS ephemeris data whose age exceeds the T-Toe limit, this field may be set to zero. If the SMLC receives a zero value for this field, it shall ignore the GANSS Week/Day and GANSS_Toe fields and assume that the MS has no GANSS ephemeris data.

T-Toe limit (octet m+6+a, bits 1-4)

If GANSS ID does not indicate 'GLONASS', this field contains a binary representation of the GANSS ephemeris age tolerance of the MS to the network in hours (range 0-10 hours).

If GANSS ID is set to 'GLONASS', this field contains a binary representation of the GANSS ephemeris age tolerance of the MS to the network in units of 30 minutes (binary range 0 to 15 representing time values of 0 to 450 minutes).

GANSSSatID x (x = 1,2, ... n) (octet m+5+a + 2x, bits 1-6)

This field is present only if NSAT exceeds zero and contains a binary representation of the identity of a GANSS satellite for which the assistance request is applicable. The number of satellite fields is indicated in the field NSAT.

IOD x (x = 1,2, ... n) (bits 7-8 octet m+5+a+2x and octet m+6+a + 2x)

This field is present only if NSAT exceeds zero and contains a binary representation of the Issue of Data as defined in 3GPP TS 44.031 [4], Table A.48.2 held in the MS, which identifies the GANSS Navigation Model for a satellite x (x = 1, 2, …, n). The SMLC shall derive the issue date and time for the IOD of each GANSS satellite x from the GANSS Week/Day and GANSS_Toe fields (e.g. when a particular IOD value for a GANSS satellite x was issued more than once within the period of T-Toe limit). The most significant bit of the IOD x is bit 8 in octet m+5+a+2x and the least significant bit is bit 1 in octet m+6+a+2x.

10.32 GANSS Positioning Data

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

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octets 3 to n	Method		GANSS Id			Usage		

Figure 10.32.1: GANSS Positioning Data IE

Method :

00	MS-Based
01	MS-Assisted
10	Conventional
11	Reserved

Coding of the GANSS Id :

000	Galileo
001	Satellite Based Augmentation Systems (SBAS)
010	Modernized GPS
011	Quasi Zenith Satellite System (QZSS)
100	GLONASS
101	BDS

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

10.33 GANSS Location Type

This is a variable length information element defining the constellation used when the Location Type / Positioning method is set to 00000100 or 00000101.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	GANSS Bitmap							

Figure 10.33.1: GANSS Location Type IE

GANSS Bitmap

8	7	6	5	4	3	2	1
spare	spare	BDS	GLON ASS	QZSS	Moder nized GPS	SBAS	Galileo

When a bit is set to "1", it means that the corresponding system is refered by GANSS.

Annex A (informative):
Change history

Meeting/Date	Tdoc	CR	Rev	Subject/Comment	New Version
January 2016	-	-	-	Version 13.0.0 created based on version 12.0.0	13.0.0

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
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