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Universal Mobile Telecommunications System (UMTS);
LTE;
Location Services (LCS);
LCS Application Protocol (LCS-AP)
between the Mobile Management Entity (MME)
and Evolved Serving Mobile Location Centre (E-SMLC);
SLs interface
(3GPP TS 29.171 version 12.1.0 Release 12)
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Foreword

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

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:

Version x.y.z

where:

x  the first digit:
   1  presented to TSG for information;
   2  presented to TSG for approval;
   3  or greater indicates TSG approved document under change control.

y  the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z  the third digit is incremented when editorial only changes have been incorporated in the document.
1 Scope

The present document specifies the procedures and information coding for LCS Application Protocol (LCS-AP) that is needed to support the location services in E-UTRAN. The LCS-AP message set is applicable to the SLs interface between the E-SMLC and the MME. LCS-AP is developed in accordance to the general principles stated in 3GPP TS 23.271 [3].

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".
[3] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".
[6] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
[7] 3GPP TS 36.413: "S1 Application Protocol (S1AP)".
[10] 3GPP TS 22.071: "Location Services (LCS); Service Description; Stage1".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].
Elementary Procedure: LCS-AP protocol consists of Elementary Procedures (EPs). An LCS-AP Elementary Procedure is a unit of interaction between the MME and the E-SMLC. An EP consists of an initiating message and possibly a response message. Two kinds of EPs are used:

- Class 1: Elementary Procedures with response (success or failure).
- Class 2: Elementary Procedures without response.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

CID Cell-ID (positioning method)
E-CID Enhanced Cell-ID (positioning method)
E-SMLC Enhanced Serving Mobile Location Centre
E-UTRAN Envolved Universal Terrestrial Radio Access Network
GNSS Global Navigation Satellite System
GPS Global Positioning System
LCS LoCation Services
LCS-AP LCS Application Protocol
LPP LTE Positioning Protocol
LPPa LTE Positioning Protocol Annex
LTE Long Term Evolution
MO-LR Mobile Originated Location Request
MT-LR Mobile Terminated Location Request
NI-LR Network Induced Location Request
MME Mobility Management Entity
OTDOA Observed Time Difference Of Arrival
PDU Protocol Data Unit
SCTP Stream Control Transmission Protocol
SET SUPL Enabled Terminal
SLP SUPL Location Platform
SUPL Secure User Plane Location
TA Timing Advanced
UE User Equipment
U-TDOA Uplink Time Difference Of Arrival

4 Functional Overview

4.1 General

Figure 4.1-1 below shows the architecture applicable to the positioning of a UE with E-UTRAN access. The SLs interface is used to convey LCS-AP messages and parameters between the MME to the E-SMLC. It is also used for tunnelling LTE Positioning Protocols (LPP between the E-SMLC and the target UE, LPPa between the E-SMLC and the eNB), which are transparent to the MME as described in 3GPP TS 36.305 [2].
5 LCS-AP Message Transport

5.1 General

The LCS-AP is a logical interface between the MME and the E-SMLC. This section specifies the standards for signaling transport to be used across LCS-AP.

5.2 Protocol Layering

Figure 5.2-1 below shows the protocol layering used to support the transfer of LCS-AP PDUs between an E-SMLC and a MME. The LTE Positioning Protocols (LPP and LPPa) can be carried in LCS-AP messages which are transparent to the MME.
5.3 Usage of SCTP Associations

SCTP (see IETF RFC 4960 [4]) shall be supported as the transport layer of LCS-AP messages.

Semi-permanent SCTP associations shall be established between MME and E-SMLC, i.e. the SCTP associations shall remain up under normal circumstances.

Local multi-homing should be supported. Remote multi-homing shall be supported.

Multiple local SCTP endpoints may be supported. Multiple remote SCTP endpoints shall be supported. When multiple local or remote SCTP endpoints are configured, several simultaneous SCTP associations shall be supported between MME and E-SMLC.

The MME shall establish the SCTP association. Since under normal operation there should always be an SCTP association established between an MME and an E-SMLC, if the E-SMLC needs to initiate a message towards an MME it shall do so over an existing SCTP association already established with that MME.

When an entity detects that an SCTP association has been lost, all resources for transactions open on that association shall be released.

The registered port number for LCS-AP is 9082. The registered payload protocol identifier for LCS-AP is 29.

6 LCS-AP Procedures

6.1 General

The LCS-AP interface can be divided into the following procedures:

- Location service request procedure
- Location information exchange procedure

The E-UTRAN positioning capabilities are intended to be forward compatible to other access types and other position methods, in an effort to reduce the amount of additional positioning support needed in the future.

6.2 Procedures Applicable to LCS-AP

6.2.1 Location Service Request

6.2.1.1 General

The purpose of the location service request procedure is to obtain the location estimate for a target UE in E-UTRAN.

6.2.1.2 Successful Operation

![Figure 6.2.1.2-1 Location Service Request Procedure, Successful Operation]
The initiator (MME) of the location service request procedure sends a LCS-AP Location Request message to the E-SMLC associated with the current serving cell for the target UE and starts the timer T3x01. The message contains the following mandatory (M), conditional (C) and optional (O) information, where conditional parameters are required if available.

- Correlation ID (M)
- Location Type (M)
- Cell Identifier (M)
- LCS Client Type (C)
- LCS Priority (C)
- LCS Service Type ID (C)
- LCS QoS (C)
- UE Positioning Capability (O)
- Include Velocity (O)
- IMSI of target UE (O)
- IMEI of target UE (O)
- APDU (O)

The Correlation ID is assigned by the MME and enables association of the location response with the location request when more than one location service request procedure is ongoing for the UE with the same E-SMLC.

The Location Type IE indicates the type of Location Information being requested. The following types are supported:

- Current geographic location estimate
- Location assistance data for the target UE

If the location estimate is requested, the E-SMLC performs positioning procedure on the target UE using a particular position method or a combination of more than one positioning method based on the UE capability. If UE capability is unknown, the E-SMLC may request UE position capability through LPP as defined in 3GPP TS 36.305 [2].

Alternatively, if assistance data was requested, the E-SMLC may provide positioning assistance data to the UE. The E-SMLC may invoke the following LCS-AP procedures to get assistance data:

- Connection Oriented Information Transfer
- Connectionless Information Transfer

If a location estimate was requested and was subsequently obtained, the E-SMLC shall return a LCS-AP Location Response to the initiator of the location request using the same SCTP association as the location request. This message contains the following mandatory (M), conditional (C) and optional parameters (O).

- Correlation ID (M)
- Location Estimate (M)
- Accuracy Fulfilment Indicator (O)
- Velocity estimate (C)
If assistance data was instead requested for an UE and the E-SMLC was able successfully to transfer this to the UE, the E-SMLC shall return a LCS-AP Location Response to the initiator of the location request (MME). This message shall contain no parameters. The absence of a LCS Cause parameter in this case implies that the transfer was successful.

If the MME receives the LCS-AP Location Response for corresponding request message, the MME shall stop the timer T3x01.

6.2.1.3 Unsuccessful Operation

If the E-SMLC is unable to obtain any of the location information requested or if requested LCS assistance data could not be transferred, the E-SMLC shall return a LCS-AP Location Response to the initiator of the Location Request carrying the following parameters:

- Correlation ID (M)
- LCS Cause (M)
- Positioning Data (O)

The E-SMLC shall use the same SCTP association for the Location Response as was used for the request.

If the MME receives the LCS-AP Location Response for corresponding request message, the MME shall stop the timer T3x01.

On the expiry of the timer T3x01, the MME shall abort the procedure, release any resources allocated for this location request procedure and notify the node that triggered the Location Request about the error.

6.2.2 Location Information Exchange

6.2.2.1 Connection Oriented Information Transfer

6.2.2.1.1 General

The Connection Oriented Information transfer procedure enables two-way transfer of LPP and LPPa messages between an E-SMLC and a MME. The procedure is only valid while a location request procedure for the target UE is ongoing. This procedure makes use of the same SCTP association as the location request procedure for the particular target UE.

6.2.2.1.2 Successful Operation

The initiate of the procedure (E-SMLC or MME) with a LPP or LPPa message to transfer concerning a particular target UE sends a LCS-AP Connection Oriented Information message to a recipient carrying the following parameters:
- Correlation ID (M)
- Payload Type (M)
- APDU (M);

The Correlation ID in this message is the Correlation ID used for the Location Request. It shall be present for a message transfer from the E-SMLC to the MME and for a message transfer from the MME to the E-SMLC.

The Payload Type shall be present to indicate the type of the APDU. The supported information types are LPP and LPPa.

The APDU shall contain an LPP APDU when communicating between the E-SMLC and the target UE or an LPPa APDU when communicating between the E-SMLC and serving eNB. The MME shall forward this to the serving eNB for the target UE.

If the intended recipient is the E-SMLC for a target UE, the message is terminated in the E-SMLC. The E-SMLC shall then perform interpretation of the APDU.

### 6.2.2.1.3 Abnormal Conditions

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

### 6.2.2.2 Connectionless Information Transfer

#### 6.2.2.2.1 General

The Connectionless Information transfer procedure enables two-way transfer of LPPa messages between an E-SMLC and a MME when there is no existing signalling connection association. This procedure can be used to query eNBs for the information not related to a UE connection, such as Timing information on the eNB.

#### 6.2.2.2.2 Successful Operation

![Figure 6.2.2.2.2-1 Connectionless Information Procedure, Successful Operation](image)

The initiator of the procedure (either E-SMLC or MME) sends a LCS-AP Connectionless Information message to a recipient carrying the following parameters:

- Source Entity (M)
- Destination Entity (M)
- APDU (M)
- Return Error Request (O)

The source entity identifies the sender. The recipient entity identifies the final destination. The APDU contains a LPPa APDU to be transferred. 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 LCS-AP Connectionless Information message to either the final destination or an intermediate entity capable of forward it to the final destination.
6.2.2.2.3 Unsuccessful Operation

If the message cannot be transferred by an intermediate entity or destination entity 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 LCS-AP Connectionless Information message to, or towards, the original source containing the following parameters:

- Source Entity (M)
- Destination Entity (M)
- APDU (M)
- 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 shall contain any originally received APDU.

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

6.2.2.2.4 Abnormal Conditions

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

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

6.3 Exception Procedures

6.3.1 Location Abort

6.3.1.1 General

The purpose of the Location Abort procedure is to cancel an ongoing positioning attempt or the request for assistance data. This message can be sent from the MME to the E-SMLC. This procedure makes use of the same SCTP association as the location request procedure for the particular target UE.

6.3.1.2 Normal Operation

![Figure 6.3.1.2-1 Location Abort Procedure, Normal Operation](image)

The MME sends a LCS-AP Location Abort Request message to the E-SMLC across the SLs interface. The message contains a LCS Cause parameter indicating the reason of cancellation.
On receipt of this message, the E-SMLC shall stop the positioning transactions of the target UE and may release any resources previously allocated. The E-SMLC shall return a LCS-AP Location Response message containing the LCS Cause received in Location Abort Request and, optionally, positioning data. The E-SMLC may also optionally include in this response any 'best-effort' location estimate that it has already determined prior to receiving the LCS-AP Location Abort Request.

6.3.1.3 Abnormal Conditions

At the recipient entity, if no ongoing location transaction for the target UE is found, the recipient entity shall discard the received LCS-AP Location Abort Request message with no return error message.

6.3.2 Reset

6.3.2.1 General

The Reset procedure is an optional procedure applicable to the LCS-AP. It enables an E-SMLC or a MME that has undergone a failure with loss of location service transactions to indicate this to a partner entity. 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 E-SMLC or a MME has suffered a failure, since error recovery procedures specific to individual connections and transactions may then be used. The Reset procedure applies to all transactions initiated on a single SCTP association.

6.3.2.2 Normal Operation

![Diagram](attachment:reset_diagram.png)

Figure 6.3.2.2-1 Reset Procedure, Normal Operation

In the event of a failure at an E-SMLC or a MME that results in the loss of location service transactions, a LCS-AP Reset Request message may be sent to the partner entity across the SLs interface. The message contains a LCS Cause parameter indicating the reason for the reset. The sending entity shall ensure that all information on location service transactions for the SCTP association on which the Reset Request was sent is reinitialized to indicate no existing transactions.

On receiving a LCS-AP Reset Request message, the recipient entity (E-SMLC or MME) shall clear all references and state information for the location service transactions on the SCTP association on which the Reset Request was received and shall release any associated resources. The recipient entity shall then return a LCS-AP Reset Acknowledge message using the same SCTP association as the Reset Request.

If the initiating entity (E-SMLC or MME) received the LCS-AP Reset Acknowledge message, it shall stop the timer T3x02.

6.3.2.3 Abnormal Conditions

On the first expiry of the timer T3x02, the Source entity (E-SMLC or MME) shall resend the LCS-AP Reset Request message and shall reset and restart timer T3x02. This retransmission is repeated 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.
6.4 Error Handling

6.4.1 Abnormal Conditions

If an ongoing location request is pre-empted at the initiator by an inter-eNB handover and MME relocation, or if the main signalling link to the target UE is released by the MME, or if a main signalling link failure indicated by the serving eNodeB persists for more than a certain timeout interval or if there is a timeout waiting for the positioning response, or any other abnormal conditions for which the positioning procedure cannot be maintained, the MME shall send a LCS-AP Location Abort message to the E-SMLC to terminate the positioning procedure.

For Intra-MME handovers, the location session between the MME and E-SMLC is not affected. Application layer impacts on these handovers are handled by higher protocol layers.

If the E-SMLC cannot proceed with positioning due to some protocol violation or error condition (e.g. inter-eNB handover), it shall return a LCS-AP Location Response message to the initiator containing a LCS cause and, optionally, positioning data.

6.4.2 Overload

If an E-SMLC is in overload condition, it may reject a LCS-AP Location Request by returning a LCS-AP Location Response containing a LCS Cause parameter indicating congestion. The initiator of the location requests (i.e. MME) may reduce the frequency of later location requests until rejection due to overload has ceased. In reducing the frequency of location service requests, the MME shall reduce lower priority requests, to zero if necessary, before reducing the frequency of higher priority requests. An E-SMLC shall similarly reject location requests of a lower priority, to zero if necessary, due to overload before rejecting location requests of a higher priority. An E-SMLC in overload condition may optionally employ the following procedures to alleviate overload:

a) Allow higher priority location service requests to pre-empt 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 UE based positioning methods, where supported by the target UE and the E-SMLC, rather than UE assisted or network based methods (except TA).

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

7 LCS-AP Messages and Message Formats

7.1 General

This section describes the structure of the messages and information elements required for the LCS-AP messages.

7.2 Message Formats

LCS-AP ASN.1 definition conforms to ITU-T Recommendations ITU-T Recommendation X.680 (07/2002) [8] and ITU-T Recommendation X.681 (07/2002) [9]. The ASN.1 definition specifies the structure and content of LCS-AP messages. The LCS-AP messages may contain any IEs specified in the object set definitions for that message without the order or number of occurrence being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct a LCS-AP message according to the PDU definitions module and with the following additional rules (Note that in the following IE means an IE in the object set with an explicit id. If one IE needed to appear more than once in one object set, then the different occurrences have different IE ids):

- IEs shall be ordered (in an IE container) in the order they appear in object set definitions.
7.3 LCS-AP Messages

The following attributes are used for the tabular description of the messages and information elements: Presence, Range Criticality and Assigned Criticality. Their definition and use can be found in 3GPP TS 36.413 [7].

7.3.1 LCS-AP Location Request message

This message is sent by the MME to request a location estimate for a target UE and contains sufficient information to enable location according to the required QoS using any positioning method supported. The message is also used to request LCS assistance data transfer to an UE.

Direction: MME → E-SMLC

Table 7.3.1-1: Location Request message contents

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
<th>Criticality</th>
<th>Assigned Criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Type</td>
<td>M</td>
<td></td>
<td>7.4.2</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
<tr>
<td>Correlation ID</td>
<td>M</td>
<td></td>
<td>7.4.28</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
<tr>
<td>Location Type</td>
<td>M</td>
<td></td>
<td>7.4.3</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
<tr>
<td>E-UTRAN Cell Identifier</td>
<td>M</td>
<td></td>
<td>E-CGI / 7.4.4</td>
<td>YES</td>
<td>ignore</td>
<td></td>
</tr>
<tr>
<td>LCS Client Type</td>
<td>O</td>
<td></td>
<td>7.4.5</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
<tr>
<td>LCS Priority</td>
<td>O</td>
<td></td>
<td>7.4.6</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
<tr>
<td>LCS QoS</td>
<td>O</td>
<td></td>
<td>7.4.7</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
<tr>
<td>LCS Service Type ID</td>
<td>O</td>
<td></td>
<td>7.4.30</td>
<td>YES</td>
<td>ignore</td>
<td></td>
</tr>
<tr>
<td>UE Positioning Capability</td>
<td>O</td>
<td></td>
<td>7.4.8</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
<tr>
<td>Include Velocity</td>
<td>O</td>
<td></td>
<td>7.4.9</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
<tr>
<td>IMSI</td>
<td>O</td>
<td></td>
<td>7.4.10</td>
<td>YES</td>
<td>ignore</td>
<td></td>
</tr>
<tr>
<td>IMEI</td>
<td>O</td>
<td></td>
<td>7.4.11</td>
<td>YES</td>
<td>ignore</td>
<td></td>
</tr>
<tr>
<td>Multiple APDUs</td>
<td>M</td>
<td>0..3</td>
<td>7.4.18</td>
<td>YES</td>
<td>reject</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: The IMSI should be sent preferably if known. The IMEI may be sent if the IMSI is not known, or in addition to the IMSI for the purpose of allowing correlation between the two identities.

7.3.2 LCS-AP Location Response message

This message is sent in response to a LCS-AP Location Request to return a successful location estimate for a target UE or to indicate some failure in obtaining this. The message is also sent in response to a LCS-AP Location Request to return an indication that LCS assistance data has been successfully delivered to an UE.

Direction: E-SMLC → MME
Table 7.3.2-1: Location Response message contents

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
<th>Criticality</th>
<th>Assigned Criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Type</td>
<td>M</td>
<td></td>
<td>7.4.2</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Correlation ID</td>
<td>M</td>
<td></td>
<td>7.4.28</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Location Estimate</td>
<td>O</td>
<td></td>
<td>Geographic Area / 7.4.12</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Positioning Data</td>
<td>O</td>
<td></td>
<td>7.4.13</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Velocity Estimate</td>
<td>O</td>
<td></td>
<td>7.4.14</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Accuracy Fulfilment Indicator</td>
<td>O</td>
<td></td>
<td>7.4.15</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>LCS Cause</td>
<td>O</td>
<td></td>
<td>7.4.16</td>
<td></td>
<td>YES</td>
<td>ignore</td>
</tr>
<tr>
<td>E-UTRAN Cell Identifier</td>
<td>O</td>
<td></td>
<td>E-CGI / 7.4.4</td>
<td></td>
<td>YES</td>
<td>ignore</td>
</tr>
<tr>
<td>Cell Portion ID</td>
<td>O</td>
<td></td>
<td>7.4.31</td>
<td></td>
<td>YES</td>
<td>ignore</td>
</tr>
</tbody>
</table>

7.3.3 LCS-AP Location Abort Request message

This message is sent by the MME to abort the positioning attempt or the request for assistance data.

Direction: MME → E-SMLC

Table 7.3.3-1: Location Abort Request message contents

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
<th>Criticality</th>
<th>Assigned Criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Type</td>
<td>M</td>
<td></td>
<td>7.4.2</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Correlation ID</td>
<td>M</td>
<td></td>
<td>7.4.28</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>LCS Cause</td>
<td>M</td>
<td></td>
<td>7.4.16</td>
<td></td>
<td>YES</td>
<td>ignore</td>
</tr>
</tbody>
</table>

7.3.4 LCS-AP Connection Oriented Information message

This message is sent in association with an existing signalling connection between an E-SMLC and another entity to transfer information between the E-SMLC and other entity belonging to a higher level protocol.

Direction: E-SMLC → MME or MME → E-SMLC

Table 7.3.4-1: Connection Oriented Information message contents

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
<th>Criticality</th>
<th>Assigned Criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Type</td>
<td>M</td>
<td></td>
<td>7.4.2</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Correlation ID</td>
<td>M</td>
<td></td>
<td>7.4.28</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Payload Type</td>
<td>M</td>
<td></td>
<td>7.4.17</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>APDU</td>
<td>M</td>
<td></td>
<td>7.4.18</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
</tbody>
</table>

7.3.5 LCS-AP Connectionless Information message

This message conveys signalling information associated with a higher protocol level between an E-SMLC and another entity when there is no existing signalling connection association.

Direction: E-SMLC → MME or MME → E-SMLC
Table 7.3.5-1: Connectionless Information message contents

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
<th>Criticality</th>
<th>Assigned Criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Type</td>
<td>M</td>
<td></td>
<td>7.4.2</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Source Identity</td>
<td>M</td>
<td></td>
<td>Network Element / 7.4.19</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Destination Identity</td>
<td>M</td>
<td></td>
<td>Network Element / 7.4.19</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>APDU</td>
<td>M</td>
<td></td>
<td>7.4.18</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Return Error Request</td>
<td>O</td>
<td></td>
<td>7.4.20</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>Return Error Cause</td>
<td>O</td>
<td></td>
<td>7.4.21</td>
<td></td>
<td>YES</td>
<td>ignore</td>
</tr>
</tbody>
</table>

7.3.6 LCS-AP Reset Request message

This message is sent to indicate a failure in the sending entity with loss of location service transactions that were established or were being established.

Direction: E-SMLC → MME or MME → E-SMLC

Table 7.3.6-1: Reset Request message contents

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
<th>Criticality</th>
<th>Assigned Criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Type</td>
<td>M</td>
<td></td>
<td>7.4.2</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
<tr>
<td>LCS Cause</td>
<td>M</td>
<td></td>
<td>7.4.16</td>
<td></td>
<td>YES</td>
<td>ignore</td>
</tr>
</tbody>
</table>

7.3.7 LCS-AP Reset Acknowledge message

This message is sent in response to a LCS-AP Reset message to indicate that references and resources associated with location service transactions towards the entity sending the LCS-AP Reset have been released.

Direction: E-SMLC → MME or MME → E-SMLC

Table 7.3.7-1: Reset Acknowledge message contents

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
<th>Criticality</th>
<th>Assigned Criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message Type</td>
<td>M</td>
<td></td>
<td>7.4.2</td>
<td></td>
<td>YES</td>
<td>reject</td>
</tr>
</tbody>
</table>

7.4 Information Elements

7.4.1 General

When specifying information elements which are to be represented by bit strings, if not otherwise specifically stated in the semantics description of the concerned IE or elsewhere, the following principle applies with regards to the ordering of bits:

- The first bit (leftmost bit) contains the most significant bit (MSB)
- The last bit (rightmost bit) contains the least significant bit (LSB)
- When importing bit strings from other specifications, the first bit of the bit string contains the first bit of the concerned information
7.4.2 Message Type

The *Message Type* IE uniquely identifies the message being sent. It is mandatory for all messages.

**Table 7.4.2-1: Message Type**

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
</table>
| Procedure Code  | M        |       | INTEGER (0..255)       | "0" = LCS-AP LOCATION SERVICE REQUEST  
"1" = LCS-AP CONNECTION ORIENTED INFORMATION TRANSFER  
"2" = LCS-AP CONNECTIONLESS INFORMATION TRANSFER  
"3" = LCS-AP LOCATION ABORT  
"4" = LCS-AP RESET             |
| Type of Message | M        |       | ENUMERATED             | (Initiating Message, Successful Outcome, Unsuccessful Outcome, …)                      |

7.4.3 Location Type

This parameter defines the type of location information being requested.

**Table 7.4.3-1: Location Type**

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location Type</td>
<td>M</td>
<td></td>
<td>ENUMERATED</td>
<td>(geographic location, assistance information, …)</td>
</tr>
</tbody>
</table>

7.4.4 E-CGI

This parameter gives the current cell location of the target UE. The E-UTRAN Cell Global Identifier (E-CGI) is used to globally identify a cell.

**Table 7.4.4-1: ECGI**

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLMN Identity</td>
<td>M</td>
<td></td>
<td>7.4.27</td>
<td>The leftmost bits of the Cell Identity correspond to the eNB ID (defined in 7.4.19).</td>
</tr>
<tr>
<td>Cell Identity</td>
<td>M</td>
<td></td>
<td>BIT STRING (28)</td>
<td>The leftmost bits of the Cell Identity correspond to the eNB ID (defined in 7.4.19).</td>
</tr>
</tbody>
</table>
7.4.5 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.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Type</td>
<td>M</td>
<td></td>
<td>ENUMERATED</td>
<td>Identifies the category of LCS client.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Emergency Services, Value Added Services, PLMN Operator Services, Lawful Intercept Services, PLMN Operator - broadcast services, PLMN Operator - O&amp;M, PLMN Operator - anonymous statistics, PLMN Operator - Target MS service support, …)</td>
<td></td>
</tr>
</tbody>
</table>

7.4.6 LCS Priority

This parameter defines the priority of the location request.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCS Priority</td>
<td>M</td>
<td>SIZE(1)</td>
<td>OCTET STRING</td>
<td>0= highest priority 1= normal priority all other values treated as 1 For details, refer to 3GPP TS 22.071 [10].</td>
</tr>
</tbody>
</table>

7.4.7 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.
### Table 7.4.7-1: LCS QoS

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
</table>
| Horizontal Accuracy | O        |             | INTEGER(0..127)       | bit 8 = 0
bits 7-1 = 7 bit Uncertainty Code defined in 3GPP TS 23.032 [6]. The horizontal location error should be less than the error indicated by the uncertainty code with 67% confidence. |
| Vertical Requested  | O        |             | ENUMERATED(Vertical Coordinate Is Not Requested (0), Vertical Coordinate Is Requested (1)) | Default value if this IE is not present is: Vertical Coordinate Is Not Requested (0).                                                                   |
| Vertical Accuracy   | O        |             | INTEGER(0..127)       | bit 8 = 0
bits 7-1 = 7 bit Vertical Uncertainty Code defined in 3GPP TS 23.032 [6]. The vertical location error should be less than the error indicated by the uncertainty code with 67% confidence. If the vertical requested IE is not present or present with a value of 0, then this vertical accuracy will be ignored, if present. |
| Response Time       | O        |             | ENUMERATED(Low Delay(0), Delay Tolerant (1), ...) | For details, refer to 3GPP TS 22.071 [10].                                                                                                               |

### 7.4.8 UE Positioning Capability

This parameter provides information about the LCS capabilities of the target UE.

#### Table 7.4.8-1: UE Positioning Capability

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE Type and Reference</th>
<th>Semantics Description</th>
<th>Criticality</th>
<th>Assigned Criticality</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPP Support</td>
<td>M</td>
<td></td>
<td>BOOLEAN</td>
<td>Defines if the UE supports LPP or not. TRUE means supported.</td>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>

### 7.4.9 Include Velocity

This parameter indicates if the Velocity of the target UE is requested in the Location Response.

#### Table 7.4.9-1: Include Velocity

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velocity Indicator</td>
<td>O</td>
<td></td>
<td>ENUMERATED(requested, not requested, ...)</td>
<td>Specify if Velocity of UE is requested.</td>
</tr>
</tbody>
</table>

### 7.4.10 IMSI

This parameter identifies the IMSI of the target UE.
### 7.4.11 IMEI

This parameter identifies the IMEI of the target UE.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMEI</td>
<td>M</td>
<td></td>
<td>OCTET STRING (SIZE (8))</td>
<td>Refers to International Mobile Station Equipment Identity and Software Version Number (SVN) defined in TS 3GPP TS 23.003 [11]. This IE is 16 digits encoded with TBCD String, two digits per octet. If the SVN is not present the last octet shall contain the digit 0 as filler. If present the SVN shall be included in the last octet.</td>
</tr>
</tbody>
</table>
7.4.12 Geographic Area

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

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHOICE Geographical Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;Point</td>
<td>M</td>
<td>7.4.23</td>
<td></td>
<td>Ellipsoidal point</td>
</tr>
<tr>
<td>&gt;&gt;Geographical Coordinates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;Point With Uncertainty</td>
<td>M</td>
<td>7.4.23</td>
<td></td>
<td>Ellipsoidal point with uncertainty circle</td>
</tr>
<tr>
<td>&gt;&gt;Geographical Coordinates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Uncertainty Code</td>
<td>M</td>
<td>INTEGER (0..127)</td>
<td></td>
<td>The uncertainty &quot;r&quot; expressed in meters is derived from the &quot;Uncertainty Code&quot; k by r = 10x(1.1^k-1)</td>
</tr>
<tr>
<td>&gt;Ellipsoidal point with uncertainty Ellipse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Geographical Coordinates</td>
<td>M</td>
<td>7.4.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Uncertainty Ellipse</td>
<td>M</td>
<td>7.4.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Confidence</td>
<td>M</td>
<td>INTEGER (0..100)</td>
<td></td>
<td>In percentage</td>
</tr>
<tr>
<td>&gt;Polygon</td>
<td></td>
<td></td>
<td></td>
<td>List of Ellipsoidal points</td>
</tr>
<tr>
<td>&gt;&gt;Polygon Point</td>
<td>1..&lt;maxnoofPoints&gt;</td>
<td></td>
<td></td>
<td>The minimum number of points allowed is 3.</td>
</tr>
<tr>
<td>&gt;&gt;&gt;Geographical Coordinates</td>
<td>M</td>
<td>7.4.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;Ellipsoidal point with altitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Geographical Coordinates</td>
<td>M</td>
<td>7.4.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Altitude and direction</td>
<td>M</td>
<td>7.4.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;Ellipsoidal point with altitude and uncertainty Ellipsoid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Geographical Coordinates</td>
<td>M</td>
<td>7.4.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Altitude and direction</td>
<td>M</td>
<td>7.4.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Uncertainty Ellipse</td>
<td>M</td>
<td>7.4.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Uncertainty Altitude</td>
<td>M</td>
<td>INTEGER (0..127)</td>
<td></td>
<td>The uncertainty altitude 'h' expressed in metres is derived from the 'Uncertainty Altitude' k, by: h=45x(1.025^k-1)</td>
</tr>
<tr>
<td>&gt;&gt;Confidence</td>
<td>M</td>
<td>INTEGER (0..100)</td>
<td></td>
<td>In percentage</td>
</tr>
<tr>
<td>&gt;Ellipsoidal Arc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Geographical Coordinates</td>
<td>M</td>
<td>7.4.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Inner radius</td>
<td>M</td>
<td>INTEGER (0..2^{15}-1)</td>
<td></td>
<td>The relation between the value (N) and the radius (r) in meters it describes is 5N ≤ r ≤ 5(N+1), except for N=2^{15}-1 for which the range is extended to include all greater values of (r).</td>
</tr>
</tbody>
</table>
### 7.4.12 Range bound

<table>
<thead>
<tr>
<th>Range bound</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>maxnoofPoints</td>
<td>Maximum no. of points in polygon. Value is 15.</td>
</tr>
</tbody>
</table>

### 7.4.13 Positioning Data

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

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position Data</td>
<td>M</td>
<td></td>
<td>INTEGER (0..127)</td>
<td>The uncertainty &quot;r&quot; is derived from the &quot;Uncertainty radius&quot; k by r = 10\times(1.1^k - 1)</td>
</tr>
<tr>
<td>&gt;&gt;Offset angle</td>
<td>M</td>
<td></td>
<td>INTEGER (0..179)</td>
<td>The relation between the value (N) and the angle (a) in degrees it describes is 2N ≤ a &lt; 2(N+1)</td>
</tr>
<tr>
<td>&gt;&gt;Included angle</td>
<td>M</td>
<td></td>
<td>INTEGER (0..179)</td>
<td>The relation between the value (N) and the angle (a) in degrees it describes is 2N &lt; a ≤ 2(N+1)</td>
</tr>
<tr>
<td>&gt;&gt;Confidence</td>
<td>M</td>
<td></td>
<td>INTEGER (0..100)</td>
<td></td>
</tr>
</tbody>
</table>

| Table 7.4.12-1: Positioning Data |

Table 7.4.12-2: Range bound
### Positioning Method and Usage

<table>
<thead>
<tr>
<th>1..&lt;maxSet&gt;</th>
<th>OCTET STRING (1)</th>
</tr>
</thead>
</table>

#### Coding of positioning method (bits 8-4):
- 00000: Cell ID
- 00001: Reserved
- 00010: E-CID
- 00011: Reserved
- 00100: OTDOA
- 00101: Reserved
- 00110: Reserved
- 00111: Reserved
- 01000: U-TDOA
- 01001: Reserved
- 01010: Reserved
- 01011: Reserved
- 01100 to 01111 reserved for other location technologies
- 10000 to 11111 reserved for network specific positioning methods

#### Coding of usage (bits 3-1):
- 000: Attempted unsuccessfully due to failure or interruption - not used.
- 001: Attempted successfully: results not used to generate location - not used.
- 010: Attempted successfully: results used to verify but not generate location - not used.
- 011: Attempted successfully: results used to generate location.
- 100: Attempted successfully: case where UE supports multiple mobile based positioning methods and the actual method or methods used by the UE cannot be determined.

---

#### GNSS Positioning Data Set
- O
<table>
<thead>
<tr>
<th>&gt;&gt;GNSS</th>
<th>1..&lt;maxGNSSSet&gt;</th>
<th>OCTET STRING (1)</th>
<th>Coding of Method (Bits 8-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning</td>
<td></td>
<td></td>
<td>00 : UE-Based</td>
</tr>
<tr>
<td>Method and</td>
<td></td>
<td></td>
<td>01 : UE-Assisted</td>
</tr>
<tr>
<td>Usage</td>
<td></td>
<td></td>
<td>10 : Conventional</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11 : Reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coding of GNSS ID (Bits 6-4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>000 : GPS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>001 : Galileo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>010 : SBAS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>011 : Modernized GPS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100 : QZSS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>101 : GLONASS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>other values reserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coding of usage (bits 3-1):</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>000 : Attempted unsuccessfull due to failure or interruption</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>001 : Attempted successfully: results not used to generate location</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>010 : Attempted successfully: results used to verify but not generate location</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>011 : Attempted successfully: results used to generate location</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100 : Attempted successfully: case where UE supports multiple mobile based positioning methods and the actual method or methods used by the UE cannot be determined.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 7.4.13-2: Range bound</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range bound</strong></td>
</tr>
<tr>
<td>maxSet</td>
</tr>
<tr>
<td>maxGNSSSet</td>
</tr>
</tbody>
</table>
7.4.14 Velocity Estimate

This parameter provides the velocity estimate for the target UE.

<table>
<thead>
<tr>
<th>Table 7.4.14-1: Velocity Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE/Group Name</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Choice Velocity Estimate</td>
</tr>
<tr>
<td>&gt;Horizontal Velocity</td>
</tr>
<tr>
<td>&gt;&gt;Horizontal Speed and Bearing</td>
</tr>
<tr>
<td>&gt;Horizontal with Vertical Velocity</td>
</tr>
<tr>
<td>&gt;&gt;Horizontal Speed and Bearing</td>
</tr>
<tr>
<td>&gt;&gt;Vertical Velocity</td>
</tr>
<tr>
<td>&gt;Horizontal Velocity with Uncertainty</td>
</tr>
<tr>
<td>&gt;&gt;Horizontal Speed and Bearing</td>
</tr>
<tr>
<td>&gt;&gt;Vertical Velocity</td>
</tr>
<tr>
<td>&gt;&gt;Horizontal Uncertainty Speed</td>
</tr>
<tr>
<td>&gt;&gt;Vertical Uncertainty Speed</td>
</tr>
</tbody>
</table>

7.4.15 Accuracy Fulfilment Indicator

This parameter whether the returned position estimate satisfies the requested accuracy or not.
Table 7.4.15-1: Accuracy Fulfilment Indicator

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy Fulfilment Indicator</td>
<td>O</td>
<td></td>
<td>ENUMERATED (requested accuracy fulfilled, requested accuracy not fulfilled, ...)</td>
<td>Indicates if the requested accuracy is fulfilled or not.</td>
</tr>
</tbody>
</table>

7.4.16 LCS Cause

The LCS Cause is included if and only if a requested location estimate was not successfully obtained (e.g. location estimate not available), or requested LCS assistance data was not successfully transferred to the UE. The parameter provides the reason for the failure.

Table 7.4.16-1: LCS Cause

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE Type and Reference</th>
<th>Semantics Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHOICE Cause Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Radio Network Layer Cause</td>
<td>M</td>
<td>ENUMERATED (Unspecified ...)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Transport Layer Cause</td>
<td>M</td>
<td>ENUMERATED (Transport Resource Unavailable, Unspecified, ...)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Protocol Cause</td>
<td>M</td>
<td>ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Unspecified, Abstract Syntax Error (Falsely Constructed Message), ...)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;Misc Cause</td>
<td>M</td>
<td>ENUMERATED (Processing Overload, Hardware Failure, O&amp;M Intervention, Unspecified, ...)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.4.17 Payload Type

This parameter indicates the type of APDU included in LCS-AP Connected Oriented Information message. The supported information types are LPP and LPPa.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payload Type</td>
<td>M</td>
<td></td>
<td>ENUMERATED (LPP, LPPa, ...)</td>
<td></td>
</tr>
</tbody>
</table>

7.4.18 APDU

This parameter contains an embedded APDU. For information transfer between an E-SMLC and an eNB this shall be an LPPa APDU. For information transfer between an E-SMLC and a target UE, this shall be an LPP APDU.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APDU</td>
<td>M</td>
<td></td>
<td>OCTET STRING</td>
<td>This IE contains a message whose content and encoding are defined according to the Payload Type.</td>
</tr>
</tbody>
</table>

7.4.19 Network Element

This parameter identifies the source or destination of the message. The network element is identified by association with either an eNB ID or the identity of an E-SMLC.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHOICE Network Element</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;Global eNB ID</td>
<td></td>
<td></td>
<td></td>
<td>The global identity of the eNB</td>
</tr>
<tr>
<td>&gt;&gt;PLMN Identity</td>
<td>7.4.27</td>
<td></td>
<td>INTEGER (0..255)</td>
<td>The identity of the E-SMLC (an index to identify a specific E-SMLC among all the available E-SMLCs in the network)</td>
</tr>
<tr>
<td>&gt;&gt;eNB ID</td>
<td>7.4.29</td>
<td></td>
<td>INTEGER (0..255)</td>
<td></td>
</tr>
<tr>
<td>&gt;E-SMLC Identity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.4.20 Return Error Request

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

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return Error Type</td>
<td>M</td>
<td></td>
<td>ENUMERATED (Yes, No)</td>
<td></td>
</tr>
</tbody>
</table>

7.4.21 Return Error Cause

This parameter indicates an error response for a LCS-AP 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.

### Table 7.4.21-1: Return Error Cause

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return Error Cause</td>
<td>M</td>
<td></td>
<td>ENUMERATED</td>
<td>(systemfailure, protocolerror, destinationunknown, destinationunreachable, congestion,...)</td>
</tr>
</tbody>
</table>

#### 7.4.22 Altitude and direction

**Table 7.4.22-1: Altitude and direction**

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction of Altitude</td>
<td>M</td>
<td></td>
<td>ENUMERATED (Height, Depth)</td>
<td>The relation between the value (N) and the altitude (a) in meters it describes is N ≤ a &lt; N+1, except for N=2^{23}-1 for which the range is extended to include all greater values of (a).</td>
</tr>
<tr>
<td>Altitude</td>
<td>M</td>
<td></td>
<td>INTEGER (0..2^{23}-1)</td>
<td>The relation between the value (N) and the altitude (a) in meters it describes is N ≤ a &lt; N+1, except for N=2^{23}-1 for which the range is extended to include all greater values of (a).</td>
</tr>
</tbody>
</table>

#### 7.4.23 Geographical Coordinates

This IE contains the geographical coordinates.

**Table 7.4.23-1: Geographical Coordinates**

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude Sign</td>
<td>M</td>
<td></td>
<td>ENUMERATED (North, South)</td>
<td>The IE value (N) is derived by this formula: N = 2^{23} X /90 &lt; N+1 X being the latitude in degree (0°..90°)</td>
</tr>
<tr>
<td>Degrees Of Latitude</td>
<td>M</td>
<td></td>
<td>INTEGER (0..2^{23}-1)</td>
<td>The IE value (N) is derived by this formula: N = 2^{23} X /90 &lt; N+1 X being the latitude in degree (0°..90°)</td>
</tr>
<tr>
<td>Degrees Of Longitude</td>
<td>M</td>
<td></td>
<td>INTEGER (-2^{23}..2^{23}-1)</td>
<td>The IE value (N) is derived by this formula: N = 2^{24} X /360 &lt; N+1 X being the longitude in degree (-180°..+180°)</td>
</tr>
</tbody>
</table>
7.4.24 Uncertainty Ellipse

This IE contains the uncertainty ellipse of a geographical area.

Table 7.4.24-1: Uncertainty Ellipse

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty semi-major</td>
<td>M</td>
<td></td>
<td>INTEGER (0..127)</td>
<td>The uncertainty “r” is derived from the “uncertainty code” k by r = 10x(1.1^-k)</td>
</tr>
<tr>
<td>Uncertainty semi-minor</td>
<td>M</td>
<td></td>
<td>INTEGER (0..127)</td>
<td>The uncertainty “r” is derived from the “uncertainty code” k by r = 10x(1.1^-k)</td>
</tr>
<tr>
<td>Orientation of major axis</td>
<td>M</td>
<td></td>
<td>INTEGER (0..89)</td>
<td>The relation between the IE value (N) and the angle (a) in degrees it describes is 2N≤ a &lt; (N+1)</td>
</tr>
</tbody>
</table>

7.4.25 Horizontal Speed and Bearing

This IE contains the two components of horizontal velocity: speed and bearing

Table 7.4.25-1: Horizontal Speed and Bearing

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing</td>
<td>M</td>
<td></td>
<td>INTEGER (0..359)</td>
<td>The direction of movement is given in degrees where “0” represents North, “90”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>represents East, etc.</td>
</tr>
<tr>
<td>Horizontal Speed</td>
<td>M</td>
<td></td>
<td>INTEGER (0..&lt;2^11-1)</td>
<td>The relationship between (N) and the horizontal speed (h) in kilometers per hour it</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>describes is:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N ≤ h &lt; N + 0.5 (N=0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N − 0.5 ≤ h &lt; N + 0.5 (0&lt;N&lt;2^11-1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N − 0.5 ≤ h (N = 2^11−1)</td>
</tr>
</tbody>
</table>

7.4.26 Vertical Velocity

This IE contains the two components of vertical velocity: speed and direction
### Vertical Velocity

**Table 7.4.26-1: Vertical Velocity**

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical Speed</td>
<td>M</td>
<td>INTEGER</td>
<td>(0..2^8-1)</td>
<td>The relationship between (N) and the vertical speed (v) in kilometers per hour it describes is:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- N ≤ v &lt; N + 0.5 (N = 0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- (N - 0.5 \leq v &lt; N + 0.5) (0 &lt; N &lt; 2^8-1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- N = 0.5 ≤ v (N = 2^8-1)</td>
</tr>
<tr>
<td>Vertical Speed Direction</td>
<td></td>
<td>ENUMERATED</td>
<td>(upward, downward)</td>
<td></td>
</tr>
</tbody>
</table>

### PLMN Identity

This information element indicates the PLMN Identity.

**Table 7.4.27-1: PLMN Identity**

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLMN identity</td>
<td>M</td>
<td></td>
<td>OCTET STRING (SIZE (3))</td>
<td>- digits 0 to 9, encoded 0000 to 1001, - 1111 used as filler digit, two digits per octet, - bits 4 to 1 of octet n encoding digit 2n-1 - bits 8 to 5 of octet n encoding digit 2n</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- The Selected PLMN identity consists of 3 digits from MCC followed by either - a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or - 3 digits from MNC (in case of a 3 digit MNC).</td>
</tr>
</tbody>
</table>

### Correlation ID

This IE indicates a specific location session. It is used in order to correlate request/response and an ongoing location session.

**Table 7.4.28-1: Correlation ID**

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation ID</td>
<td>M</td>
<td></td>
<td>OCTET STRING (SIZE (4))</td>
<td>The identifier of a location session in E-UTRAN. It should be unique for all concurrently active location sessions in a particular MME.</td>
</tr>
</tbody>
</table>
7.4.29  eNB ID

This information element is used to identify an eNB.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice eNB ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; Macro eNB ID</td>
<td>M</td>
<td></td>
<td>BIT STRING (20)</td>
<td>Equal to the 20 leftmost bits of the Cell Identity IE contained in the E-UTRAN CGI IE (see section 7.4.4) of each cell served by the eNB</td>
</tr>
<tr>
<td>&gt; Home eNB ID</td>
<td>M</td>
<td></td>
<td>BIT STRING (28)</td>
<td>Equal to the Cell Identity IE contained in the E-UTRAN CGI IE (see section 7.4.4) of the cell served by the eNB</td>
</tr>
</tbody>
</table>

7.4.30  LCS Service Type ID

This parameter defines the service type ID for the location request.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCS Service Type ID</td>
<td>O</td>
<td></td>
<td>INTEGER(0..127)</td>
<td>Identifies the type of service requested. The meaning of the different service types is defined in 3GPP TS 22.071 [10].</td>
</tr>
</tbody>
</table>

7.4.31  Cell Portion ID

This parameter gives the current Cell Portion location of the target UE. The Cell Portion ID is the unique identifier for a cell portion within a cell.

<table>
<thead>
<tr>
<th>IE/Group Name</th>
<th>Presence</th>
<th>Range</th>
<th>IE type and reference</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Portion ID</td>
<td>M</td>
<td></td>
<td>INTEGER (0..255,...)</td>
<td></td>
</tr>
</tbody>
</table>

7.5  Message and information element abstract syntax

7.5.1  General

LCS-AP ASN.1 definition conforms to [8] and [9].

The ASN.1 definition specifies the structure and content of LCS-AP messages. LCS-AP messages can contain any IEs specified in the object set definitions for that message without the order or number of occurrence being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct a LCS-AP message according to the PDU definitions module and with the following additional rules (Note that in the following IE means an IE in the object set with an explicit id. If one IE needed to appear more than once in one object set, then the different occurrences have different IE ids):

- IEs shall be ordered (in an IE container) in the order they appear in object set definitions.
- Object set definitions specify how many times IEs may appear. An IE shall appear exactly once if the presence field in an object has value "mandatory". An IE may appear at most once if the presence field in an object has
value "optional" or "conditional". If in a tabular format there is multiplicity specified for an IE (i.e. an IE list) then in the corresponding ASN.1 definition the list definition is separated into two parts. The first part defines an IE container list where the list elements reside. The second part defines list elements. The IE container list appears as an IE of its own. For this version of the standard an IE container list may contain only one kind of list elements.

If a LCS-AP message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax error in clause 10 of [7].

7.5.2 Usage of protocol extension mechanism for non-standard use

The protocol extension mechanism for non-standard use may be used:

- for special operator- (and/or vendor) specific features considered not to be part of the basic functionality, i.e. the functionality required for a complete and high-quality specification in order to guarantee multi-vendor interoperability.

- by vendors for research purposes, e.g. to implement and evaluate new algorithms/features before such features are proposed for standardisation.

The extension mechanism shall not be used for basic functionality. Such functionality shall be standardised.

7.5.3 Elementary procedure definitions

```plaintext
-- ************************************************************
-- Elementary Procedure definitions
-- ************************************************************

LCS-AP-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) lcs-AP (4) version1 (1) lcs-AP-PDU-Descriptions (0)}

DEFINITIONS AUTOMATIC TAGS ::= BEGIN
-- ************************************************************
-- IE parameter types from other modules.
-- ************************************************************

IMPORTS
    Criticality,
    ProcedureCode
FROM LCS-AP-CommonDataTypes

    Location-Request,
    Location-Response,
    Location-Abort-Request,
    Connection-Oriented-Information,
    Connectionless-Information,
    Reset-Request,
    Reset-Acknowledge
FROM LCS-AP-PDU-Contents

    id-Location-Service-Request,
    id-Connection-Oriented-Information-Transfer,
    id-Connectionless-Information-Transfer,
    id-Location-Abort,
    id-Reset
FROM LCS-AP-Constants;

-- ************************************************************
-- Interface Elementary Procedure Class
-- ************************************************************
```
LCS-AP-ELEMENTARY-PROCEDURE ::= CLASS {
  &InitiatingMessage
  &SuccessfulOutcome OPTIONAL,
  &UnsuccessfulOutcome OPTIONAL,
  &procedureCode ProcedureCode UNIQUE,
  &criticality Criticality DEFAULT ignore
}
WITH SYNTAX {
  INITIATING MESSAGE &InitiatingMessage
  [SUCCESSFUL OUTCOME &SuccessfulOutcome]
  [UNSUCCESSFUL OUTCOME &UnsuccessfulOutcome]
  PROCEDURE CODE &procedureCode
  [CRITICALITY &criticality]
}
-- ************************************************************
-- Interface PDU Definition
-- ************************************************************
LCS-AP-PDU ::= CHOICE {
  initiatingMessage InitiatingMessage,
  successfulOutcome SuccessfulOutcome,
  unsuccessfulOutcome UnsuccessfulOutcome,
  ...
}
InitiatingMessage ::= SEQUENCE {
  procedureCode LCS-AP-ELEMENTARY-PROCEDURE.&procedureCode
    ({LCS-AP-ELEMENTARY-PROCEDURES}),
  criticality LCS-AP-ELEMENTARY-PROCEDURE.&criticality
    ({LCS-AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
  value LCS-AP-ELEMENTARY-PROCEDURE.&InitiatingMessage
    ({LCS-AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}
SuccessfulOutcome ::= SEQUENCE {
  procedureCode LCS-AP-ELEMENTARY-PROCEDURE.&procedureCode
    ({LCS-AP-ELEMENTARY-PROCEDURES}),
  criticality LCS-AP-ELEMENTARY-PROCEDURE.&criticality
    ({LCS-AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
  value LCS-AP-ELEMENTARY-PROCEDURE.&SuccessfulOutcome
    ({LCS-AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}
UnsuccessfulOutcome ::= SEQUENCE {
  procedureCode LCS-AP-ELEMENTARY-PROCEDURE.&procedureCode
    ({LCS-AP-ELEMENTARY-PROCEDURES}),
  criticality LCS-AP-ELEMENTARY-PROCEDURE.&criticality
    ({LCS-AP-ELEMENTARY-PROCEDURES}{@procedureCode}),
  value LCS-AP-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome
    ({LCS-AP-ELEMENTARY-PROCEDURES}{@procedureCode})
}
-- ************************************************************
-- Interface Elementary Procedure List
-- ************************************************************
LCS-AP-ELEMENTARY-PROCEDURES LCS-AP-ELEMENTARY-PROCEDURE ::= {
  LCS-AP-ELEMENTARY-PROCEDURES-CLASS-1 | LCS-AP-ELEMENTARY-PROCEDURES-CLASS-2 , ...
}
LCS-AP-ELEMENTARY-PROCEDURES-CLASS-1 LCS-AP-ELEMENTARY-PROCEDURE ::= {
  location-Service-Request
  connectionless-Information-Transfer
  location-Abort
  reset
  ...
}
LCS-AP-ELEMENTARY-PROCEDURES-CLASS-2 LCS-AP-ELEMENTARY-PROCEDURE ::= {


location-Service-Request LCS-AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE Location-Request
  SUCCESSFUL OUTCOME Location-Response
  UNSUCCESSFUL OUTCOME Location-Response
  PROCEDURE CODE id-Location-Service-Request
  CRITICALITY reject
}

connection-Oriented-Information-Transfer LCS-AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE Connection-Oriented-Information
  PROCEDURE CODE id-Connection-Oriented-Information-Transfer
  CRITICALITY reject
}

connectionless-Information-Transfer LCS-AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE Connectionless-Information
  UNSUCCESSFUL OUTCOME Connectionless-Information
  PROCEDURE CODE id-Connectionless-Information-Transfer
  CRITICALITY reject
}

location-Abort LCS-AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE Location-Abort-Request
  SUCCESSFUL OUTCOME Location-Response
  PROCEDURE CODE id-Location-Abort
  CRITICALITY reject
}

reset LCS-AP-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE Reset-Request
  SUCCESSFUL OUTCOME Reset-Acknowledge
  PROCEDURE CODE id-Reset
  CRITICALITY reject
}

END

7.5.4 PDU definitions

LCS-AP-PDU-Contents {
  itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
  eps-Access (21) modules (3) lcs-AP (4) version1 (1) lcs-AP-PDU-Contents (1)
}

DEFINITIONS AUTOMATIC TAGS ::= BEGIN

IMPORTS
  APDU,
  Accuracy-Fulfillment-Indicator,
  Cell-Portion-ID,
  Correlation-ID,
  E-CGI,
Geographical-Area,
IMSI,
IMEI,
Include-Velocity,
LCS-Cause,
LCS-Client-Type,
LCS-Service-Type-ID,
LCS-Priority,
LCS-QoS,
Location-Type,
MultipleAPDUs,
Network-Element,
Payload-Type,
Positioning-Data,
Return-Error-Type,
Return-Error-Cause,
UE-Positioning-Capability,
Velocity-Estimate
FROM LCS-AP-IEs

ProtocolExtensionContainer{},
ProtocolIE-Container{},
LCS-AP-PROTOCOL-EXTENSION,
LCS-AP-PROTOCOL-IES
FROM LCS-AP-Containers

id-Accuracy-Fulfillment-Indicator,
id-APDU,
id-Cell-Portion-ID,
id-Correlation-ID,
id-Destination-ID,
id-E-UTRAN-Cell-Identifier,
id-Include-Velocity,
id-IMEI,
id-IMSI,
id-Location-Type,
id-LCS-Client-Type,
id-LCS-Priority,
id-LCS-QoS,
id-LCS-Cause,
id-LCS-Service-Type-ID,
id-Location-Estimate,
id-Location-Type,
id-MultipleAPDUs,
id-Return-Error-Request,
id-Return-Error-Cause,
id-Source-Identity,
id-UE-Positioning-Capability,
id-Velocity-Estimate
FROM LCS-AP-Constants;

-- ************************************************************
-- Location-Request
-- ************************************************************

Location-Request ::= SEQUENCE {
  protocolIEs    ProtocolIE-Container       { { Location-Request-IEs} },
  protocolExtensions  ProtocolExtensionContainer { { Location-Request-Extensions} } OPTIONAL,
...
}

Location-Request-IEs LCS-AP-PROTOCOL-IES ::= {
  { ID id-Correlation-ID    CRITICALITY reject TYPE Correlation-ID    PRESENCE
    mandatory } | 
  { ID id-Location-Type    CRITICALITY reject TYPE Location-Type    PRESENCE
    mandatory } | 
  { ID id-E-UTRAN-Cell-Identifier    CRITICALITY ignore TYPE E-CGI     PRESENCE
    mandatory } | 
  { ID id-LCS-Client-Type    CRITICALITY reject TYPE LCS-Client-Type   PRESENCE
    optional } | 
  { ID id-LCS-Priority     CRITICALITY reject TYPE LCS-Priority     PRESENCE
    optional } | 
  { ID id-LCS-QoS         CRITICALITY reject TYPE LCS-QoS         PRESENCE
    optional } |
{ ID id-UE-Positioning-Capability CRITICALITY reject TYPE UE-Positioning-Capability PRESENCE optional } |
{ ID id-Include-Velocity CRITICALITY reject TYPE Include-Velocity PRESENCE optional } |
{ ID id-IMSI CRITICALITY ignore TYPE IMSI PRESENCE optional } |
{ ID id-IMEI CRITICALITY ignore TYPE IMEI PRESENCE optional } |
{ ID id-MultipleAPDUs CRITICALITY reject TYPE MultipleAPDUs PRESENCE optional },
...

Location-Request-Extensions LCS-AP-PROTOCOL-EXTENSION ::= {
{ ID id-LCS-Service-Type-ID CRITICALITY ignore EXTENSION LCS-Service-Type-ID PRESENCE optional },
...
}

-- **************************************************************************************
-- Location-Response
-- **************************************************************************************

Location-Response ::= SEQUENCE {
protocolIEs ProtocolIE-Container { {Location-Response-IEs} },
protocolExtensions ProtocolExtensionContainer { {Location-Response-Extensions} } OPTIONAL,
...
}

Location-Response-IEs LCS-AP-PROTOCOL-IES ::= {
{ ID id-Correlation-ID CRITICALITY reject TYPE Correlation-ID PRESENCE mandatory } |
{ ID id-Location-Estimate CRITICALITY reject TYPE Geographical-Area PRESENCE optional } |
{ ID id-Positioning-Data CRITICALITY reject TYPE Positioning-Data PRESENCE optional } |
{ ID id-Velocity-Estimate CRITICALITY reject TYPE Velocity-Estimate PRESENCE optional } |
{ ID id-Accuracy-Fulfillment-Indicator CRITICALITY reject TYPE Accuracy-Fulfillment-Indicator PRESENCE optional } |
{ ID id-LCS-Cause CRITICALITY ignore TYPE LCS-Cause PRESENCE optional },
...
}

Location-Response-Extensions LCS-AP-PROTOCOL-EXTENSION ::= {
{ ID id-E-UTRAN-Cell-Identifier CRITICALITY ignore EXTENSION E-CGI PRESENCE optional },
{ ID id-Cell-Portion-ID CRITICALITY ignore EXTENSION Cell-Portion-ID PRESENCE optional },
...
}

-- **************************************************************************************
-- Location-Abort
-- **************************************************************************************

Location-Abort-Request ::= SEQUENCE {
protocolIEs ProtocolIE-Container { {Location-Abort-Request-IEs} },
protocolExtensions ProtocolExtensionContainer { {Location-Abort-Request-Extensions} } OPTIONAL,
...
}

Location-Abort-Request-IEs LCS-AP-PROTOCOL-IES ::= {
{ ID id-Correlation-ID CRITICALITY reject TYPE Correlation-ID PRESENCE mandatory },
{ ID id-LCS-Cause CRITICALITY ignore TYPE LCS-Cause PRESENCE mandatory },
...}
Location-Abort-Request-Extensions LCS-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--                  Connection-Oriented-Information
-- ************************************************************

Connection-Oriented-Information ::= SEQUENCE {
    protocolIEs   ProtocolIE-Container { {Connection-Oriented-Information-IEs} },
    protocolExtensions  ProtocolExtensionContainer { {Connection-Oriented-Information-Extensions} } OPTIONAL,
    ...
}

Connection-Oriented-Information-IEs LCS-AP-PROTOCOL-IES ::= {
    { ID id-Correlation-ID  CRITICALITY reject TYPE Correlation-ID   PRESENCE optional },
    { ID id-Payload-Type   CRITICALITY reject TYPE Payload-Type   PRESENCE optional },
    { ID id-APDU    CRITICALITY reject TYPE APDU     PRESENCE optional },
    ...
}

Connection-Oriented-Information-Extensions LCS-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--                  Connectionless-Information
-- ************************************************************

Connectionless-Information ::= SEQUENCE {
    protocolIEs   ProtocolIE-Container { {Connectionless-Information-IEs} },
    protocolExtensions  ProtocolExtensionContainer { {Connectionless-Information-Extensions} } OPTIONAL,
    ...
}

Connectionless-Information-IEs LCS-AP-PROTOCOL-IES ::= {
    { ID id-Source-Identity   CRITICALITY reject TYPE Network-Element  PRESENCE mandatory },
    { ID id-Destination-ID   CRITICALITY reject TYPE Network-Element  PRESENCE mandatory },
    { ID id-APDU     CRITICALITY reject TYPE APDU     PRESENCE mandatory },
    { ID id-Return-Error-Request CRITICALITY reject TYPE Return-Error-Type  PRESENCE optional },
    { ID id-Return-Error-Cause  CRITICALITY ignore TYPE Return-Error-Cause  PRESENCE optional },
    ...
}

Connectionless-Information-Extensions LCS-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ************************************************************
--                  Reset-Request
-- ************************************************************

Reset-Request ::= SEQUENCE {
    protocolIEs   ProtocolIE-Container { {Reset-Request-IEs} },
    protocolExtensions  ProtocolExtensionContainer { {Reset-Request-Extensions} } OPTIONAL,
    ...
}

Reset-Request-IEs LCS-AP-PROTOCOL-IES ::= {
    { ID id-LCS-Cause CRITICALITY ignore TYPE LCS-Cause   PRESENCE mandatory },
    ...
}
Reset-Request-Extensions LCS-AP-PROTOCOL-EXTENSION ::= {
    ...
}

-- ******************************************************************************
-- Reset-Acknowledge
-- ******************************************************************************
Reset-Acknowledge ::= SEQUENCE {
    protocolIEs    ProtocolIE-Container { { Reset-Acknowledge-IEs} },
    protocolExtensions  ProtocolExtensionContainer { { Reset-Acknowledge-Extensions} } OPTIONAL,
    ...
}

Reset-Acknowledge-IEs LCS-AP-PROTOCOL-IES ::= {
    ...
}

Reset-Acknowledge-Extensions LCS-AP-PROTOCOL-EXTENSION ::= {
    ...
}

END

7.5.5 Information element definitions

-- ******************************************************************************
-- Information Element Definitions
-- ******************************************************************************

LCS-AP-IEs {
    itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
    eps-Access (21) modules (3) lcs-AP (4) version1 (1) lcs-AP-IEs (2)}

DEFINITIONS AUTOMATIC TAGS ::= BEGIN

IMPORTS
    max-No-Of-Points,
    max-Set,
    max-GNSS-Set
FROM LCS-AP-Constants

    Criticality,
    ProcedureCode,
    TriggeringMessage,
    ProtocolIE-ID
FROM LCS-AP-CommonDataTypes

    ProtocolExtensionContainer{},
    LCS-AP-PROTOCOL-EXTENSION
FROM LCS-AP-Containers;

-- A

APDU ::= OCTET STRING

Accuracy-Fulfillment-Indicator ::= ENUMERATED {
    requested-accuracy-fulfilled,
    requested-accuracy-not-fulfilled,
    ...
}
Altitude ::= INTEGER (0..65535)
-- The valid value for this IE is 0 to 32767.
-- Reception of value greater than 32767 shall be mapped to the value 32767.

Altitude-And-Direction ::= SEQUENCE {
  direction-Of-Altitude Direction-Of-Altitude,
  altitude    Altitude,
  ...
}

Angle ::= INTEGER (0..179)
-- B

Bearing ::= INTEGER (0..359)
-- C

CellIdentity ::= BIT STRING (SIZE (28))
Cell-Portion-ID ::= INTEGER (0..255,...)

Confidence ::= INTEGER (0..100)

Correlation-ID ::= OCTET STRING (SIZE (4))
-- D

DegreesLatitude ::= INTEGER (0..8388607)  -- 23 bit field

DegreesLongitude ::= INTEGER (-8388608..8388607) -- 24 bit field

Direction-Of-Altitude ::= ENUMERATED {
  height,
  depth
}
-- E

E-CGI ::= SEQUENCE {
  pLMNidentity   PLMN-ID,
  cell-ID     CellIdentity,
  iE-Extensions ProtocolExtensionContainer { { E-CGI-ExtIEs} } OPTIONAL,
  ...
}

E-CGI-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Ellipsoid-Point-With-Uncertainty-Ellipse ::= SEQUENCE {
  geographical-Coordinates Geographical-Coordinates,
  uncertainty-Ellipse   Uncertainty-Ellipse,
  confidence     Confidence,
  iE-Extensions    ProtocolExtensionContainer { { Ellipsoid-Point-With-Uncertainty-
                                            Ellipse-ExtIEs} } OPTIONAL,
  ...
}

Ellipsoid-Point-With-Uncertainty-Ellipse-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Ellipsoid-Point-With-Altitude ::= SEQUENCE {
  geographical-Coordinates Geographical-Coordinates,
  altitude-And-Direction Altitude-And-Direction,
  iE-Extensions    ProtocolExtensionContainer { { Ellipsoid-Point-With-Altitude-ExtIEs} }
  OPTIONAL,
  ...
}

Ellipsoid-Point-With-Altitude-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

ETSI
Ellipsoid-Point-With-Altitude-And-Uncertainty-Ellipsoid ::= SEQUENCE {
geographical-Coordinates Geographical-Coordinates,
altitude-And-Direction Altitude-And-Direction,
uncertainty-Ellipse Uncertainty-Ellipse,
uncertainty-Altitude Uncertainty-Altitude,
confidence Confidence,
iE-Extensions ProtocolExtensionContainer { { Ellipsoid-Point-With-Altitude-And-
Uncertainty-Ellipsoid-ExtIEs} } OPTIONAL,
...
}

Ellipsoid-Point-With-Altitude-And-Uncertainty-Ellipsoid-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
...
}

Ellipsoid-Arc ::= SEQUENCE {
geographical-Coordinates Geographical-Coordinates,
inInnerRadius Inner-Radius,
uncertainty-Radius Uncertainty-Code,
offset-Angle Angle,
included-Angle Angle,
confidence Confidence,
iE-Extensions ProtocolExtensionContainer { { Ellipsoid-Arc-ExtIEs} } OPTIONAL,
...
}

Ellipsoid-Arc-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
...
}

ENB-ID ::= CHOICE {
macro-eNB-ID Macro-eNB-ID,
home-eNB-ID Home-eNB-ID,
...
}

E-SMLC-ID ::= INTEGER (0..255)

-- F
-- G

Geographical-Area ::= CHOICE {
point Point,
point-With-Uncertainty Point-With-Uncertainty,
ellipsoidPoint-With-Uncertainty-Ellipse Ellipsoid-Point-With-Uncertainty-
Ellipse,
polygon Polygon,
ellipsoidPoint-With-Altitude Ellipsoid-Point-With-Altitude,
ellipsoidPoint-With-Altitude-And-Uncertainty-Ellipsoid Ellipsoid-Point-With-Altitude-And-
Uncertainty-Ellipsoid,
ellipsoid-Arc Ellipsoid-Arc,
...
}

Geographical-Coordinates ::= SEQUENCE {
latitudeSign LatitudeSign,
degreesLatitude DegreesLatitude,
degreesLongitude DegreesLongitude,
iE-Extensions ProtocolExtensionContainer { {Geographical-Coordinates-ExtIEs} } OPTIONAL,
...
}

Geographical-Coordinates-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
...
}

Global-eNB-ID ::= SEQUENCE {
pLMN-ID PLMN-ID,
eNB-ID ENB-ID
}
GNSS-Positioning-Method-And-Usage ::= OCTET STRING (SIZE (1))

GNSS-Positioning-Data-Set ::= SEQUENCE (SIZE (1..max-GNSS-Set)) OF GNSS-Positioning-Method-And-Usage

-- H

Home-eNB-ID ::= BIT STRING (SIZE (28))

Horizontal-Accuracy ::= INTEGER (0..127)

Horizontal-Speed-And-Bearing ::= SEQUENCE {
  bearing INTEGER (0..359),
  horizontal-Speed INTEGER (0..2047)
}

Horizontal-Velocity ::= SEQUENCE {
  horizontal-Speed-And-Bearing Horizontal-Speed-And-Bearing,
  iE-Extensions ProtocolExtensionContainer { { Horizontal-Velocity-ExtIEs} } OPTIONAL,
  ...
}

Horizontal-Velocity-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Horizontal-With-Vertical-Velocity ::= SEQUENCE {
  horizontal-Speed-And-Bearing Horizontal-Speed-And-Bearing,
  vertical-Velocity Vertical-Velocity,
  iE-Extensions ProtocolExtensionContainer { { Horizontal-Velocity-ExtIEs} } OPTIONAL,
  ...
}

Horizontal-With-Vertical-Velocity-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Horizontal-Velocity-With-Uncertainty ::= SEQUENCE {
  horizontal-Speed-And-Bearing Horizontal-Speed-And-Bearing,
  uncertainty-Speed INTEGER (0..255),
  iE-Extensions ProtocolExtensionContainer { { Horizontal-Velocity-With-Uncertainty-ExtIEs} } OPTIONAL,
  ...
}

Horizontal-Velocity-With-Uncertainty-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Horizontal-With-Vertical-Velocity-And-Uncertainty ::= SEQUENCE {
  horizontal-Speed-And-Bearing Horizontal-Speed-And-Bearing,
  vertical-Velocity Vertical-Velocity,
  horizontal-Uncertainty-Speed INTEGER (0..255),
  vertical-Uncertainty-Speed INTEGER (0..255),
  iE-Extensions ProtocolExtensionContainer { { Horizontal-Velocity-With-Uncertainty-ExtIEs} } OPTIONAL,
  ...
}

Horizontal-With-Vertical-Velocity-And-Uncertainty-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

-- I

IMSI ::= OCTET STRING (SIZE (3..8))

IMEI ::= OCTET STRING (SIZE (8))

Include-Velocity ::= ENUMERATED {
requested,
not-Requested,
...
}

Inner-Radius ::= INTEGER (0..65535)  -- 16 bit field

-- J
-- K
-- L

LatitudeSign ::= ENUMERATED {
    north,
    south
}

Location-Type ::= ENUMERATED {
    geographic-Information,
    assistance-Information,
    ...
}

LCS-Cause ::= CHOICE {
    radio-Network-Layer Radio-Network-Layer-Cause,
    transport-Layer Transport-Layer-Cause,
    protocol Protocol-Cause,
    misc Misc-Cause
}

LCS-Client-Type ::= ENUMERATED {
    emergency-Services,
    value-Added-Services,
    pLMN-Operator-Services,
    lawful-Intercept-Services,
    pLMN-Operator-broadcast-Services,
    pLMN-Operator-OM,
    pLMN-Operator-Anonymous-Statistics,
    pLMN-Operator-Target-MS-Service-Support,
    ...
}

LCS-Priority ::= OCTET STRING (SIZE (1))

LCS-QoS ::= SEQUENCE {
    horizontal-Accuracy Horizontal-Accuracy OPTIONAL,
    vertical-Requested Vertical-Requested OPTIONAL,
    vertical-Accuracy Vertical-Accuracy OPTIONAL,
    response-Time Response-Time OPTIONAL,
    ...
}

LCS-Service-Type-ID ::= INTEGER (0..127)

-- M

Macro-eNB-ID ::= BIT STRING (SIZE (20))

Message-Identifier ::= BIT STRING (SIZE (16))

Misc-Cause ::= ENUMERATED {
    processing-Overload,
    hardware-Failure,
    o-And-M-Intervention,
    unspecified,
    ...
}

MultipleAPDUs ::= SEQUENCE (SIZE (1..3)) OF APDU

-- N
Network-Element ::= CHOICE {
  global-eNB-ID  Global-eNB-ID, 
  e-SMLC-ID     E-SMLC-ID
}

Orientation-Major-Axis ::= INTEGER (0..89)

Payload-Type ::= ENUMERATED {
  lPP, lPPa, ...
}

PLMN-ID ::= TBCD-STRING

Point ::= SEQUENCE {
  geographical-Coordinates  Geographical-Coordinates, 
  iE-Extensions             ProtocolExtensionContainer { {Point-ExtIEs} } OPTIONAL, ...
}

Point-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Point-With-Uncertainty ::= SEQUENCE {
  geographical-Coordinates  Geographical-Coordinates, 
  uncertainty-Code         Uncertainty-Code, 
  iE-Extensions             ProtocolExtensionContainer { {Point-With-Uncertainty-ExtIEs} } OPTIONAL, ...}

Point-With-Uncertainty-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Polygon ::= SEQUENCE (SIZE (1..max-No-Of-Points)) OF Polygon-Point

Polygon-Point ::= SEQUENCE {
  geographical-Coordinates  Geographical-Coordinates, 
  iE-Extensions             ProtocolExtensionContainer { {Polygon-Point-ExtIEs} } OPTIONAL, ...
}

Polygon-Point-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Positioning-Data ::= SEQUENCE {
  positioning-Data-Set  Positioning-Data-Set OPTIONAL, 
  gNSS-Positioning-Data-Set  GNSS-Positioning-Data-Set OPTIONAL, 
  iE-Extensions             ProtocolExtensionContainer { {Positioning-Data-ExtIEs} } OPTIONAL, ...
}

Positioning-Data-ExtIEs LCS-AP-PROTOCOL-EXTENSION ::= {
  ...
}

Positioning-Data-Set ::= SEQUENCE (SIZE (1..max-Set)) OF Positioning-Method-And-Usage

Positioning-Method-And-Usage ::= OCTET STRING (SIZE (1))

Protocol-Cause ::= ENUMERATED {
  transfer-Syntax-Error, 
  abstract-Syntax-Error-Reject, 
  abstract-Syntax-Error-Ignore-And-Notify, 
  message-Not-Compatible-With-Receiver-State, 
  semantic-Error, 
  unspecified,
abstract-Syntax-Error,
...

-- Q
-- R

Radio-Network-Layer-Cause ::= ENUMERATED {
  unspecified,
  ...
}

Response-Time ::= ENUMERATED {
  low-Delay(0),
  delay-Tolerant(1),
  ...
}

Return-Error-Type ::= ENUMERATED {
  yes,
  no
}

Return-Error-Cause ::= ENUMERATED {
  system-Failure,
  protocol-Error,
  destination-Unknown,
  destination-Unreachable,
  congestion,
  ...
}

-- S
-- T

TBCD-STRING ::= OCTET STRING (SIZE (3))

Transport-Layer-Cause ::= ENUMERATED {
  transport-Resource-Unavailable,
  unspecified,
  ...
}

-- U

Uncertainty-Altitude ::= INTEGER (0..127)

Uncertainty-Code ::= INTEGER (0..127)

Uncertainty-Ellipse ::= SEQUENCE {
  uncertainty-SemiMajor Uncertainty-Code,
  uncertainty-SemiMinor Uncertainty-Code,
  orientation-Major-Axis Orientation-Major-Axis
}

UE-Positioning-Capability ::= SEQUENCE {
  IPP BOOLEAN,
  ...
}

-- V

Velocity-Estimate ::= CHOICE {
  horizontal-Velocity, Horizontal-Velocity,
  horizontal-Without-Vertical-Velocity Horizontal-Without-Vertical-Velocity,
  horizontal-Velocity-Without-Uncertainty Horizontal-Velocity-Without-Uncertainty,
  horizontal-Without-Vertical-Velocity-And-Uncertainty Horizontal-Without-Vertical-Velocity-And-
  Uncertainty,
  ...
}

Vertical-Requested ::= ENUMERATED {
  vertical-coordinate-Is-Not-Requested(0),
  vertical-coordinate-Is-Requested(1)
}

Vertical-Accuracy ::= INTEGER (0..127)
Vertical-Velocity ::= SEQUENCE {
  vertical-Speed INTEGER (0..255),
  vertical-Speed-Direction Vertical-Speed-Direction
}

Vertical-Speed-Direction ::= ENUMERATED {
  upward,
  downward
}

7.5.6 Common definitions

-- *******************************************************
-- Common definitions
-- *******************************************************

LCS-AP-CommonDataTypes {
  itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
  eps-Access (21) modules (3) lcs-AP (4) version1 (1) lcs-AP-CommonDataTypes (3)}
DEFINITIONS AUTOMATIC TAGS ::= BEGIN
  Criticality ::= ENUMERATED { reject, ignore, notify }
  Presence ::= ENUMERATED { optional, conditional, mandatory }
  ProcedureCode ::= INTEGER (0..255)
  ProtocolExtensionID ::= INTEGER (0..65535)
  ProtocolIE-ID ::= INTEGER (0..65535)
  TriggeringMessage ::= ENUMERATED {initiating-message, successful-outcome, unsuccessful-outcome, outcome}
END

7.5.7 Constant definitions

-- *******************************************************
-- Constant definitions
-- *******************************************************

LCS-AP-Constants {
  itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
  eps-Access (21) modules (3) lcs-AP (4) version1 (1) lcs-AP-Constants (4)}
DEFINITIONS AUTOMATIC TAGS ::= BEGIN
-- *******************************************************
-- Elementary Procedures
-- *******************************************************

  id-Location-Service-Request INTEGER ::= 0
  id-Connection-Oriented-Information-Transfer INTEGER ::= 1
  id-Connectionless-Information-Transfer INTEGER ::= 2
id-Location-Abort INTEGER ::= 3
id-Reset INTEGER ::= 4

-- ****************************

-- IEs

-- ****************************

id-Accuracy-Fulfillment-Indicator INTEGER ::= 0
id-APDU INTEGER ::= 1
id-Correlation-ID INTEGER ::= 2
id-Destination-ID INTEGER ::= 3
id-E-UTRAN-Cell-Identifier INTEGER ::= 4
id-Included-Velocity INTEGER ::= 5
id-IMEI INTEGER ::= 6
id-IMSI INTEGER ::= 7
id-LCS-Client-Type INTEGER ::= 8
id-LCS-Priority INTEGER ::= 9
id-LCS-QoS INTEGER ::= 10
id-LCS-Cause INTEGER ::= 11
id-LCS-Priority INTEGER ::= 12
id-Location-Type INTEGER ::= 13
id-MultipleAPDUs INTEGER ::= 14
id-Payload-Type INTEGER ::= 15
id-Positioning-Data INTEGER ::= 16
id-Return-Error-Request INTEGER ::= 17
id-Return-Error-Cause INTEGER ::= 18
id-Source-Identity INTEGER ::= 19
id-UE-Positioning-Capability INTEGER ::= 20
id-Velocity-Estimate INTEGER ::= 21
id-LCS-Service-Type-ID INTEGER ::= 22
id-Cell-Portion-ID INTEGER ::= 23

-- ****************************

-- Extension constants

-- ****************************

-- Lists

-- ****************************

max-No-Of-Points INTEGER ::= 15
max-Set INTEGER ::= 9
max-GNSS-Set INTEGER ::= 9

maxProtocolExtensions INTEGER ::= 65535
maxProtocolIEs INTEGER ::= 65535

END

7.5.8 Container Definitions

-- ****************************

-- Container definitions

-- ****************************

LCS-AP-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
eps-Access (21) modules (3) lcs-AP (4) version1 (1) lcs-AP-Containers (5)
}
DEFINITIONS AUTOMATIC TAGS ::= BEGIN
-- *****************************************************************************
--  IE parameter types from other modules.
-- *****************************************************************************

IMPORTS
    Criticality,
    Presence,
    ProtocolExtensionID,
    ProtocolIE-ID
FROM LCS-AP-CommonDataTypes
    maxProtocolExtensions,
    maxProtocolIEs
FROM LCS-AP-Constants;

-- *****************************************************************************
--  Class Definition for Protocol IEs
-- *****************************************************************************

LCS-AP-PROTOCOL-IES ::= CLASS {
    &id    ProtocolIE-ID  UNIQUE,
    &criticality Criticality  DEFAULT ignore,
    &Value,
    &presence  Presence
}
WITH SYNTAX {
    ID     &id
    CRITICALITY   &criticality
    TYPE    &Value
    PRESENCE   &presence
}

-- *****************************************************************************
--  Class Definition for Protocol Extensions
-- *****************************************************************************

LCS-AP-PROTOCOL-EXTENSION ::= CLASS {
    &id    ProtocolExtensionID  UNIQUE,
    &criticality Criticality    DEFAULT ignore,
    &Extension,
    &presence  Presence
}
WITH SYNTAX {
    ID     &id
    CRITICALITY   &criticality
    EXTENSION   &Extension
    PRESENCE   &presence
}

-- *****************************************************************************
--  Container for Protocol IEs
-- *****************************************************************************

ProtocolIE-Container {LCS-AP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE (SIZE (0..maxProtocolIEs)) OF
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field {LCS-AP-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
    id    LCS-AP-PROTOCOL-IES.&id    {{IEsSetParam}@id},
    criticality LCS-AP-PROTOCOL-IES.&criticality {{IEsSetParam}@id},
    value   LCS-AP-PROTOCOL-IES.&Value         {{IEsSetParam}@id}
}

-- *****************************************************************************
--  Container Lists for Protocol IE Containers
-- *****************************************************************************

--
7.5.9 Message transfer syntax

LCS-AP shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax as specified in ITU-T Recommendation X.691 [12].

7.6 Handling of unknown, unforeseen and erroneous protocol data

Section 10 of 3GPP TS 36.413 [7] is applicable for the purposes of the present document.

8 LCS-AP Timers

8.1 General

The description of timers in the following tables should be considered a brief summary.

8.2 Timers of LCS-AP

<table>
<thead>
<tr>
<th>TIMER NUM.</th>
<th>TIMER VALUE</th>
<th>CAUSE OF START</th>
<th>NORMAL STOP</th>
<th>ON EXPIRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3x01</td>
<td>3 seconds</td>
<td>A Location Request procedure started in the MME.</td>
<td>Location Response message is received</td>
<td>Return error to requesting entity</td>
</tr>
<tr>
<td>T3x02</td>
<td>3 seconds</td>
<td>A Reset message is sent</td>
<td>Reset Acknowledge message is received</td>
<td>Retransmission of the Reset message</td>
</tr>
</tbody>
</table>
### Annex A (informative): Change history

<table>
<thead>
<tr>
<th>Date</th>
<th>TSG #</th>
<th>TSG Doc.</th>
<th>CR</th>
<th>Rev</th>
<th>Subject/Comment</th>
<th>Old</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-03</td>
<td>CP-47</td>
<td>CP-100054</td>
<td></td>
<td></td>
<td>3GPP TS presented for approval in CT#47</td>
<td>2.0.0</td>
<td>9.0.0</td>
</tr>
<tr>
<td>2010-06</td>
<td>CP-48</td>
<td>CP-100286</td>
<td>0001</td>
<td></td>
<td>Correction to Positioning Data Element</td>
<td>9.0.0</td>
<td>9.1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0003</td>
<td>Correction to Cell ID Category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010-06</td>
<td>CP-48</td>
<td>CP-100417</td>
<td>0002</td>
<td>3</td>
<td>Provide Service Type ID to E-SMLC</td>
<td>9.1.0</td>
<td>10.0.0</td>
</tr>
<tr>
<td>2010-09</td>
<td>CP-49</td>
<td>CP-100463</td>
<td>0006</td>
<td>1</td>
<td>Define message transfer syntax in LCS-AP</td>
<td>10.0.0</td>
<td>10.1.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Add LCS-AP port identifier, payload protocol identifier and Elementory Procedure number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011-03</td>
<td>CP-51</td>
<td>CP-110054</td>
<td>0014</td>
<td>2</td>
<td>Fix mismatches between technical description and ASN.1 coding</td>
<td>10.1.0</td>
<td>10.2.0</td>
</tr>
<tr>
<td>2011-06</td>
<td>CP-52</td>
<td>CP-110365</td>
<td>0016</td>
<td>1</td>
<td>Protocol Layering for LCS-AP</td>
<td>10.2.0</td>
<td>10.3.0</td>
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<tr>
<td>2011-09</td>
<td>CP-53</td>
<td>CP-110579</td>
<td>0020</td>
<td>1</td>
<td>Polygon encoding correction</td>
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<td>11.0.0</td>
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<tr>
<td>2012-03</td>
<td>CP-55</td>
<td>CP-120038</td>
<td>0021</td>
<td>2</td>
<td>Use of multiple SCTP associations between MME and E-SMLC</td>
<td>11.0.0</td>
<td>11.1.0</td>
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<tr>
<td>2012-12</td>
<td>CP-58</td>
<td>CP-120880</td>
<td>0023</td>
<td>1</td>
<td>Mandatory Correlation ID in Connection Oriented Information</td>
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<td>11.2.0</td>
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<td>CP-60</td>
<td>CP-130267</td>
<td>0024</td>
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<td>APDU in Connection Oriented Information message</td>
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<td>11.3.0</td>
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<tr>
<td>2013-12</td>
<td>CP-62</td>
<td>CP-130631</td>
<td>0025</td>
<td>1</td>
<td>Adding E-SMLC provided Cell info and Cell Portion</td>
<td>11.3.0</td>
<td>12.0.0</td>
</tr>
<tr>
<td>2014-06</td>
<td>CP-64</td>
<td>CP-140269</td>
<td>0026</td>
<td>-</td>
<td>Value range of Cell-Portion-ID</td>
<td>12.0.0</td>
<td>12.1.0</td>
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### History

<table>
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